December 2019 Volume 74 Supplement 2

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THORAX

December 2019

Thorax

AN INTERNATIONAL JOURNAL OF RESPIRATORY MEDICINE

British Thoracic Society Winter Meeting 2019

QEII Centre
Broad Sanctuary
Westminster
London SW1P 3EE

4 to 6 December 2019

Programme and Abstracts

thorax.bmj.com

BMJ

Fictional patient, for illustrative purposes only

For patients with COPD on treatment with ICS/LABA who are symptomatic and at risk of an exacerbation.*[1]

*Has worsening of symptoms or has experienced an exacerbation treated with antibiotics or oral corticosteroid, in the past 12 months.

It's the things you do today that make a big difference to their tomorrows[1–3]

TRELEGY Ellipta provides your patients with superior improvements in lung function and health-related quality of life, and reduction in annual rate of exacerbations vs. Symbicort Turbohaler at 24 weeks.[1–3]

TRELEGY ▼ ELLIPTA
fluticasone furoate/umeclidinium/vilanterol

TRELEGY Ellipta (FF/UMEC/VI) 92/55/22 mcg OD is indicated for maintenance treatment in adult patients with moderate to severe COPD who are not adequately treated by a combination of an ICS and a LABA or a combination of a LAMA and a LABA[1]

Today. Tomorrow. TRELEGY.

TRELEGY Ellipta is generally well tolerated. Common adverse reactions include: pneumonia, upper respiratory tract infection, bronchitis, pharyngitis, rhinitis, sinusitis, influenza, nasopharyngitis, candidiasis of mouth and throat, urinary tract infection, headache, cough, oropharyngeal pain, constipation, arthralgia, back pain[1]

FF, fluticasone furoate; ICS, inhaled corticosteroid; LABA, long-acting β_2-agonist; LAMA, long-acting muscarinic antagonist; OD, once-daily; UMEC, umeclidinium, VI, vilanterol

References: 1. TRELEGY Ellipta SmPC 2018. **2.** Lipson DA *et al. Am J Respir Crit Care Med* 2017; 196:438–446. **3.** Lipson DA *et al. N Engl J Med* 2018; 378:1671–1680.

Find out more here:

www.trelegy.co.uk
or request a visit from a GSK representative

Trelegy ▼ Ellipta (fluticasone furoate/umeclidinium/vilanterol [as trifenatate]) Prescribing information

Please consult the full Summary of Product Characteristics (SmPC) before prescribing. **Trelegy Ellipta (fluticasone furoate/umeclidinium/vilanterol [as trifenatate]) inhalation powder.** Each single inhalation of fluticasone furoate (FF) 100 micrograms (mcg), umeclidinium (UMEC) 62.5 micrograms and vilanterol (VI) 25 mcg provides a delivered dose of 92 mcg FF, 55 mcg UMEC and 22 mcg VI. **Indications:** Maintenance treatment in adult patients with moderate to severe COPD who are not adequately treated by a combination of an inhaled corticosteroid (ICS) and a long-acting β_2-agonist (LABA) or a combination of a long-acting β_2-agonist and a long-acting muscarinic antagonist. **Dosage and administration:** One inhalation once daily. **Contraindications:** Hypersensitivity to the active substances or to any of the excipients (lactose monohydrate & magnesium stearate). **Precautions:** Paradoxical bronchospasm, unstable or life-threatening cardiovascular disease or heart rhythm abnormalities, convulsive disorders or thyrotoxicosis, pulmonary tuberculosis or patients with chronic or untreated infections, narrow-angle glaucoma, urinary retention, hypokalaemia, patients predisposed to low levels of serum potassium, diabetes mellitus. In patients with moderate to severe hepatic impairment patients should be monitored for systemic corticosteroid-related adverse reactions. Eye symptoms such as blurred vision may be due to underlying serious conditions such as cataract, glaucoma or central serous chorioretinopathy (CSCR); consider referral to ophthalmologist. Increased incidence of pneumonia has been observed in patients with COPD receiving inhaled corticosteroids. Risk factors for pneumonia include: current smokers, older age, patients with a low body mass index and severe COPD. Patients with rare hereditary problems of galactose intolerance, the Lapp lactase deficiency or glucose-galactose malabsorption should not take Trelegy. Acute symptoms: Not for acute symptoms, use short-acting inhaled bronchodilator. Warn patients to seek medical advice if short-acting inhaled bronchodilator use increases. Therapy should not be abruptly stopped without physician supervision due to risk of symptom recurrence. Systemic effects: Systemic effects of ICSs may occur, particularly at high doses for long periods, but much less likely than with oral corticosteroids. **Interactions with other medicinal products:** Caution should be exercised during concurrent use of non-selective and selective beta-blockers and when co-administering with strong CYP3A4 inhibitors (e.g. ketoconazole, ritonavir, cobicistat-containing products), hypokalaemic treatments or non-potassium-sparing diuretics. Co-administration with other long-acting muscarinic antagonists or long acting β_2-adrenergic agonists has not been studied and is not recommended. **Pregnancy and breast-feeding:** Experience limited. Balance risks against benefits. **Side effects:** Common (≥1/100 to <1/10): pneumonia, upper respiratory tract infection, bronchitis, pharyngitis, rhinitis, sinusitis, influenza, nasopharyngitis, candidiasis of mouth and throat, urinary tract infection, headache, cough, oropharyngeal pain, constipation, arthralgia, back pain. Other important side effects include: Uncommon (≥1/1,000 to <1/100) supraventricular tachyarrhythmia, tachycardia, atrial fibrillation; Not known (cannot be estimated from the available data) vision blurred; See SmPC for other adverse reactions. **Legal category:** POM. **Presentation and Basic NHS cost:** Trelegy Ellipta 92/55/22 mcg - £44.50. 1 inhaler x 30 doses. **Marketing authorisation (MA) nos. 92/55/22 mcg 1x30 doses [EU/1/17/1236/02]; MA holder:** GSK Trading Services Ltd., Currabinny, Co. Cork Ireland. **Last date of revision:** November 2018. UK/TLY/0031/17(1). Trademarks are owned by or licensed to the GSK group of companies. 2018 GSK group of companies or its licensor Trelegy Ellipta was developed in collaboration with Innoviva Inc.

A full list of adverse reactions for TRELEGY Ellipta can be found in the Summary of Product Characteristics.

Adverse events should be reported. Reporting forms and information can be found at www.mhra.gov.uk/yellowcard or search for MHRA Yellowcard in the Google Play or Apple App Store. Adverse events should also be reported to GlaxoSmithKline on 0800 221 441.

TRELEGY Ellipta was developed in collaboration with INNOVIVA

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PROGRAMME

AND

ABSTRACTS

Thorax

British Thoracic Society
Winter Meeting 2019

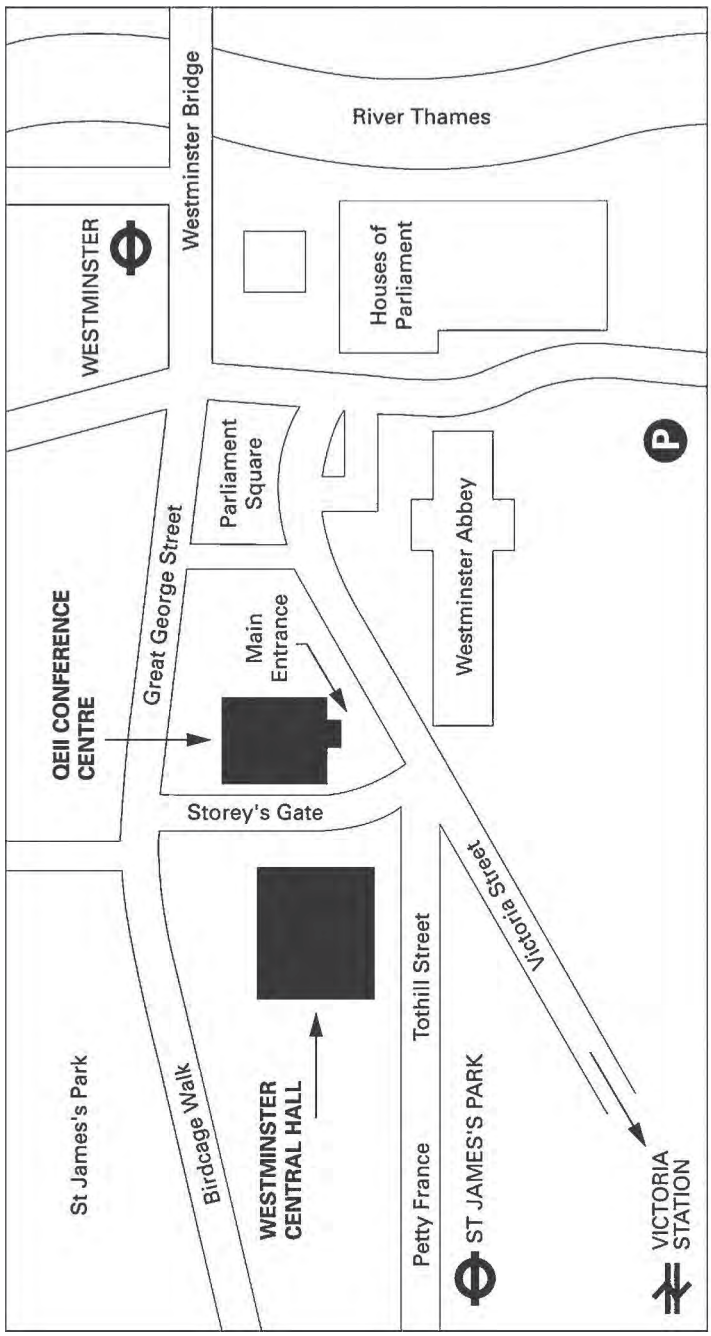
QEII Centre
Broad Sanctuary
Westminster
London SW1P 3EE

4 to 6 December 2019
Programme and Abstracts

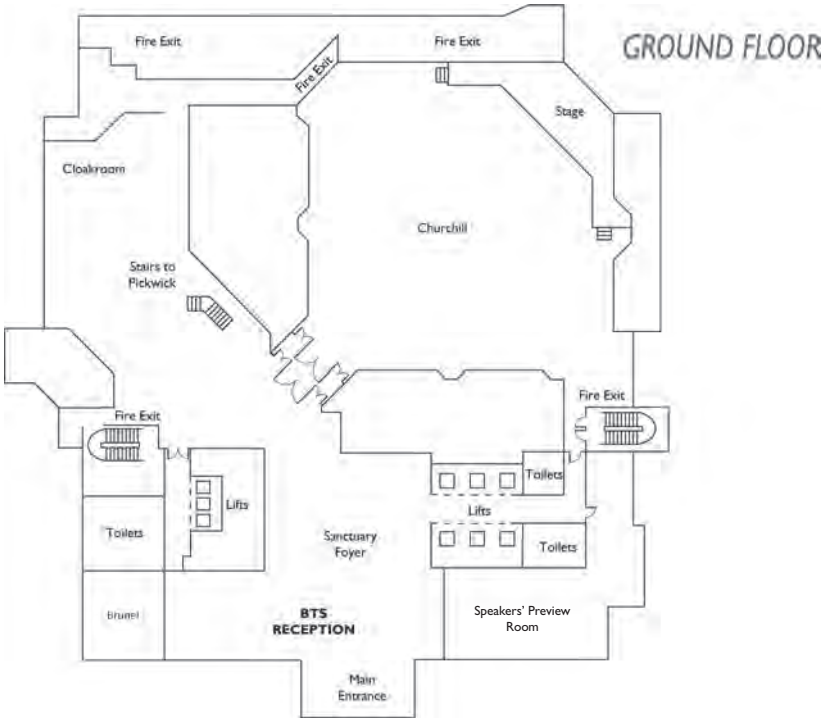
Approved by the Federation of the
Royal Colleges of Physicians of the UK
for 18 category 1 (external) credits
(6 credits per day).
Code: 127623

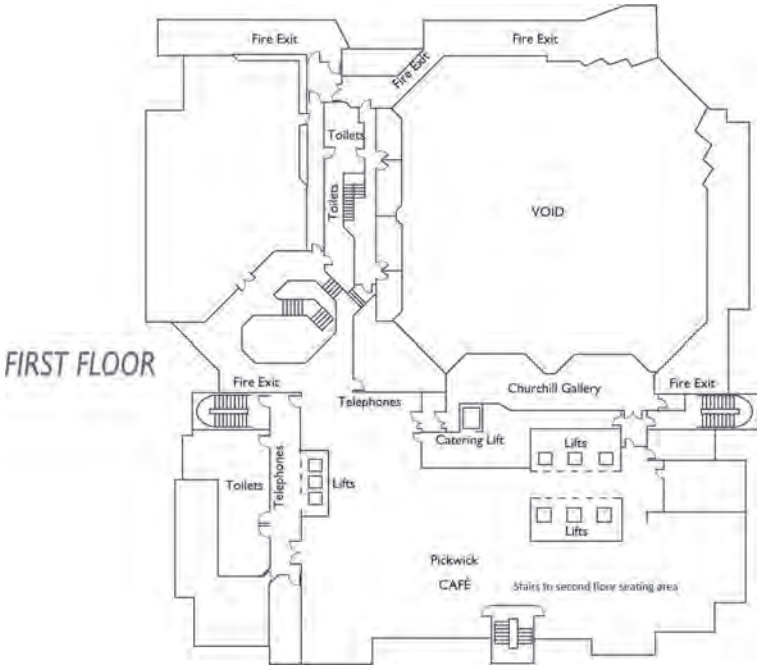
Map to the QEII Centre

PowerPoint preview facilities will be available throughout the three days of the Meeting on the ground floor of the Centre. All presenters and chairs should report to the Speakers' section of the Registration Desks on arrival.



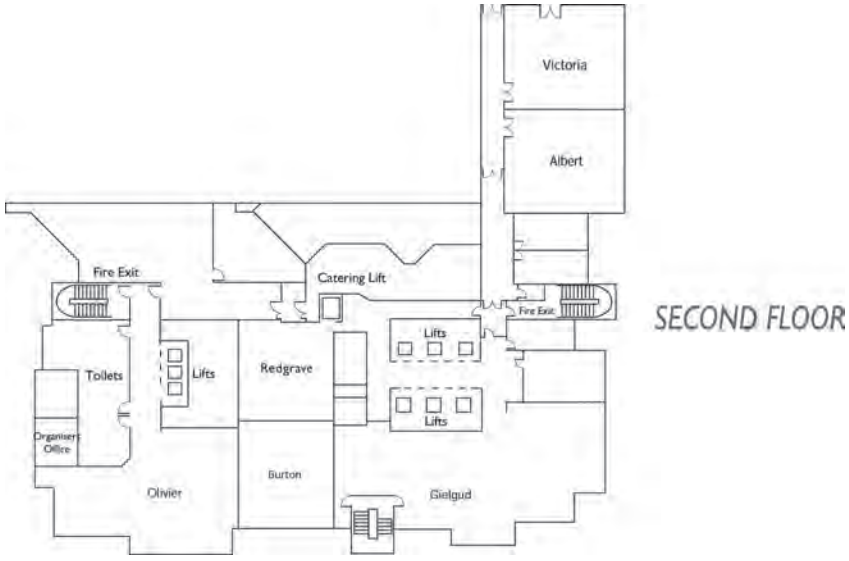
The QEII Centre - Ground and First Floors





Full café facilities will be open in the Pickwick on the 1st floor from 8.00am to 4.00pm on Wednesday 4 and Thursday 5 December and from 8.00am to 2.30pm on Friday 6 December. A snack bar, serving hot and cold drinks, sandwiches and confectionery only, will be open at the same times in the Whittle & Fleming on the 3rd floor.

The QEII Centre - Second and Third Floors



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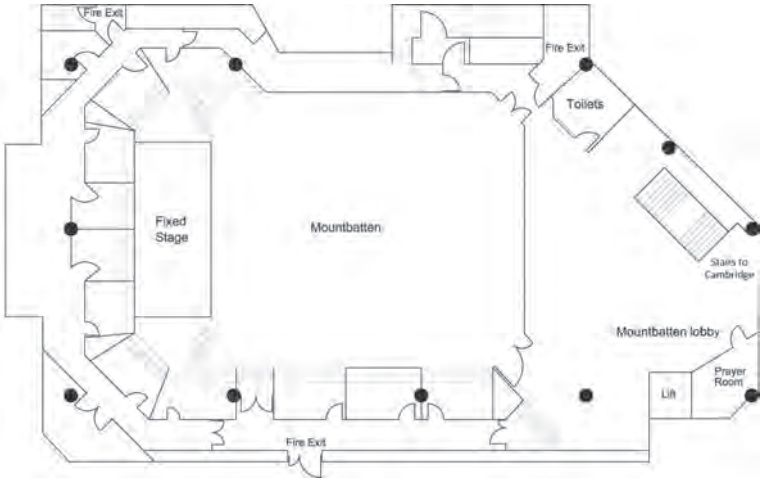
The QEII Centre - Fourth, Fifth and Sixth Floors

Stairs to Mountbatten, 6th floor

FIFTH FLOOR



SIXTH FLOOR

Full café facilities will be open in the Pickwick on the 1st floor from 8.00am to 4.00pm on Wednesday 4 and Thursday 5 December and from 8.00am to 2.30pm on Friday 6 December. A snack bar, serving hot and cold drinks, sandwiches and confectionery only, will be open at the same times in the Whittle & Fleming on the 3rd floor.

DAILY PROGRAMME

WEDNESDAY 4 DECEMBER 2019

Time	Details			Location/Floor
8.00am – 9.00am	COFFEE/TEA	Whittle & Fleming/3rd		
8.45am – 4.00pm	Poster viewing	P1-P10	A multi-faceted approach to ILD management	Whittle & Fleming /3rd
Authors present		P11-P20	Asthma: endotypes/biomarkers	
10.00am – 11.00am		P21-P29	Pulmonary rehabilitation: more and better	
		P30-P37	Ventilation in neuromuscular disease	
		P38-P51	Driving quality improvement through education and training	
		P52-P60	Prognosis and outcomes in ILD	
		P61-P71	Paediatric respiratory pick and mix	
8.45am – 4.00pm	Moderated poster viewing	M1-M9	The epidemiology and impact of difficult infections	Cambridge/5th
8.00am – 8.30am	BTS Journal Club		Epidemiology	Albert/2nd
8.30am – 10.30am	Joint BTS/BALR symposium (part I)		The silver tsunami: lung disease in an ageing population	Westminster/4th
8.45am – 9.50am	Spoken session	S1-S4	Smoking cessation strategies for lung health	St James/4th
8.45am – 10.05am	Spoken session	S5-S9	Pulmonary rehabilitation: better: more!	Abbey/4th
8.45am – 10.15am	Symposium		Difficult infection	Mountbatten/6th
8.45am – 10.45am	Symposium		Obstructive sleep apnoea: beyond AHI and ESS	Windsor/5th
9.00am – 10.30am	Symposium		The early detection of lung cancer	Churchill/Ground
10.00am – 11.00am	COFFEE/TEA	Whittle & Fleming and Britten/3rd		
10.30am – 11.50am	Spoken session	S10-S14	Pleural disease: not so benign	St James/4th
10.30am – 12.05pm	Spoken session	S15-S20	Biomarkers and treatments in cystic fibrosis	Moore/4th
10.30am – 12.30pm	Symposium		Winter think tank policy debate	Mountbatten/6th
10.45am – 12.20pm	Spoken session	S21-S26	An update in screening for lung cancer	Abbey/4th
10.45am – 12.45pm	Symposium		COPD: it's not just tobacco	Churchill/Ground
11.00am – 12.00pm	SAG open meeting		Pulmonary Rehabilitation	Albert/2nd
11.00am – 12.30pm	Symposium		Latent TB in the 21st century	Windsor/5th
11.00am – 1.00pm	Joint BTS/BALR symposium (part 2)		The silver tsunami: strategies to stop the wave from breaking	Westminster/4th
12.00pm – 2.00pm	LUNCH Cash catering only	Pickwick /1st and Whittle & Fleming/3rd		

Please see page Axii for a complete list of the days and times of BTS Specialist Advisory Group Open Meetings.

Coffee and tea are complimentary ONLY during the coffee/tea break times shown above. Outside these times, drinks may be purchased from the café in the Pickwick (1st floor), or the snack bar in the Whittle & Fleming (3rd floor).

Time	Details			Location/Floor
12.10pm – 1.45pm	SAG open meeting		Cystic Fibrosis	Gielgud/2nd
12.45pm – 2.00pm	Poster discussion	P1-P10	A multi-faceted approach to ILD management	Moore/4th
1.00pm – 1.45pm	The BTS Clinical Lecture		Detecting and treating lung cancer earlier	Churchill/Ground
1.00pm – 2.00pm	SAG open meeting		Sleep Apnoea	Albert/2nd
1.15pm – 2.30pm	Poster discussion	P11-P20	Asthma: endotypes/biomarkers	Abbey/4th
2.00pm – 3.00pm	SAG open meeting		Lung Cancer and Mesothelioma	Gielgud/2nd
2.00pm – 3.10pm	Poster discussion	P21-P29	Pulmonary rehabilitation: more and better	Windsor/5th
2.00pm – 3.10pm	Moderated poster discussion	M1-M9	The epidemiology and impact of difficult infections	Cambridge/5th
2.00pm – 3.20pm	Spoken session	S27-S31	What's new? Clinical trials in lung disease	Rutherford/4th
2.00pm – 3.30pm	Joint BTS/BPRS symposium		Lung involvement in multisystem disease	Mountbatten/6th
2.00pm – 3.30pm	Award symposium	T1-T6	BTS/BALR/BLF Early Career Investigator Award Symposium	Westminster/4th
2.00pm – 4.00pm	Symposium		Point of care and pleural imaging: at the cutting edge	Churchill/Ground
2.15pm – 3.20pm	Poster discussion	P30-P37	Ventilation in neuromuscular disease	St James/4th
2.15pm – 4.00pm	Poster discussion	P38-P51	Driving quality improvement through education and training	Moore/4th
2.30pm – 3.30pm	SAG open meeting		COPD	Victoria/2nd
2.30pm – 3.40pm	Poster discussion	P52-P60	Prognosis and outcomes in ILD	Albert/2nd
2.40pm – 4.15pm	Spoken session	S32-S37	Acute asthma: lessons from the frontline	Abbey/4th
3.00pm – 4.30pm	COFFEE/TEA		Whittle & Fleming and Britten/3rd and Cambridge/5th (3.30pm – 3.45pm only)	
3.30pm – 4.30pm	SAG open meeting		Pulmonary Infection	Gielgud/2nd
3.45pm – 5.15pm	Poster discussion	P61-P71	Paediatric respiratory pick and mix	Windsor/5th
4.15pm – 4.45pm	Award presentations			Churchill/Ground
4.45pm – 5.30pm	The BTS President's Address		"Lights, camera, action!"	Churchill/Ground
5.30pm – 6.00pm	BTS AGM		BTS Annual General Meeting (BTS members only)	Churchill/Ground

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DAILY PROGRAMME

THURSDAY 5 DECEMBER 2019

Time	Details			Location/Floor
8.00am – 9.00am	COFFEE/TEA	Whittle & Fleming/3rd		
8.45am – 4.00pm	Poster viewing	P72-P85	Lung cancer diagnostics: challenges and solutions	Whittle & Fleming/3rd
Authors present		P86-P97	Biologics in asthma	
10.00am – 11.00am		P98-P111	Malignant pleural disease	
		P112-P124	Pulmonary hypertension: advances in diagnosis and treatment	
		P125-P133	Lung physiology: something old, something new	
		P134-P143	Respiratory infections: getting it right	
		P144-P155	Asthma epidemiology: understanding the problem	
		P156-P169	Targeted assessment of asthma	
8.45am – 4.00pm	Moderated poster viewing	M10-M15	Real world studies with antifibrotics in IPF	Cambridge/5th
8.00am – 8.30am	BTS Journal Club		Clinical trials	Albert/2nd
8.00am – 9.30am	Open session		Preparing for a move to a consultant post: tips, tactics and potential opportunities	Gielgud/2nd
8.30am – 10.00am	Symposium		Immunotherapy: the brave new world	Mountbatten/6th
8.45am – 10.15am	Symposium		New strategies for COPD exacerbations	Churchill/Ground
8.45am – 10.15am	Joint BTS/BPRS symposium		The assessment of lung disease in children	Windsor/5th
8.45am – 10.20am	Spoken session	S38-S43	Integrative working to improve patient experience in lung disease	Moore/4th
9.00am – 10.00am	Open meeting		BTS/ARTP Respiratory Physiology Joint Board	Victoria/2nd
9.00am – 10.20am	Spoken session	S44-S48	Novel insights into malignant pleural disease	Abbey/4th
9.00am – 10.35am	Spoken session	S49-S54	Increasing experience of biologics and asthma	Westminster/4th
9.15am – 10.15am	Respiratory Futures open session		Health inequalities and the future of respiratory care	St James/4th
10.00am – 11.00am	COFFEE/TEA	Whittle & Fleming and Britten/3rd		
10.30am – 11.45am	Open session		Integrated care network meeting	Gielgud/2nd
10.30am – 11.50am	Spoken session	S55-S59	The failing lung in COPD	St James/4th
10.30am – 12.05pm	Spoken session	S60-S65	Diagnostic and therapeutic advances in paediatrics	Mountbatten/6th
10.30am – 12.15pm	Symposium		Plenary Scientific Symposium	Churchill/Ground
10.30am – 12.15pm	Open session		Global lung health and launch of the BTS Global Lung Health Initiative	Victoria/2nd
12.00pm – 1.30pm	Open session		Working in respiratory	Gielgud/2nd
12.00pm – 2.00pm	LUNCH Cash catering only	Pickwick/1st and Whittle & Fleming/3rd		

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Time	Details			Location/Floor
12.15pm – 12.30pm	Open session		BREATHE - a Health Data Research UK Hub for Respiratory Disease	Churchill/Ground
12.30pm – 1.30pm	SAG open meeting		Asthma	Moore/4th
12.45pm – 1.30pm	The BTS Scientific Lecture		Microbiome and effect on the lungs	Churchill/Ground
1.45pm – 2.45pm	BLF open session		BLF research update: new approaches in COPD	Gielgud/2nd
1.45pm – 2.50pm	Spoken session	S66-S69	ILD and rare respiratory diseases: cracking the code	Westminster/4th
1.45pm – 3.20pm	Spoken session	S70-S75	Translational science in COPD	St James/4th
1.45pm – 3.20pm	Spoken session	S76-S81	An update in lung physiology	Rutherford/4th
1.45pm – 3.30pm	Symposium		BTS audit and quality improvement: highlights from 2019	Abbey/4th
1.45pm – 3.30pm	Poster discussion	P72-P85	Lung cancer diagnostics: challenges and solutions	Windsor/5th
2.00pm – 3.00pm	Moderated poster discussion	M10-M15	Real world studies with antifibrotics in IPF	Cambridge/5th
2.00pm – 3.30pm	Symposium		Immunity to respiratory infections: from mechanisms to therapy	Churchill/Ground
2.00pm – 3.30pm	Symposium		Highlights from *JAMA* and *Thorax*	Mountbatten/6th
2.00pm – 3.30pm	Poster discussion	P86-P97	Biologics in asthma	Albert/2nd
2.00pm – 3.45pm	Poster discussion	P98-P111	Malignant pleural disease	Moore/4th
3.00pm – 4.30pm	Open session		National Asthma and COPD Audit Programme	Gielgud/2nd
3.00pm – 4.30pm	COFFEE/TEA	Whittle & Fleming, Britten/3rd		
3.15pm – 4.15pm	SAG open meeting		Nurse	Victoria/2nd
3.15pm – 4.55pm	Poster discussion	P112-P124	Pulmonary hypertension: advances in diagnosis and treatment	Westminster/4th
3.30pm – 5.05pm	Spoken session	S82-S87	There is more to ILD than IPF	St James/4th
3.45pm – 4.55pm	Poster discussion	P125-P133	Lung physiology: something old, something new	Rutherford/4th
3.45pm – 5.00pm	Poster discussion	P134-P143	Respiratory infections: getting it right	Windsor/5th
3.45pm – 5.15pm	Poster discussion	P144-P155	Asthma epidemiology: understanding the problem	Abbey/4th
3.45pm – 5.30pm	Poster discussion	P156-P169	Targeted assessment of asthma	Mountbatten/6th
4.00pm – 5.00pm	SAG open meeting		Specialist Trainees	Albert/2nd
4.00pm – 5.30pm	Symposium		Updates in cystic fibrosis	Churchill/Ground
5.30pm – 7.00pm	The President's Reception – All welcome!			Britten/3rd

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DAILY PROGRAMME

FRIDAY 6 DECEMBER 2019

Time	Details			Location/Floor
8.00am – 9.00am	COFFEE/TEA	Whittle & Fleming/3rd		
8.45am – 2.00pm	Poster viewing	P170-P176	Community and integrated care: joining the dots	Whittle & Fleming/3rd
Authors present		P177-P186	Sleep miscellany	
10.00am – 11.00am		P187-P200	Acute and domiciliary NIV in COPD: advances in practice	
		P201-P210	Clinical studies in TB	
		P211-P222	Beyond airways disease: ILO and cough	
		P223-P236	Asthma and inhalers: all the colours of the rainbow	
		P237-P250	CF and bronchiectasis: updates and controversies	
		P251-P265	Clinical studies in COPD: new evidence to guide practice	
8.45am – 3.30pm	Moderated poster viewing	M16-M27	Bronchiectasis: clinical phenotyping and outcomes	Cambridge/5th
8.00am – 8.30am	BTS Journal Club		Critiquing basic science	Albert/2nd
8.30am – 10.05am	Spoken session	S88-S93	Modelling lung disease in vitro/vivo	Moore/4th
8.30am – 10.05am	Spoken session	S94-S99	Genetic and cellular mechanisms of pulmonary hypertension	Abbey/4th
8.30am – 10.30am	Symposium		Pneumothorax: insights to aetiology and novel treatment directions	Churchill/Ground
8.45am – 10.15am	Symposium		Understanding occupational lung disease: lessons from the past and into the future	Westminster/4th
8.45am – 10.15am	Open session		New UK-wide guidance on the management of asthma: why, how and when?	Windsor/5th
8.45am – 10.20am	Spoken session	S100-S105	COPD: inflammation, smoking and exacerbations	St James/4th
9.00am – 10.30am	Symposium		E-cigarettes: signals of benefit and signals of harm	Mountbatten/6th
9.15am – 10.15am	SAG open meeting		Critical Care	Albert/2nd
9.30am – 10.30am	SAG open meeting		Interstitial and Rare Lung Disease	Gielgud/2nd
10.00am – 11.00am	COFFEE/TEA	Whittle & Fleming and Britten/3rd		
10.30am – 11.30am	SAG open meeting		Pulmonary Vascular Disease	Victoria/2nd
10.30am – 11.30am	SAG open meeting		Pharmacist	Rutherford/4th
10.30am – 11.35am	Spoken session	S106-S109	Improving outcomes in community acquired pneumonia	St James/4th
10.30am – 11.35am	Spoken session	S110-S113	TB: from diagnosis to treatment	Abbey/4th
10.30am – 12.05pm	Spoken session	S114-S119	Clinical care in COPD	Westminster/4th
10.45am – 11.45am	SAG open meeting		Occupational and Environmental Lung Disease	Albert/2nd

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Time	Details			Location/Floor
10.45am – 12.45pm	Symposium		Asthma: genes, drivers and health inequalities	Mountbatten/6th
11.00am – 12.00pm	SAG open meeting		Pleural Disease	Moore/4th
11.00am – 12.30pm	Symposium		Advancements in IPF	Churchill/Ground
11.30am – 12.00pm	Open session		Taskforce for Lung Health - end of year one report	Windsor/5th
11.45am – 12.45pm	SAG open meeting		Tobacco	Rutherford/4th
11.45am – 12.45pm	SAG open meeting		Tuberculosis	Abbey/4th
12.00pm – 2.00pm	LUNCH Cash catering only	Pickwick/1st and Whittle & Fleming/3rd EXHIBITION closes at 2.00pm		
12.30pm – 1.30pm	SAG open meeting		Cough	Victoria/2nd
1.00pm – 1.45pm	The BTS Grand Challenge Lecture		Health impacts of air pollution	Churchill/Ground
1.45pm – 2.45pm	Poster discussion	P170-P176	Community and integrated care: joining the dots	Moore/4th
1.45pm – 2.50pm	Spoken session	S120-S123	Occupational lung disease – "danger at work"	St James/4th
1.45pm – 2.50pm	Spoken session	S124-S127	"Under your skin" – imaging in lung disease	Abbey/4th
1.45pm – 3.00pm	Poster discussion	P177-P186	Sleep miscellany	Westminster/4th
1.45pm – 3.05pm	Spoken session	S128-S132	Advances in asthma science and treatment	Windsor/5th
1.45pm – 3.30pm	Poster discussion	P187-P200	Acute and domiciliary NIV in COPD: advances in practice	Rutherford/4th
2.00pm – 3.15pm	Poster discussion	P201-P210	Clinical studies in TB	Albert/2nd
2.00pm – 3.30pm	Symposium		Progressive-fibrosing ILD: if they look and behave the same, are they?	Churchill/Ground
2.00pm – 3.30pm	Symposium		Pulmonary vascular disease: from bench to bedside	Mountbatten/6th
2.00pm – 3.30pm	Moderated poster discussion	M16-M27	Bronchiectasis: clinical phenotyping and outcomes	Cambridge/5th
2.00pm – 3.45pm	Poster discussion	P211-P222	Beyond airways disease: ILO and cough	Victoria/2nd
2.45pm – 3.45pm	COFFEE/TEA	Britten/3rd		
3.00pm – 4.20pm	Spoken session	S133-S137	Fuelling the fire: inflammation and infection in lung disease	St James/4th
3.00pm – 4.45pm	Poster discussion	P223-P236	Asthma and inhalers: all the colours of the rainbow	Moore/4th
3.00pm – 4.45pm	Poster discussion	P237-P250	CF and bronchiectasis: updates and controversies	Abbey/4th
3.15pm – 5.15pm	Poster discussion	P251-P265	Clinical studies in COPD: new evidence to guide practice	Windsor/5th

Please see page Axii for a complete list of the days and times of BTS Specialist Advisory Group Open Meetings.

Coffee and tea are complimentary ONLY during the coffee/tea break times shown above. Outside these times, drinks may be purchased from the café in the Pickwick (1st floor), or the snack bar in the Whittle & Fleming (3rd floor).

OPEN MEETINGS OF THE BTS SPECIALIST ADVISORY GROUPS

Open meetings of the British Thoracic Society Specialist Advisory Groups (SAGs) will take place during the Winter Meeting. All participants are welcome to attend and hear more about the work of the SAGs and be involved in planning symposia for future Summer and Winter Meeting programmes. Further details may be found online.

WEDNESDAY 4 DECEMBER

Time	Details	Location/Floor
11.00am – 12.00pm	Pulmonary Rehabilitation	Albert/2nd
12.10pm – 1.45pm	Cystic Fibrosis	Gielgud/2nd
1.00pm – 2.00pm	Sleep Apnoea	Albert/2nd
2.00pm – 3.00pm	Lung Cancer and Mesothelioma	Gielgud/2nd
2.30pm – 3.30pm	COPD	Victoria/2nd
3.30pm – 4.30pm	Pulmonary Infection	Gielgud/2nd

THURSDAY 5 DECEMBER

Time	Details	Location/Floor
9.00am – 10.00am	BTS/ARTP Respiratory Physiology Joint Board	Victoria/2nd
12.30pm – 1.30pm	Asthma	Moore/4th
3.15pm – 4.15pm	Nurse	Victoria/2nd
4.00pm – 5.00pm	Specialist Trainee	Albert/2nd

FRIDAY 6 DECEMBER

Time	Details	Location/Floor
9.15am – 10.15am	Critical Care	Albert/2nd
9.30am – 10.30am	Interstitial and Rare Lung Disease	Gielgud/2nd
10.30am – 11.30am	Pulmonary Vascular Disease	Victoria/2nd
10.30am – 11.30am	Pharmacist	Rutherford/4th
10.45am – 11.45am	Occupational and Environmental Lung Disease	Victoria/2nd
11.00am – 12.00pm	Pleural Disease	Moore/4th
11.45am – 12.45pm	Tobacco	Rutherford/4th
11.45am – 12.45pm	Tuberculosis	Abbey/4th
12.30pm – 1.30pm	Cough	Victoria/2nd

BTS MEDAL AND AWARD PRESENTATIONS

Wednesday 4 December at 4.15pm in the Churchill, Ground floor

The presentations will be made for the annual BTS Medal, the BTS Award for Meritorious Service, the BTS/BALR/BLF Early Career Investigator Awards and the Medical Student Awards just before the BTS President's Address. Please come along to this session to congratulate the winners.

THE BTS PRESIDENT'S RECEPTION

Thursday 5 December from 5.30pm to 7.00pm in the Britten, 3rd floor

All participants are warmly invited to join us for this social occasion.

NTM-LUNG DISEASE

EARLY DIAGNOSIS & MANAGEMENT CAN SAVE LIVES

NTM-LD is a chronic condition that can significantly increase patient morbidity and mortality.[1-10]

Targeting Susceptible Patients

A nontuberculous mycobacterial (NTM) lung infection is a chronic condition that can get progressively worse and be debilitating in some patients. Patients with structural lung disease such as emphysema, asthma, bronchiectasis, cystic fibrosis, and COPD are at a greater risk of being infected.[11-16]

More Prevalent Than Thought

A survey identified nearly 20,000 patients in Europe who have been diagnosed with an NTM lung infection. Due to the fact that this infection is under-reported, the number could be higher.[17,18]

NTM May Be Masked

Symptoms, such as coughing and fatigue, are common of other respiratory comorbidities. These overlapping symptoms may mask an NTM lung infection, delaying diagnosis. Due to these factors, NTM lung infections can easily be overlooked, in some cases for months or even years.[12,15]

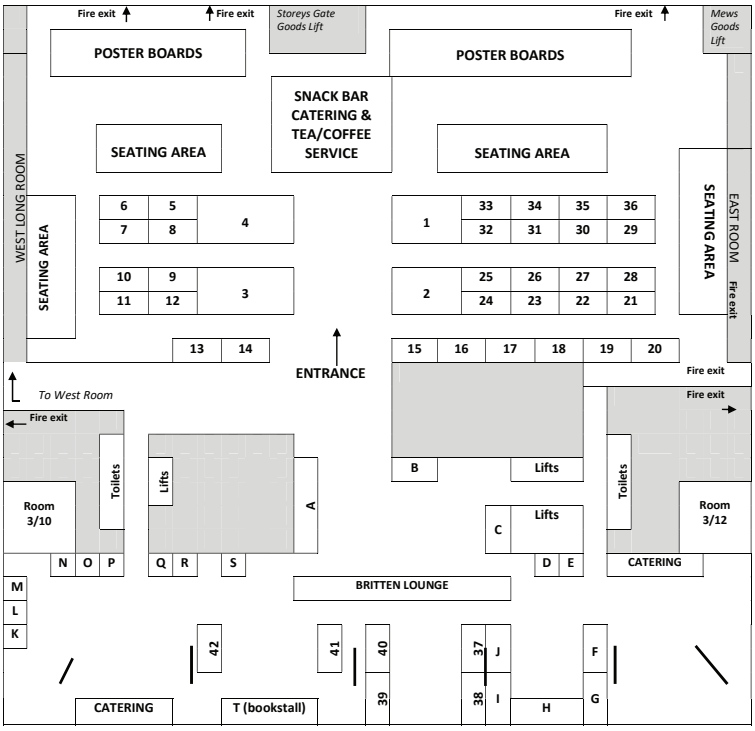
KNOW WHAT TO LOOK FOR. VISIT NTMFACTS.CO.UK TO LEARN MORE.

References: 1. *Aksamit TR et al. Chest. 2017;151(5):982–992.* **2.** *Yeh JJ et al. PLoSOne. 2014;9(6):e99260.* **3.** *Hayashi M et al. Am J Respir Crit Care Med. 2012;185(5):575–583.* **4.** *Ito Y et al. Int J Tubercl Lung Dis. 2012;16(3):408–414.* **5.** *Andrejak C et al. Am J Respir Crit Care Med. 2010;181:514–521.* **6.** *Marras TK et al. Emerg Infect Dis. 2017;23(3):468-476.* **7.** *Fleshner M et al. Int J Tubercl Lung Dis. 2016;20(5):582–587.* **8.** *Kotilainen H et al. Eur J Clin Microbiol Infect Dis. 2015;34:1909–1918.* **9.** *Novosad SA et al. Ann Am Thorac Soc. 2017 Jul;14(7):1112–1119. doi: 1513/AnnalsATS.201610–800OC.* **10.** *Diel R et al. BMC Infect Dis. 2018; 18:206.* **11.** *Winthrop KL, McNelley E, Kendall B, et al. Am J Respir Crit Care Med. 2010;182(7):977–982.* **12.** *Griffith DE, Aksamit T, Brown-Elliott BA et al. Am J Respir Crit Care Med. 2007;175:367–416.* **13.** *Adjemian J, Olivier KN, Seitz AE, et al. Am J Respir Crit Care Med. 2012;185(8):881–886.* **14.** *Fritscher LG, Marras TK, Bradi AC, et al. Chest. 2011;139(1):23–7.* **15.** *Young JD, Balagopal A, Reddy NS, et al. J Respir Dis. 2007;28(1):7–18.* **16.** *Adjemian J, Olivier KN, Prevots DR. Am J Respir Crit Care Med. 2014;190(5):581–586.* **17.** *Wagner D, van Ingen J, Adjemian J, et al. Annual Prevalence and Treatment Estimates for Nontuberculous Mycobacterial Pulmonary Disease in Europe: A NTM-NET Collaborative Study. 2014, Presented at ERS Congress.* **18.** *Van der Werf MJ, Ködmön C, Katalinć-Janković V, et al. BMC Infectious Diseases. 2014;14(62):1–9.*

Graphic is for illustrative purposes only. Disease progression and actual lung damage vary among patients.

insmed

FLOOR PLAN OF THE EXHIBITION STANDS



Exhibitors and stand numbers

36	Aquilant
2	AstraZeneca
26	Avanos
23	BD
34	BOC Healthcare
3	Bristol-Myers Squibb & Pfizer Alliance
16	Broncus Medical / Uptake Medical
15	BTG part of Boston Scientific Corporation
4	Chiesi Limited
29	Circassia
8	Exhalation Technology
32	Fisher & Paykel Healthcare
7	Gilead Sciences
35	Glenmark
1	GSK
5	Hitachi Medical Systems/PENTAX Medical for Endobronchial Ultrasound Technology
40	Insmed
24 & 25	Novartis Pharmaceuticals UK Limited
13 & 14	Olympus
17	Orion Pharma (UK) Ltd
42	PARI Medical Ltd
3	Pfizer
11	Pulmonx
12	Roche
33	Rocket Medical
19 & 20	Sandoz
9 & 10	Sanofi Genzyme
21, 22, 27, 28	Teva
37	The Respiratory Show 2020
31	Trudell Medical UK Ltd
6	Vertex Pharmaceuticals UK Ltd
41	Vygon (UK) Ltd
T	Wisepress.com

Charity and non-commercial stands

Q	Action for Pulmonary Fibrosis
F	Association for Respiratory Technology and Physiology
G	Association of Chartered Physiotherapists in Respiratory Care
J	Association of Respiratory Nurse Specialists
C	BMJ
I	British Association for Lung Research
R	British Lung Foundation
M	British Thoracic Oncology Group
A	British Thoracic Society & Respiratory Futures
S	European Respiratory Society
D	National Asthma & COPD Audit Programme
L	National Institute for Health Research
E	National Lung Cancer Audit
B	NHS England, NHS Improvement National Respiratory Programme & NHS RightCare
O	PCD Family Support Group
H	Primary Care Respiratory Society
P	SarcoidosisUK

flutiform® k-haler®

fluticasone propionate/formoterol

Intelligently designed. Simple to use.

The first and only ICS/LABA fixed-dose combination delivered in a breath-actuated aerosol inhaler.[2]

Aerosol delivery avoids the need for forceful inspiration.[1,3]

Kinked ***k-valve***™ holds the dose in situ until inhalation, and prevents double-dosing.[3]

Prominent colour-coded dose counter shows how many doses are remaining.[1,4]

Each dose is simply released by a gentle breath, removing the need for co-ordination.[3]

Full opening of the cover loads the dose.[1,4]

Award winning patient friendly packaging provide simple and clear instructions for patients

Award winning ease of use design

For more information or to arrange for a visit from a member of our team, please call 01223 424444.

flutiform k-haler*® (fluticasone propionate/formoterol fumarate) 50 µg/5 µg and 125 µg /5 µg pressurised inhalation suspension. Prescribing Information United Kingdom. Please read the Summary of Product Characteristics before prescribing. Presentation** Pressurised inhalation suspension, in a breath-actuated pressurised aerosol inhaler. **Indications** Regular treatment of asthma where the use of a combination product (inhaled corticosteroid [ICS] and long-acting β2-agonist [LABA]) is appropriate: (i) for patients not adequately controlled with ICS and 'as required' inhaled short-acting β2-agonist (SABA) (ii) for patients already adequately controlled on both an ICS and a LABA. For adults and adolescents aged 12 years and above. **Dosage and administration** For inhalation use. Patients should be shown how to use the inhaler correctly by a healthcare professional. Patients should be given the strength of ***flutiform k-haler containing the appropriate fluticasone propionate dose for their disease severity (note that ***flutiform k-haler*** 50 µg/5 µg per actuation is not appropriate in patients with severe asthma). The appropriate strength should be taken as two inhalations, twice daily (normally morning and evening) and used every day, even when asymptomatic. ***flutiform k-haler*** is not recommended in children under 12 years. Prescribers should be aware that in asthmatics, fluticasone propionate is as effective as some other inhaled steroids when administered at approximately half the total daily microgram dose. Patients should be assessed regularly and once asthma is controlled, treatment should be reviewed and stepped down to the lowest effective dose, or an ICS alone. ICSs alone are first line treatment for most patients. ***flutiform k-haler*** is not intended for initial treatment of mild asthma. For patients with severe asthma the ICS therapy should be established before prescribing a fixed-dose combination product. Patients on ***flutiform k-haler*** must not use an additional LABA. An inhaled SABA should be taken for immediate relief of asthma symptoms arising between doses. Patients should be advised to contact their prescriber when ***flutiform k-haler*** dose counter is getting near zero. **Contraindications** Hypersensitivity to the active substances or to any of the excipients. **Precautions and warnings** ***flutiform k-haler*** should not be used as the first asthma treatment, to treat acute asthma symptoms or for prophylaxis of exercise-induced asthma. It should not be initiated during an exacerbation, during significantly worsening or acutely deteriorating asthma, and should not be stopped abruptly. If a patient experiences serious asthma-related adverse events or exacerbations, they should continue treatment and seek medical advice. Patients should be reviewed as soon as possible if there is any indication of deteriorating asthma control. In case of sudden and progressive deterioration, seek urgent medical assessment. Caution in patients with: pulmonary tuberculosis; quiescent tuberculosis; fungal, viral or other infections of the airway; thyrotoxicosis; phaeochromocytoma; diabetes mellitus (consider additional blood sugar controls); uncorrected hypokalaemia; predisposition to low levels of serum potassium; impaired adrenal function (monitor HPA axis function regularly); hypertrophic obstructive cardiomyopathy; idiopathic subvalvular aortic stenosis; severe hypertension; aneurysm or other severe cardiovascular disorders; unstable or acute severe asthma and other conditions when the likelihood for hypokalaemia adverse effects is increased. There is risk of potentially serious hypokalaemia with high doses of β2-agonists or concomitant treatment with β2-agonists and drugs that can induce or potentiate a hypokalaemic effect. Monitoring of serum potassium levels is recommended during these circumstances. Formoterol may induce prolongation of the QTc interval. Caution must be observed when treating patients with existing prolongation of QTc interval. ***flutiform k-haler*** should be discontinued immediately if there is evidence of paradoxical bronchospasm. Visual disturbance may be reported with corticosteroid use. Systemic effects with an ICS may occur, particularly at high doses for prolonged periods or when combined with potent CYP3A4 inhibitors, but are less likely than with oral corticosteroids. Possible systemic effects include Cushing's syndrome, Cushingoid features, adrenal suppression, growth retardation in children and adolescents, decrease in bone mineral density and cataract glaucoma. Children may also experience anxiety, sleep disorders and behavioural changes. Increased exposure can be expected in patients with severe hepatic impairment. Prolonged treatment with high doses of corticosteroids may result in adrenal suppression and acute adrenal crisis, particularly in children and adolescents or potentially as a result of trauma, surgery, infection or rapid dose reduction. ***flutiform k-haler*** contains a negligible amount of ethanol that does not pose risk to patients. Interactions Co-treatment with CYP3A inhibitors (e.g. ritonavir, atazanavir, clarithromycin, indinavir, itraconazole, nelfinavir, saquinavir, ketoconazole, telithromycin, cobicistat) should be avoided unless the benefit outweighs the increased risk of systemic side-effects. Caution is advised with concomitant use of non-potassium sparing diuretics (e.g. loop or thiazide), xanthine derivatives, glucocorticosteroids, L-Dopa, L-thyroxine, oxytocin, alcohol or other adrenergic drugs, including anaesthesia with halogenated hydrocarbons and digitalis glycosides, β-adrenergic drugs, known to prolong the QTc interval, such as tricyclic antidepressants or MAOIs (and for two weeks following their discontinuation), antipsychotics (including phenothiazines), quinidine, disopyramide, procainamide, antihistamines. **Furazolidone and procarbazine *flutiform k-haler*** should not normally be used with β-blockers including those that are used as eye drops to treat glaucoma. Under certain circumstances, e.g. as prophylaxis after myocardial infarction, cardioselective β-blockers could be considered with caution. **Pregnancy and lactation *flutiform k-haler*** is not recommended during pregnancy unless the benefits to the mother outweigh risks to the foetus. A risk to the breastfeeding infant cannot be excluded. **Side-effects** Uncommon (<1/100) but potentially serious side-effects: hyperglycaemia, agitation, depression, aggression, behavioural changes (predominantly in children), vision blurred, vertigo, palpitations, ventricular extrasystoles, angina pectoris, tachycardia, hypertension, dyspnoea, peripheral oedema. Please consult the SPC for a full list of side-effects and those reported for the individual molecules. **Legal category** POM **Package quantities and price** One inhaler (120 actuations) 50 µg/5 µg - £14.40 125 µg/5 µg - £28.00 **Marketing Authorisation numbers** PL 16950/0338-39 **Marketing Authorisation holder** Napp Pharmaceuticals Limited Cambridge Science Park Milton Road Cambridge CB4 0GW UK Tel: 01223 424444 For medical information enquiries, please contact medicalinformationuk@napp.co.uk. FLUTIFORM is a registered trademark of Jagotec AG, and is used under licence. K-HALER is a registered trade mark of Mundipharma AG. © 2018 Napp Pharmaceuticals Limited. UK/FLUT-K-18011 Date of Preparation: May 2018

Adverse events should be reported. Reporting forms and information can be found at www.mhra.gov.uk/yellowcard. Adverse events should also be reported to Napp Pharmaceuticals Limited on 01223 424444.

References: 1. Mundipharma International Limited. flutiform k-haler. Summary of Product Characteristics. Available from: https://www.medicines.org.uk/emc/product/9483/smpc. Last accessed August 2019. **2.** MIMS. Available from: www.mims.co.uk/search/drugs?keywords=Beta 2 agonists, long-acting/corticosteroids. Last accessed August 2019. **3.** Bell D et al. J Aerosol Med Pulm Drug Deliv 2017; 30:425–34. **4.** https://www.medicines.org.uk/emc/product/9412/pil

UK/FLUT-K-19022 Date of preparation: August 2019

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NAPP RESPIRATORY

BE MORE LIKE MAX

Prescribe an inhaler that can deliver in the real world

- Used correctly by 93% of people after reading the PIL*[1]
- Consistent dose delivery:**
  - At flow rates of 30–90L/min[2,3]
  - When held at +/-90 degrees from vertical[3]
  - At temperatures from -20°C to 40°C[3]
- Licensed for use as maintenance and reliever therapy (MART) in asthma†[4]

Prescribe DuoResp Spiromax.

DuoResp® Spiromax®
budesonide/formoterol

For asthma and COPD in adults‡
Visit duoresp.co.uk for more information

PIL, patient information leaflet.
*Correct usage data after reading PIL for Turbohaler® and Easyhaler® were 76.7% and 58.3% respectively (p<0.001, for both comparisons) n=120 for all groups.[1] Patients are advised to read the PIL carefully and follow the instructions for use as detailed in the leaflet.
**Dose delivery study using low, middle and high strength DuoResp Spiromax. Dose consistency was measured over inhaler life. Low dose was included in the study but is not licensed in the UK.[3]
†For 160/4.5mcg strength only.[4]
‡DuoResp Spiromax is licensed for use in adults 18 years of age and older only.[4]

Please refer to the Summary of Product Characteristics (SmPC) for full details of the Prescribing Information. DuoResp® Spiromax® (budesonide/formoterol) 160mcg/4.5mcg inhalation powder and DuoResp® Spiromax® (budesonide/formoterol) 320mcg/9mcg inhalation powder Abbreviated Prescribing Information. **Presentation:** *DuoResp® Spiromax® 160/4.5*: Each delivered dose contains 160mcg of budesonide and 4.5mcg of formoterol fumarate dihydrate. This is equivalent to a metered dose of 200mcg budesonide and 6mcg of formoterol fumarate dihydrate. *DuoResp® Spiromax® 320/9*: Each delivered dose contains 320mcg of budesonide and 9mcg of formoterol fumarate dihydrate. This is equivalent to a metered dose of 400mcg budesonide and 12mcg of formoterol fumarate dihydrate. Inhalation powder. **Indications:** Asthma: Treatment of asthma, where use of a combination (inhaled corticosteroid and long-acting β_2-adrenoceptor agonist) is appropriate. COPD: Symptomatic treatment of patients with COPD with forced expiratory volume in 1 second (FEV_1) < 70% predicted normal (post bronchodilator) and a history of repeated exacerbations, who have significant symptoms despite regular therapy with long-acting bronchodilators. **Dosage and administration:** For use in adults ≥18 years. Not for use in children < 18 years of age. ***Asthma:*** Not intended for the initial management. If an individual patient should require a combination of doses other than those available in the combination inhaler, appropriate doses of β_2-adrenoceptor agonists and/or corticosteroids by individual inhalers should be prescribed. The dose should be titrated to the lowest dose at which effective control of symptoms is maintained. When control of symptoms is achieved titrate to the lowest effective dose, which could include once daily dosing. *DuoResp® Spiromax® 160/4.5: maintenance* therapy – regular maintenance treatment with a separate reliever inhaler: *Adults*: 1-2 inhalations twice daily (maximum of 4 inhalations twice daily). *DuoResp® Spiromax®* maintenance and reliever therapy – regular maintenance treatment and as needed in response to symptoms: should be considered for patients with: (i) inadequate asthma control and in frequent need of reliever medication (ii) previous asthma exacerbations requiring medical intervention. *Adults*: The recommended maintenance dose is 2 inhalations per day, given either as one inhalation morning and evening or as 2 inhalations in either the morning or evening. For some patients a maintenance dose of 2 inhalations twice daily may be appropriate. Patients should take 1 additional inhalation as needed in response to symptoms. If symptoms persist after a few minutes, an additional inhalation should be taken. Not more than 6 inhalations should be taken on any single occasion. A total daily dose of up to 12 inhalations could be used for a limited period. Patients using more than 8 inhalations daily should be strongly recommended to seek medical advice. *DuoResp® Spiromax® 320/9*: Only to be used as maintenance therapy. *Adults*: 1 inhalation twice daily (maximum of 2 inhalations twice daily). ***COPD:*** *Adults*: 1 inhalation twice daily. *Elderly patients (≥65 years old)*: No special requirements. *Patients with renal or hepatic impairment*: No data available. **Contraindications:** Hypersensitivity to the active substance or to any of the excipients. **Precautions and warnings:** If treatment is ineffective, or exceeds the highest recommended dose, medical attention must be sought. Patients with sudden and progressive deterioration in control of asthma or COPD should undergo urgent medical assessment. Patients should have their rescue inhaler available at all times. The reliever inhalations should be taken in response to symptoms and are not intended for regular prophylactic use e.g. before exercise. For such, a separate rapid-acting bronchodilator should be considered. Patients should not be initiated during an exacerbation. Serious asthma-related adverse events and exacerbations may occur. If asthma symptoms remain uncontrolled or worsen, patients should continue treatment and seek medical advice. If paradoxical bronchospasm occurs, treatment should be discontinued immediately. Paradoxical bronchospasm responds to a rapid-acting inhaled bronchodilator and should be treated straightaway. Visual disturbance may be reported with systemic and topical corticosteroid use. Such patients should be considered for referral to an ophthalmologist for evaluation of possible causes. Systemic effects may occur, particularly at high doses prescribed for long periods. Potential effects on bone density should be considered, particularly in patients on high doses for prolonged periods that have co-existing risk factors for osteoporosis. Prolonged treatment with high doses of inhaled corticosteroids may result in clinically significant adrenal suppression. Additional systemic corticosteroid cover should be considered during periods of stress. Treatment should not be stopped abruptly. Transfer from oral steroid therapy to a budesonide/formoterol fumarate fixed-dose combination may result in the appearance of allergic or arthritic symptoms which will require treatment. In rare cases, tiredness, headache, nausea and vomiting can occur due to insufficient glucocorticosteroid effect and temporary increase in the dose of oral glucocorticosteroids may be necessary. To minimise risk of oropharyngeal Candida infection patients should rinse mouth with water. Administer with caution in patients with thyrotoxicosis, phaeochromocytoma, diabetes mellitus, untreated hypokalaemia, or severe cardiovascular disorders. The need for, and dose of inhaled corticosteroids should be re-evaluated in patients with active or quiescent pulmonary tuberculosis, fungal and viral infections in the airways. Additional blood glucose controls should be considered in diabetic patients. Hypokalaemia may occur at high doses. Particular caution is recommended in unstable or acute severe asthma. Serum potassium levels should be monitored in these patients. As with other lactose containing products the small amounts of milk proteins present may cause allergic reactions. There is some evidence of an increased risk of pneumonia with increasing steroid dose but this has not been demonstrated conclusively across all studies. Physicians should remain vigilant for the possible development of pneumonia in patients with COPD as the clinical features of such infections overlap with the symptoms of COPD exacerbations. **Interactions:** Concomitant treatment with potent CYP3A4 inhibitors should be avoided. If this is not possible the time interval between administration should be as long as possible. Co-treatment with CYP3A inhibitors, including cobicistat-containing products is expected to increase risk of systemic side effects and the use in combination should be avoided. Not recommended with β-adrenergic blockers (including eye drops) unless compelling reasons. Concomitant treatment with quinidine, disopyramide, procainamide, phenothiazines, antihistamines (terfenadine), and Tricyclic Antidepressants (TCAs) can prolong the QTc-interval and increase the risk of ventricular arrhythmias. L-Dopa, L-thyroxine, oxytocin and alcohol can impair cardiac tolerance. Concomitant treatment with MAOIs, including agents with similar properties, may precipitate hypertensive reactions. Patients receiving anaesthesia with halogenated hydrocarbons have an elevated risk of arrhythmias. Hypokalaemia may increase the disposition towards arrhythmias in patients taking digitalis glycosides. **Pregnancy and lactation:** Use only when benefits outweigh potential risks. Budesonide is excreted in breast milk; at therapeutic doses no effects on infants are anticipated. **Effects on ability to drive and use machines:** No or negligible influence. **Adverse reactions:** Since *DuoResp® Spiromax®* contains both budesonide and formoterol, the same pattern of adverse reactions as reported for these substances may occur. No increased incidence of adverse reactions has been seen following concurrent administration of the two compounds. *Serious*: Immediate and delayed hypersensitivity reactions, e.g. exanthema, urticaria, pruritus, dermatitis, angioedema and anaphylactic reaction, Cushing´s syndrome, adrenal suppression, growth retardation, decrease in bone mineral density, hypokalaemia, hyperglycaemia, aggression, psychomotor hyperactivity, anxiety, sleep disorders, depression, behavioural changes, cataract and glaucoma, tachycardia, cardiac arrhythmias, e.g. atrial fibrillation, supraventricular tachycardia and extrasystoles, angina pectoris, prolongation of QTc-interval, variations in blood pressure, bronchospasm, pneumonia in COPD patients and paradoxical bronchospasm. *Common:* Candida infections in the oropharynx, headache, tremor, palpitations, mild irritation in the throat, coughing, pneumonia in COPD patients and hoarseness. Consult the Summary of Product Characteristics in relation to other side effects. **Overdose:** An overdose of formoterol may lead to: tremor, headache, palpitations. Symptoms reported from isolated cases are tachycardia, hyperglycaemia, hypokalaemia, prolonged QTc-interval, arrhythmia, nausea and vomiting. Supportive and symptomatic treatment may be indicated. **Price per pack:** *DuoResp® Spiromax® 160/4.5* and *DuoResp® Spiromax® 320/9*: £27.97. **Legal Category:** POM. **Marketing Authorisation Numbers:** *DuoResp® Spiromax® 160/4.5*: EU/1/14/920/001. *DuoResp® Spiromax® 320/9*: EU/1/14/920/004. **Marketing Authorisation Holder:** Teva Pharma B.V. Swensweg 5, 2031GA Haarlem, The Netherlands. **Date of Preparation:** September 2018. **Job Code:** UK/MED/18/0194.

Adverse events should be reported. Reporting forms and information can be found at www.mhra.gov.uk/yellowcard.
Adverse events should also be reported to Teva UK Limited on 0207 540 7117 or medinfo@tevauk.com

References: 1. Sandler N et al. *BMJ Open Resp Res* 2016; 3: e000119. 2. Chrystyn H et al. *Int J Pharm* 2015; 491: 268–276. 3. Canonica G et al. *J Aerosol Med Pulm Drug Deliv* 2015; 28(5): 309–319. 4. DuoResp Spiromax Summary of Product Characteristics.

Approval Code: UK/DUO/18/0054(1)

Teva UK Limited, Ridings Point, Whistler Drive, Castleford, West Yorkshire WF10 5HX

Date of preparation: August 2019

Wednesday 4 December 2019

8.00am – 9.00am
COFFEE/TEA will be served in the Whittle & Fleming, 3rd floor

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8.45am – 4.00pm
Whittle & Fleming, 3rd floor
POSTER VIEWING
Authors present: 10.00am – 11.00am

P1-P10
A multi-faceted approach to ILD management
Discussion of abstracts will take place from 12.45pm to 2.00pm in the Moore, 4th floor

P11-P20
Asthma: endotypes/biomarkers
Discussion of abstracts will take place from 1.15pm to 2.30pm in the Abbey, 4th floor

P21-P39
Pulmonary rehabilitation: more and better
Discussion of abstracts will take place from 2.00pm to 3.10pm in the Windsor, 5th floor

P30-P37
Ventilation in neuromuscular disease
Discussion of abstracts will take place from 2.15pm to 3.20pm in the St James, 4th floor

P38-P51
Driving quality improvement through education and training
Discussion of abstracts will take place from 2.15pm to 4.00pm in the Moore, 4th floor

P52-P60
Prognosis and outcomes in ILD
Discussion of abstracts will take place from 2.30pm to 3.40pm in the Albert, 2nd floor

P61-P71
Paediatric respiratory pick and mix
Discussion of abstracts will take place from 3.45pm to 5.15pm in the Windsor, 5th floor

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8.45am – 4.00pm
Cambridge, 5th floor
MODERATED POSTER VIEWING

M1-M9
The epidemiology and impact of difficult infections
Discussion of abstracts will take place from 2.00pm to 3.10pm in the Cambridge, 5th floor

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8.00am – 8.30am
Albert, 2nd floor
BTS JOURNAL CLUB
Epidemiology
Dr Jennifer Quint (London)

Learning objectives:

By the end of the session:

- Participants will be able to critically appraise the epidemiology studies discussed in this session, and will be able to discuss the rationale of the methodological approaches and analysis used.

- Participants will develop an appreciation of how the findings from the studies discussed can be applied to clinical practice.

The relevant references will be available on the BTS website so that delegates may review the papers in advance.

8.30am – 10.30am
Westminster, 4th floor
JOINT BTS/BALR SYMPOSIUM
THE SILVER TSUNAMI (PART 1): LUNG DISEASE IN AN AGEING POPULATION
Chaired by: Dr Bettina Schock (Belfast) and Dr Chris Scotton (Exeter)

8.30am	Fundamentals of ageing (and what model organisms can tell us)
	Professor David Gems (London)
9.10am	Multi-omic approaches to understanding accelerated ageing in COPD
	Dr Corry-Anke Brandsma (Groningen)
9.50am	Genetic predisposition for telomere dysfunction in ageing
	Dr Chad Newton (Dallas)

Learning objectives:

- To review the cell and molecular mechanisms underlying the normal ageing process, and how data from model organisms can inform studies in humans.

- To understand how genomic and transcriptomic technology has revealed specific interactions between gene expression, ageing in the lung and development of COPD.

- To discuss how underlying genetic signatures can impact on telomere length and function (a hallmark of ageing), and predisposition to lung diseases such as idiopathic pulmonary fibrosis.

8.45am – 9.50am
St James, 4th floor
SPOKEN SESSION: S1 – S4

Smoking cessation strategies for lung health

Chaired by: Dr Amanda Farley (Birmingham) and Professor Keir Lewis (Swansea)

8.50am **S1**

Five year outcomes in a cohort of smokers admitted with respiratory disease and treated with varenicline on a respiratory ward

D Hobden, S Kennedy, LJ Restrick

9.05am **S2**

Doctors' perceptions of efficacy, safety and use of e-cigarettes in the United Kingdom

JC Gates, E Heiden, M Amos, T Brown, H Rupani, A Hicks, AJ Chauhan

9.20am **S3**

Exposure to electronic cigarette vapour induces functional changes in neutrophils which are more exaggerated by 4th generation devices

A Jasper, E Sapey, DR Thickett, A Scott

9.35am **S4**

Diagnosing and treating tobacco dependence in hospital inpatients; identifying health professionals needs and how might we address them

D Attar-Zadeh, A Vaghela, M Vithlani, LJ Restrick

8.45am – 10.05am
Abbey, 4th floor
SPOKEN SESSION: S5 – S9

Pulmonary rehabilitation: better: more!

Chaired by: Dr Neil Greening (Leicester) and Dr Claire Nolan (London)

8.50am **S5**

Changing the shape of rehabilitation: breathlessness rehabilitation

E Chaplin, O Rervitt, S Ward, A Watt, N Gardiner, L Houchen-Wolloff, C Bourne, S Singh

9.05am **S6**

The utility of eccentric cycling for people with COPD: acute cardiorespiratory and metabolic responses

TJC Ward, MR Lindley, RA Ferguson, RA Evans, D Constantin, SJ Singh, CE Bolton, P Greenhaff, MC Steiner

9.20am **S7**

Does completion of a pulmonary rehabilitation programme improve patient activation scores?

DS Barber, S Pilsworth, F Frost, D Wat, S Sibley

9.35am **S8**

Pulmonary rehabilitation – time for change?

S Pilsworth

9.50am **S9**

The role of ambulatory oxygen in improving the effectiveness of pulmonary rehabilitation for patients with chronic obstructive pulmonary disease – single blinded randomised trial

V Padmanaban, C Collins, A Lound, C Lee, P Mallia, SL Elkin

8.45am – 10.15am
Mountbatten, 6th floor
SYMPOSIUM

DIFFICULT INFECTION

Chaired by: Dr Andrea Collins (Liverpool) and Professor Michael Loebinger (London)

8.45am Mechanisms of invasive aspergillosis

Dr Darius Armstrong-James (London)

9.15am Management of non-TB mycobacteria

Professor Rachel Thomson (Brisbane)

9.45am Pulmonary infections in the immunocompromised host

Professor Alison Condliffe (Sheffield)

Learning objectives:

First presentation:

- Understand mechanism of action of novel small molecule inhibitors.

- Understand impact on antifungal immunity.

- Understand risk of fungal disease with immunosuppressants.

- Impact of influenza on fungal immunity.

Second presentation:

- Be able to differentiate between contamination, colonisation, infection and disease.

- To understand the principles behind treatment of NTM infections.

- To recognise the risk factors for disease progression and poor outcome.

- To understand the major limitations and side effects of treatment.

- To provide insight into new developments in the treatment of NTM infections.

Third presentation:

- Recognition of those at risk of opportunistic infection and which infections are most likely depending on the nature of the immunocompromise.

- Treatment of infections in the immunocompromised host.

8.45am – 10.45am
Windsor, 5th floor
SYMPOSIUM

OBSTRUCTIVE SLEEP APNOEA: BEYOND AHI AND ESS

Chaired by: Dr Sonya Craig (Liverpool) and Dr Sophie West (Newcastle upon Tyne)

8.45am	Moving towards personalized medicine: OSA phenotypes and their limitations
	Professor Jean Louis Pepin (Grenoble)
9.15am	Targeting treatments in OSA – the SOX trial and its implications
	Dr Chris Turnbull (Oxford)
9.45am	Targeted treatments in OSA – the role of new drug therapies
	Dr Luigi Taranto Montemurro (Boston)
10.15am	The role of CPAP in mild OSA
	Professor Mary Morrell (London)

Learning objectives:

- To review recently described distinct clinical and polysomnographic phenotypes of OSA and their relevance to OSA outcomes.

- To understand potential targeted drug and oxygen therapy in OSA and implications for our understanding of disease.

- To understand the latest data on the role of CPAP in treating people with mild OSA.

9.00am – 10.30am
Churchill, Ground floor
SYMPOSIUM

THE EARLY DETECTION OF LUNG CANCER

Chaired by: Dr Richard Lee (London) and Dr Emma O'Dowd (Nottingham)

9.00am	Blood, bile, breath or urine – is tissue an issue for early detection of lung cancer?
	Dr Gerard Silvestri (Charleston, South Carolina)
9.30am	Broadening the horizon: space age biopsies
	Dr Neal Navani (London)
10.00am	UK lung cancer screening takes off: lessons learned from the first pilots
	Professor David Baldwin (Nottingham)

Learning objectives:

- A discussion of the advantages and challenges of non-tissue methods in the early diagnosis of lung cancer.

- An update on the latest methods to obtain diagnostic tissue specimens in early lung cancer.

- A discussion of the data emerging from the first pilots of lung cancer screening in the UK in the context of existing studies.

10.00am – 11.00am
COFFEE/TEA will be served in the Whittle & Fleming and Britten, 3rd floor

10.30am – 11.50am
St James, 4th floor
SPOKEN SESSION: S10 – S14

Pleural disease: not so benign

Chaired by: Dr Duneesha de Fonseka (Sheffield) and Dr James Goldring (London)

10.35am **S10**

Whole genome analysis of familial pneumothorax by the 100,000 Genomes Project

HL Grimes, D Brown, S Holden, J Babar, S Karia, J Herre, M Knolle, E Maher, Genomics England Research Consortium, SJ Marciniak

10.50am **S11**

Utility of computed tomography (CT) to predict need for early surgery and recurrence after first episode of primary spontaneous pneumothorax (PSP)

A Azam, M Abdelmoteleb, N Qayyum, A Zahid, Q Abdullah, M Haris, MB Ganaie

11.05am **S12**

The changes in incidence and management of pleural empyema in England over the last decade

DT Arnold, FW Hamilton, TT Morris, R Payne, NA Maskell

11.20am **S13**

The microbiology of pleural infection, an approach based on 16S rRNA gene next generation sequencing

NI Kanellakis, E Bedawi, JP Corcoran, S Gerry, R Hallifax, R Mercer, V George, A Dudina, JM Wrightson, R Asciak, R Miller, M Dobson, N Ilott, NA Maskell, I Psallidas, NM Rahman

11.35am **S14**

The role of soluble urokinase plasminogen activating receptor (suPAR) in parapneumonic effusions

DT Arnold, FW Hamilton, KT Elvers, N Zahan-Evans, NA Maskell

10.30am – 12.05pm
Moore, 4th floor
SPOKEN SESSION: S15 – S20

Biomarkers and treatments in cystic fibrosis

Chaired by: Dr Alex Horsley (Manchester) and Dr Donna McShane (Cambridge)

10.35am **S15**

An observational study of ivacaftor in patients with cystic fibrosis (CF) and selected non-G551D gating mutations: outcomes from the second interim analysis of the VOCAL study

NJ Simmonds, C Castellani, C Colombo, K van der Ent, L Jha, C DeSouza, T Thorat, N Kinnman

10.50am **S16**

The influence of the CFTR modulator ivacaftor on aspergillosis in cystic fibrosis

NC Fritsch, HD Green, AM Jones, PJ Barry

11.05am **S17**

Ivacaftor treatment in patients 6 to <12 months old with cystic fibrosis with a CFTR gating mutation: results of a 2-part, single-arm, Phase 3 study

JC Davies, LT Wang, P Panorchan, Campbell, S Tian, M Higgins, O Egbuna, C McKee, M Rosenfeld

11.20am **S18**

The sputum proteome and its relationship to cystic fibrosis lung disease: using global proteomics to develop clinically useful biomarkers

RW Lord, RE Maher, V Harman, B Bianco, PJ Whorwell, PS McNamara, JA Smith, RJ Beynon, AM Jones

11.35am **S19**

Peak nasal inspiratory flow and nasal cytokines are useful biomarkers of nasal inflammation in cystic fibrosis gene therapy

AD Saleh, SR Durham, MH Shamji, U Griesenbach, EWFW Alton

11.50am **S20**

Inhaled aztreonam lysine recovers lung function and improves quality of life in acute pulmonary exacerbations of cystic fibrosis

F Frost, J Fothergill, C Winstanley, D Nazareth, MJ Walshaw

10.30am – 12.30pm
Mountbatten, 6th floor
SYMPOSIUM

WINTER THINK TANK POLICY DEBATE

"Always snowed under? How can the NHS manage and reduce winter pressures more effectively?"

High profile speakers will include senior representatives of NHS England, Public Health England, the Health Foundation and the British Thoracic Society.

The session aims to dig deeper into the issue; analysing historical data and trends depicting the health and economic burden of winter pressures to the NHS and society over the years – as well as analysing the different factors which have converged to underpin past 'bad winters' in this country. Speakers will also review how other countries cope in similar circumstances.

The session will also spotlight current national policy and resources, showcase best practice within the respiratory community and look to the future on what wider policy and service solutions are needed longer term. This is an interactive 'think tank' debate – and plenty of time has been allocated to questions and ideas from the audience – either communicated in person or via social media #BTSWinter2019 #Winterthinktank

10.45am – 12.20pm
Abbey, 4th floor
SPOKEN SESSION: S21 – S26

An update in screening for lung cancer

Chaired by: Dr Richard Lee (London) and Dr Elizabeth Starren (London)

10.50am **S21**

Developing NHS England's National Targeted Lung Health Check Pilot

RW Lee, A Nair, C Stacey, D Fitzgerald, S Quaife, P Sasieni, S Janes, D Baldwin

11.05am **S22**

The Liverpool Healthy Lung Project – raising the importance of lung health

MJ Ledson, M Ahmed, R Arvanitis, M Timoney, E Gaynor, J Field

11.20am **S23**

Optimum diagnostic pathway and pathologic confirmation rate of early stage lung cancer: results from VIOLET

E Lim, S Begum, T Batchelor, R Krishnadas, M Shackcloth, J Dunning, I Paul, V Anikin, N McGonigle, B Naidu, H Fallouh, E Belcher, D Stavroulias, M Loubani, S Qadri, V Zamvar, H Mckeon, R Harris, JM Blazeby, AG Nicholson, CA Rogers

11.35am **S24**

Assessment of histopathological and resection margin data in post-operative non-small cell lung cancer patients

H Gleeson, J Edwards, H George, L Socci, S Tenconi, JN Rao, DN Hopkinson

11.50am **S25**

Improved lung cancer survival following low dose computed tomography (LDCT) screening in asbestos-exposed individuals

EJA Harris, P Franklin, A Reid, N Olsen, NH de Klerk, AW Musk, FJH Brims

12.05pm **S26**

Results of the National Mesothelioma Organisational Audit

A Shantikatara, S Harden, L Darlison, PA Beckett

10.45am – 12.45pm
Churchill, Ground floor
SYMPOSIUM

COPD: IT'S NOT JUST TOBACCO

Chaired by: Dr Jennifer Quint (London) and Dr Richa Singh (London)

10.45am Lung function trajectories, occupational/ environmental and drug associated causes of COPD

Professor Adnan Custovic (London)

11.15am COPD from home and work: biological particles, fumes and pesticides

Professor Deborah Jarvis (London)

11.45am COPD from play: crack, heroin and cannabis

Dr Hassan Burhan (Liverpool)

12.15pm COPD: aetiology and trajectories

Professor Alvar Agusti (Barcelona)

Overview:

Patients cannot determine their mother's behaviour in utero or their family's socio-economic status in childhood. The Soriano data shows a stronger relation between FVC and income compared to FEV1/FVC and pack-years. The Fletcher model of FEV1 decline, based on cross-sectional data, assumes full potential was achieved and shows an exponential decay in FEVI. Based on a large longitudinal

cohort, Lange and colleagues show the true importance of "achieved potential", and that substantial decline in FEV1 occurs much earlier. This clearly supports a change in the reactive nature of clinical practice in the UK, to proactive case finding and earlier intervention. The importance of other exposures is increasingly being recognised; the prospective European Community Respiratory Health Survey estimated that exposure to biological dusts, gases and fumes, and pesticides accounted for 21% of cases (Lytras Thorax 2018). The impact of smoking crack, heroin and cannabis is considerable, and addressing this presents even greater challenges.

Learning objectives:

- To understand the early-life determinants of lung function and the trajectory of FEV1 in COPD.

- To understand the role of occupational and environmental exposures in COPD.

- To consider how non-tobacco substance use contributes to the burden of COPD and the value of case finding for COPD in populations who use substances other than tobacco.

- To evaluate how the concept of treatable traits applies to COPD including non-tobacco related disease.

11.00am – 12.00pm
Albert, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

Pulmonary Rehabilitation

11.00am – 12.30pm
Windsor, 5th floor
SYMPOSIUM

LATENT TB IN THE 21ST CENTURY

Chaired by: Dr Felicity Perrin (London) and Dr Simon Tiberi (London)

11.00am	Blood transcriptional signatures reveal heterogeneity of tuberculosis Dr Anne O'Garra (London)
11.30am	Latent TB – what does it mean and how do we diagnose it? Professor Ibrahim Abubakar (London)
12.00pm	Treatment for latent TB: can we do better? Dr Martin Dedicoat (Birmingham)

Learning objectives:

- The immune response to evolving infection with Mycobacterium tuberculosis will be revealed through the use of transcriptomics. We will review the diverse blood transcriptional signatures, composed of small sets of genes, that have been proposed for the diagnosis of tuberculosis and the identification of at-risk asymptomatic people and suggest novel approaches for the development of such biomarkers for clinical use.

- To evaluate the current screening strategies for LTBI in the UK.

- To discuss current and future therapeutic management of people with, or at risk of, LTBI.

11.00am – 1.00pm
Westminster, 4th floor
JOINT BTS/BALR SYMPOSIUM

THE SILVER TSUNAMI (PART 2): STRATEGIES TO STOP THE WAVE FROM BREAKING

Chaired by: Dr Manuela Platé (London) and Dr Karl Staples (Southampton)

11.00am	Inflammageing and the microbiome in the lung Dr Dawn Bowdish (Hamilton, Ontario)
11.40am	Mitochondrial (dys)function in the ageing lung Professor Peter Barnes (London)
12.20pm	Potential of senolytics as disease-modifiers in IPF Professor James L Kirkland (Rochester, Minnesota)

Learning objectives:

- To understand the impact of ageing on our symbiosis with commensal micro-organisms, and how this affects host-pathogen interactions and susceptibility to lung infection in advancing age.

- To appreciate the key role played by mitochondria and altered metabolic processes in ageing, and the potential for novel treatments targeting mitochondrial function in the context of COPD.

- To review the recent clinical data on the use of senolytic drugs in idiopathic pulmonary fibrosis, and the underlying rationale for targeting senescence in lung disease.

12.00pm – 2.00pm

LUNCH will be available to purchase in the café in the Pickwick, 1st floor, and the snack bar in the Whittle & Fleming, 3rd floor.

12.10pm – 1.45pm
Gielgud, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

Cystic Fibrosis

12.45pm – 2.00pm
Moore, 4th floor
POSTER DISCUSSION: P1 – P10

A multi-faceted approach to ILD management

Chaired by: Dr Dhruv Parekh (Birmingham) and Dr Muhunthan Thillai (Cambridge)

P1 Psychometric properties of health-related quality of life tools for idiopathic pulmonary fibrosis

J Kim, A Clark, S Birring, C Atkins, M Whyte, AM Wilson

P2 The veterans specific activity questionnaire as a patient reported outcome measure in pulmonary vasculitis and interstitial lung disease

R Sethi, F Gawecki, M Mohamed, RK Coker, K Ward, CL Shovlin

P3 Sleep characteristics and quality of life in patients with fibrotic interstitial lung disease

KJ Myall, D Roque, S Simpson, ES Suh, A West, B Kent

P4 Validity and reproducibility of cardiopulmonary exercise testing in interstitial lung disease

OW Tomlinson, L Markham, RL Wollerton, BA Knight, A Duckworth, A Spiers, CA Williams, M Gibbons, CJ Scotton

P5 The use of cardiopulmonary exercise testing in idiopathic pulmonary fibrosis: feasibility and correlation with quality of life measures

RJ Davis, SL Barratt, J Viner, C Dixon, A Morley, H Adamali, N Maskell

P6 Longitudinal changes in exercise capacity and spirometry in interstitial lung disease

RL Wollerton, L Markham, OW Tomlinson, BA Knight, A Duckworth, A Spiers, CA Williams, M Gibbons, CJ Scotton

P7 The safety of bronchoalveolar lavage in patients with idiopathic pulmonary fibrosis

J Smith, FJ Chua, AU Wells, E Renzoni, AG Nicholson, RG Jenkins, RP Marshall, WA Fahy, TM Maher, PL Molyneaux

P8 ECMO bridge to lung transplant in patients with ILD – our experience

B Zych, A Rosenberg, M Carby, A Simon, A Reed, N Kewalramai

P9 Weight loss as a predictor of mortality in patients with idiopathic pulmonary fibrosis: a retrospective study

G Vekaria, T Murrells, J Porter, M Heightman, J Sahota, T Miklasch, L Beitverda, R Starodub

P10 Weight loss is a feature of progressive disease in idiopathic pulmonary fibrosis

S Barth, C Hogben, M King, B Vitri, J Mann, P George, M Kokosi, V Kouranos, E Renzoni, AU Wells, F Chua, TM Maher, PL Molyneaux

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1.00pm – 1.45pm
Churchill, Ground floor
THE BTS CLINICAL LECTURE

Detecting and treating lung cancer earlier

Professor Sam Janes (London)

Introduced by: Professor Jonathan Bennett (Leicester)

1.00pm – 2.00pm
Albert, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

Sleep Apnoea

1.15pm – 2.30pm
Abbey, 4th floor
POSTER DISCUSSION: P11 – P20

Asthma: endotypes/biomarkers

Chaired by: Dr Simon Brill (Barnet) and Professor Daniela Riccardi (Cardiff)

P11 Sputum neutrophil activity in asthma

CGM Barber, JA Ward, LC Lau, K Gove, SP Elliott, T Brown, H Rupani, TSC Hinks, RJ Kurukulaaratchy, R Djukanovic, A Chauhan, K Staples, PH Howarth

P12 Asthma breathomics – a systematic review of exhaled volatile organic compounds associated with diagnosis and disease characteristics

AM Peel, A Sinha, YK Loke, AM Wilson, M Wilkinson, SJ Fowler

P13 Exhaled nitric oxide and blood eosinophil count in predicting sputum inflammatory type in a heterogeneous airways disease population

L Lehtimäki, R Shrimanker, A Moran, G Hynes, S Thulborn, C Borg, C Connolly, A Gittins, T Downs, R Russell, C Brightling, J Cane, I Pavord, T Hinks, M Bafadhel

P14 Characteristics of T2-biomarker low severe asthma patients in the UK Severe Asthma Registry

J Busby, PE Pfeffer, DJ Jackson, AH Mansur, A Menzies-Gow, S Siddiqui, R Chaudhuri, M Patel, LG Heaney

P15 Detection of inhaled corticosteroids in the serum – relationship to adherence and markers of asthma severity

F Alahmadi, R Niven, L Elsey, B Keevil, K George, S Fowler

P16 Can FeNO be used to optimise management of asthma?

SA Rahemtoola, HJ Durrington, A Simpson, R Maidstone

P17 Dietary nitrate supplementation increases fractional exhaled nitric oxide: implications for the assessment of airway health in athletes

HA Allen, JH Hull, JP O'Hara, JW Dickinson, OJ Price

P18 Airwave oscillometry in relation to patient reported outcomes in asthma

CRW Kuo, B Lipworth

P19 Tracking treatment response in severe asthma using a novel assessment of lung inhomogeneity

NMJ Smith, NP Talbot, GAD Ritchie, ID Pavord, PA Robbins, N Petousi

P20 The association between asthma, corticosteroids and allostatic load biomarkers: a cross-sectional study

L Barry, C O'Neill, L Heaney

2.00pm – 3.00pm
Gielgud, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING
Lung Cancer and Mesothelioma

2.00pm – 3.10pm
Windsor, 5th floor
POSTER DISCUSSION: P21 – P29

Pulmonary rehabilitation: more and better

Chaired by: Dr William Man (London) and Dr Stephanie Mansell (London)

P21 Influence of attendance rate on pulmonary rehabilitation efficacy in those with respiratory disease

JL McCreery, KA Mackintosh, J Duckers, T Lines, J Chamberlain, M Jones, MA McNarry

P22 Assessing the impact of a telephone clinic to supplement the vetting process for pulmonary rehabilitation (PR) referrals

L Brock, L McDonnell, L Hogg, A Dewar

P23 Re-development of a pulmonary rehabilitation education programme

C Bourne, N Gardiner, S Singh

P24 Enablers and barriers in referral and uptake of pulmonary rehabilitation (PR) in a South Asian patient group with COPD: a qualitative study

SE Fox, F Early, PM Wilson, C Deaton, HW Haque, JR Ward, JP Fuld

P25 Pulmonary rehabilitation quality improvement via a regional network

L Morton-Holtham, E Wells, J Congleton, J Bott

P26 Pulmonary rehabilitation in Cheshire and Merseyside (C&M)

S Pilsworth

P27 Dance for people with chronic breathlessness: a feasibility study

SL Harrison, K Bierski, J Edwards, V McFaull, S McLusky, A Russell, G Williams, S Williams

P28 A comparison of daily physical activity between adults with severe asthma and healthy controls

J Neale, M Orme, S Chantrell, S Majd, P Bradding, SJ Singh, RH Green, RA Evans

P29 Use of pedometers as a tool to promote daily physical activity levels in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis

M Armstrong, A Winnard, N Chynkiamis, S Boyle, C Burtin, I Vogiatzis

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2.00pm – 3.10pm
Cambridge, 5th floor
MODERATED POSTER DISCUSSION: M1 – M9

The epidemiology and impact of difficult infections

Chaired by: Dr Charles Haworth (Cambridge) and Professor Adilia Warris (Exeter)

M1 Do climate changes influence environmental aspergillus fumigatus load at the Manchester University NHS Foundation Trust Adult Cystic Fibrosis Centre?

JA Coleman, AM Jones, LJ Collier, MD Richardson, RJ Bright-Thomas

M2 Pseudomonas aeruginosa (Pa) biofilm-forming potential and metabolomic phenotypes differ between chronically infected patients with cystic fibrosis (CF) and non-CF bronchiectasis (Bx)

WD Smith, RA Murphy, A Simbo, OL Fletcher, SJS Cameron, EE Bardin, Z Takats, C Hogg, A Filloux, A Bush, JC Davies

M3 Pseudomonas aeruginosa induces inflammation in bronchial epithelial cells via the p38 MAP and Syk tyrosine kinase pathways

MS Coates, K Ito, EWFW Alton, JC Davies

M4 Pseudomonas aeruginosa inhibits aspergillus fumigatus in vitro through multiple mechanisms, including pyoverdine production

DA Hughes, D Armstrong-James, JS Elborn, JC Davies

M5 The multiple sclerosis drug, glatiramer acetate, acts as a resistance breaker with antibiotics from different classes against cystic fibrosis strains of Pseudomonas aeruginosa

RA Murphy, J Harrison, S Schelenz, JC Davies

M6 Outcomes of pulmonary Mycobacterium abscessus infection

WG Flight, NE Hough, SJ Chapman

M7 Should we be paying more attention to nutritional status in non-tuberculous mycobacterial lung disease?

N Hussain, M Kagka, E Weekes, R Breen, H Milburn

M8 Non-tuberculous mycobacteria testing in bronchiectasis in the UK: data from the EMBARC registry

S Finch, R van der Laan, M Crichton, I Clifton, T Gatheral, P Walker, C Haworth, A Hill, M Loebinger, P Goeminne, S Aliberti, E Polverino, A De Soyza, JD Chalmers

M9 Psychosocial impact of Mycobacterium abscessus infection in adults with cystic fibrosis

SFH Zaki, KSA Chapman, SJ Chapman, WG Flight

2.00pm – 3.20pm
Rutherford, 4th floor
SPOKEN SESSION: S27 – S31

What's new? Clinical trials in lung disease

Chaired by: Professor Peymané Adab (Birmingham) and Professor Dave Singh (Manchester)

2.05pm S27

A placebo-controlled, double-blind, randomised, crossover study to assess the efficacy, safety and tolerability of TRPV4 inhibitor GSK2798745 in participants with chronic cough

VJ Ludbrook, KE Hanrott, J Marks-Konczalik, JL Kreindler, NP Bird, D Hewens, M Beerahee, DJ Behm, A Morice, L McGarvey, SM Parker, SS Birring, J Smith

2.20pm **S28**

Benefits observed with patient-reported outcomes in a phase 2b clinical trial of gefapixant, a P2X3 receptor antagonist, in chronic cough

SS Birring, LP McGarvey, JA Smith, AH Morice, MR Sher, J Schelfhout, A Mehta, DR Muccino

2.35pm **S29**

The impact of GOLD stage on the effectiveness of tiotropium/olodaterol in preventing COPD exacerbations in the DYNAGITO trial

J Wedzicha, PMA Calverley, AR Anzueto, A de la Hoz, F Voß, KF Rabe, C Jenkins

2.50pm **S30**

The feasibility of investigating methylphenidate for the treatment of sarcoidosis-associated fatigue (the FaST-MP study) – a double-blind, parallel-arm randomised controlled-trial

CP Atkins, AP Jones, AM Wilson

3.05pm **S31**

Dupilumab reduces severe exacerbations across baseline disease characteristics in patients with elevated baseline type 2 biomarkers: the Liberty Asthma Quest study

WW Busse, X Muñoz, TB Casale, P Paggiaro, M Castro, Y Tohda, MS Rice, Y Deniz, P Rowe, N Amin, A Teper

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2.00pm – 3.30pm
Mountbatten, 6th floor
JOINT BTS/BPRS SYMPOSIUM

LUNG INVOLVEMENT IN MULTI-SYSTEM DISEASE

Chaired by: Dr Des Cox (Dublin) and Dr Rebecca Thursfield (Liverpool)

2.00pm Auto-immune and connective tissue diseases

Dr Liza McCann (Liverpool)

2.30pm Skeletal dysplasia

Dr Colin Wallis (London)

3.00pm Sickle cell disease

Dr Mark Velangi (Birmingham)

Learning objectives:
The lungs may be involved in a number of systemic and structural diseases. The audience will be provided with latest updates on several common and rare paediatric conditions with a focus on diagnosis and treatment of pulmonary complications.

2.00pm – 3.30pm
Westminster, 4th floor
PRIZE SYMPOSIUM: T1 – T6

BTS/BALR/BLF EARLY CAREER INVESTIGATOR AWARDS

Chaired by: Dr Mohammed Munavvar (Preston)

Judged by: Professor James Chalmers (Dundee), Dr Elizabeth Sapey (Birmingham) and Dr Chris Scotton (Exeter)

T1 Meta-analysis of idiopathic pulmonary fibrosis genome-wide analyses identifies three novel genetic signals associated with disease susceptibility

RJ Allen, B Guillen-Guio, JM Oldham, SF Ma, A Dressen, ML Paynton, LM Kraven, M Obeidat, X Li, R Braybrooke, TE Fingerlin, IP Hall, I Sayers, MD Tobin, TM Maher, DA Shwartz, BL Yaspan, PL Molyneaux, C Flores, I Noth, RG Jenkins, LV Wain

T2 Effect of incident heart failure on short- and long-term mortality of COPD patients

EL Axson, V Sundaram, CI Bloom, A Bottle, MR Cowie, JK Quint

T3 Itaconate drives the resolution of pulmonary fibrosis

PP Ogger, P Ghai, RJ Hewitt, PL Molyneaux, TM Maher, CM Lloyd, AJ Byrne

T4 Calcium-sensing receptor antagonists (calcilytics) as a novel therapeutic for alarmin-driven inflammatory lung disease

B Mansfield, P Huang, R Bruce, T-R Ho, X Du, Q Huang, W Wang, ST Lugg, W Ford, E Kidd, C Corrigan, JPT Ward, C Hawrylowicz, D Thickett, KE Lewis, L Mur, PJ Kemp, Y Sun, D Riccardi

T5 Pregnancy zone protein is released into neutrophil extracellular traps in severe bronchiectasis

S Finch, A Shoemark, AJ Dicker, HR Keir, A Smith, TC Fardon, D Cassidy, JTJ Huang, JD Chalmers

T6 Identification of ROLIP as a mitochondrial regulator of metabolism and the hypoxia response pathway

PSJ Bailey, BM Ortmann, AS Costa, C Frezza, JA Nathan

2.00pm – 4.00pm
Churchill, Ground floor
SYMPOSIUM

POINT OF CARE AND PLEURAL IMAGING: AT THE CUTTING EDGE

Chaired by: Dr Rachelle Asciak (Msida, Malta) and Dr Rachel Benamore (Oxford)

2.00pm Thoracic ultrasound in the acutely breathless patient: is this the standard of care?

Dr Christian Laursen (Odense, Denmark)

2.30pm More than anatomy: volumetric and functional MRI in malignant pleural disease

Dr Selina Tsim (Glasgow)

3.00pm Perfusion CT and artificial intelligence: goodbye radiologists!

Professor Fergus Gleeson (Oxford)

3.30pm PET-CT in the undiagnosed effusion: results of the TARGET study

Dr Duneesha de Fonseka (Sheffield)

Learning objectives:

- Review the current evidence for the use of point of care ultrasound in diagnosis and management of respiratory failure.

- To understand the additional value of thoracic MRI in pleural disease diagnosis, outcome prediction and disease response.

- Understand potential future developments in perfusion CT and AI for the diagnosis and management of pleural disease.

- To review the latest evidence on the use of PET-CT in targeting pleural biopsy and managing the malignant effusion pathway.

2.15pm – 3.20pm
St James, 4th floor
POSTER DISCUSSION: P30 – P37

Ventilation in neuromuscular disease

Chaired by: Dr Michael Davies (Cambridge) and Dr Alanna Hare (London)

P30 Use and uptake of long term mechanical ventilation in patients with motor neurone disease in the United Kingdom

J Palmer, B Kathiresan

P31 Review of home mechanical ventilation in patients living with motor neurone disease

KK Rajan, S Sheridan, P Murphy, ES Suh, P Marino, H Pattani, J Steier, N Hart, G Kaltsakas, M Ramsay

P32 Symptomology versus physiology: trialling long term non-invasive ventilation in a motor neurone disease clinical cohort

E Parkes, J Shakespeare, A Bishopp, A Ali

P33 VOTECO2ALS: validation of tidal expired CO2 measured at home as surveillance for ventilatory failure in people with motor neurone disease (MND)

I Smith, M Davies, A Fofana, J Grey, J Altrip, M Haines

P34 Non-invasive ventilation in motor neurone disease: are we offering to all who need it?

H Rai, B Kathiresan, J Palmer

P35 Delivery of a botulinum injection as a service in outpatient settings for control of hypersalivation: a safe and efficacious service when delivered by trained home ventilation consultant

VL Lostarakos, THM Tedd, TD Doris, MPB Messer

P36 Characteristics and outcomes of spinal cord injury patients discharged from a tertiary spinal injuries unit with long-term tracheostomy ventilation

A Forrest, B Chakrabarti, A Manuel, M Bevan, A Ward, S Lane, R Parker, PK Plant, N Duffy, S Lari, F Selmi, B Soni, RM Angus

P37 Onasemnogene abeparvovec gene-replacement therapy for spinal muscular atrophy: from bench to bedside

P Kaufmann, I Kausar, KD Foust, A Kaspar, BK Kaspar, JR Mendell

2.15pm – 4.00pm
Moore, 4th floor
POSTER DISCUSSION: P38 – P51

Driving quality improvement through education and training

Chaired by: Dr Andrew Cheng (Manchester) and Dr Helen Liddicoat (Dundee)

P38 'Getting it right first time' (GIRFT) in the management of COPD
N Ahmad, E Crawford, K Srinivasan, H Moudgil

P39 Acute non-invasive ventilation (NIV) delivery in ward settings – improving nursing competency improves outcomes in NCEPOD recommendations
K Dalton, D Hinge, S Hippolyte

P40 Effect of practical non-invasive ventilation training sessions on confidence and competence of clinicians
H Rai, D Crowle, B Kathiresan

P41 Improving NIV training for general medical trainees: a trainee led initiative by RespTRACT
FS Grudzinska, S Thein, R Edgar, DPS Dosanjh, D Parekh, on behalf of RespTRACT

P42 Development of an acute non-invasive ventilation teaching programme for trainees in a district general hospital following the NCEPOD report – inspiring change
R Anstey, K Millington, F Easton, R Mason

P43 An integrated and sustainable education programme improves knowledge, leadership and confidence in acute non-invasive ventilation (NIV) in line with the BTS Quality Standards
CA Peal, AD Moriarty, J Wyatt, AW Molyneux, DP Smith

P44 NIV prescription proforma – does it improve patient care?
A Dhara, P Bandipalyam, J Patel, A Ladva, A Maheswaran, S Srivastava

P45 A study of burnout and professional fulfilment among respiratory physicians (RP) in United Kingdom
S Piracha, U Maqsood, M Saleem, M Ganaie, A Raza

P46 Stopping smoking in the unstoppable
D Kadar, A Broadhurst, G Agboado, S Sibley, S Pilsworth

P47 Investigating changes in parents' perceptions and attitudes of smoking in the home after a second hand smoke educational intervention in nurseries
Y MacNicol, NJ Roberts

P48 A joint respiratory and palliative care clinic: the patient experience
N Nathoo, N Devani, R Craig, S Mandal

P49 UK cost-effectiveness value pyramid of asthma interventions
C Roukas, F Tomini, B Mihaylova

P50 Clinical outcomes and micro-costing of bronchial thermoplasty in severe asthma in the UK
L White, C Capbianco, AH Mansur

P51 Patient satisfaction during bronchoscopy: a quality improvement project
J Tonkin, E Gannon, SJ O'Connor

2.30pm – 3.30pm
Victoria, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

COPD

2.30pm – 3.40pm
Albert, 2nd floor
POSTER DISCUSSION: P52 – P60

Prognosis and outcomes in ILD

Chaired by: Dr Nicola Simler (Cambridge) and Dr Tim Sutherland (Leeds)

P52 Vitamin D deficiency is associated with adverse survival in patients with idiopathic pulmonary fibrosis
R Kumar, J Mann, F Chua, T Maher, E Renzoni, M Kokosi, V Kouranos, P Molyneaux, A Wells, J Mackintosh, P George

P53 Incidence of idiopathic pulmonary fibrosis in people with type 2 diabetes: the Fremantle Diabetes study
WA Davis, V Navaratnam, RB Hubbard, TME Davis

P54 Predicting outcomes of patients hospitalised with an acute respiratory deterioration of idiopathic pulmonary fibrosis

C Hyams, DB Hettle, H Adamali, SL Barratt

P55 Bleeding risk in patients with idiopathic pulmonary fibrosis (IPF) on nintedanib and con-current anticoagulation or antiplatelet therapy

EK Denneny, G Vekaria, J Sahota, L Beitverda, C Warner, H Garthwaite, M Heightman, H Booth, JC Porter

P56 What happens to patients with idiopathic pulmonary fibrosis who are not eligible for antifibrotic treatment due to current NICE guidelines

S Noor, S Nawaz, T Garfoot, M Greaves, C Hayton, G Margaritopoulos, T Marshall, A Montoro, H Morris, K Newman, P Rivera-Ortega, S Stanel, K Zakis, C Leonard, N Chaudhuri

P57 Peripheral blood monocyte count as a prognostic marker in fibrotic interstitial lung disease (fILD): analysis from a single UK specialist centre

TJM Wallis, K Pontoppidan, CJ Brereton, B Welham, MG Jones, SV Fletcher

P58 Chest imaging abnormalities in patients with uncontrolled rheumatoid arthritis prior to starting biological therapy

A Benjamin, K Ward

P59 The utilisation of flow cytology and evaluation of CD4/CD8 ratios from mediastinal and hilar lymph node sampling by endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA): experiences at Oxford University Hospitals Foundation Trust (OUH)

A Achaiah, O Lomas, A Moore, J Wrightson, A Sykes

P60 Temporally close presentation of primary lung cancer and idiopathic pulmonary fibrosis (IPF): an analysis of incident IPF cases from 2007 – 2018

E Daniels, O Kadwani, P Molyneaux, P George, J Mann, A Devaraj, E Renzoni, TM Maher, V Kouranos, M Kokosi, S Kemp, P Shah, AG Nicholson, SR Desai, AU Wells, F Chua

2.40pm – 4.15pm
Abbey, 4th floor
SPOKEN SESSION: S32 – S37

Acute asthma: lessons from the frontline

Chaired by: Dr James Calvert (Bristol) and Mrs Leanne Jo Holmes (Manchester)

2.45pm **S32**

Associations between asthma severity, initial management and specialist review on length of stay and mortality outcomes

A Adamson, S Robinson, CM Roberts, JK Quint, J Calvert

3.00pm **S33**

Risk factors for frequent exacerbations in a real-life adult population with severe refractory asthma

JF Yang, J Busby, LG Heaney, PE Pfeffer, DJ Jackson, AH Mansur, A Menzies-Gow, S Siddiqui, CE Brightling, M Patel, NC Thomson, WT Lee, SJ Smith, R Chaudhuri

3.15pm **S34**

The role of baseline morning cortisol as a guide to assess adrenal failure in severe steroid dependent asthma

AM Nanzer, C Roxas, L Green, L Thomson, M Fernandes, J Kavanagh, G d'Ancona, J Dhariwal, BD Kent, DJ Jackson

3.30pm **S35**

Poor influenza vaccination rates in people with airways disease

JC Gates, T Brown, E Heiden, D Lodge, R Simpson, A Hicks, H Rupani, AJ Chauhan

3.45pm **S36**

Improving asthma care in the emergency department (ED): a 2-year prospective quality improvement (QI) project

G Long, A Simpson, K Stagg, C Dutton, H Jackson, G Wood, L Watson, B Kane

4.00pm **S37**

The effect of asthma management plans and annual asthma reviews on exacerbations

S Naqvi, R Patel, K Bhullar, JK Quint, CI Bloom

SCIENTIFIC PROGRAMME

Wednesday 4 December 2019

3.00pm – 4.30pm

COFFEE/TEA will be served in the Whittle & Fleming and Britten, 3rd floor, and the Cambridge, 5th floor (3.30pm – 3.45pm only)

3.30pm – 4.30pm
Gielgud, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

Pulmonary Infection

3.45pm – 5.15pm
Windsor, 5th floor
POSTER DISCUSSION: P61 – P71

Paediatric respiratory pick and mix

Chaired by: Dr Gary Doherty (Belfast) and Dr Clare Murray (Manchester)

P61 The impact of initial duration of hospital admission and viral aetiology of bronchiolitis in the first six months of life on subsequent respiratory morbidity

J Bloor, P McNamara, G Saint

P62 The association between perinatal and early life exposures and lung function in Australian Aboriginal young adults: the Australian Aboriginal Birth Cohort study

V Navaratnam, DL Forrester, AB Chang, SC Dharmage, G Singh

P63 Detection of viruses in the gut of children with bronchiolitis and viral induced wheeze – increasing our understanding of the gut-lung-axis

SA Unger, J Boxhall, S Griffin, H Basten, K Templeton, R Langley

P64 An in-silico investigation of DNA repair gene variation in the mycobacteroides abscessus subspecies abscessus ST26 clonal lineage

D Kenna, N Mustafa, C Peters, J Turton, RJ Langley

P65 Factors impacting chest X-ray resolution following paediatric empyema

PB Bhatia

P66 Paediatric pneumonia – literature review of proteomics of airway biofluids to identify new diagnostic biomarkers

J Twynam-Perkins, S Cunningham, D Dockrell

P67 Characteristics and aetiology of non-CF bronchiectasis in East London children

SMN Brown, C Pao, R Smith

P68 The management of acute wheeze – what do paediatric trainees do?

L Duthie, V Currie, P Nagakumar

P69 The uncertain role of spirometry in managing childhood asthma in the UK 2019

SW Turner

P70 A comparison of the mean co-operation time among patients on jet nebulization with and without visual distraction

W Bancoro

P71 Embedding paediatric PPIE in non-invasive ventilation interface design

NJ Barker, HE Elphick, H Reed, M Willox, K Jeays-Ward, P Metherall, A McCarthy

4.15pm – 4.45pm
Churchill, Ground floor
BTS AWARD PRESENTATIONS

Presentation of the BTS Medal, BTS Award for Meritorious Service, BTS/BALR/BLF Early Career Investigator Awards and the BTS Medical Student Awards

4.45pm – 5.30pm
Churchill, Ground floor
THE BTS PRESIDENT'S ADDRESS

"Lights, camera, action!"

Dr Mohammed Munavvar (Preston)

Introduced by: Dr Mark Elliott (Leeds)

5.30pm – 6.00pm
Churchill, Ground floor
BTS ANNUAL GENERAL MEETING

BTS members only

Thursday 5 December 2019

8.00am – 9.00am
COFFEE/TEA will be served in the Whittle & Fleming, 3rd floor

8.45am – 4.00pm
Whittle & Fleming, 3rd floor
POSTER VIEWING
Authors present: 10.00am – 11.00am

P72-P85
Lung cancer diagnostics: challenges and solutions
Discussion of abstracts will take place from 1.45pm to 3.30pm in the Windsor, 5th floor

P86-P97
Biologics in asthma
Discussion of abstracts will take place from 2.00pm to 3.30pm in the Albert, 2nd floor

P98-P111
Malignant pleural disease
Discussion of abstracts will take place from 2.00pm to 3.45pm in the Moore, 4th floor

P112-P124
Pulmonary hypertension: advances in diagnosis and treatment
Discussion of abstracts will take place from 3.15pm to 4.55pm in the Westminster, 4th floor

P125-P133
Lung physiology: something old, something new
Discussion of abstracts will take place from 3.45pm to 4.55pm in the Rutherford, 4th floor

P134-P143
Respiratory infections: getting it right
Discussion of abstracts will take place from 3.45pm to 5.00pm in the Windsor, 5th floor

P144-P155
Asthma epidemiology: understanding the problem
Discussion of abstracts will take place from 3.45pm to 5.15pm in the Abbey, 4th floor

P156-P169
Targeted assessment of asthma
Discussion of abstracts will take place from 3.45pm to 5.30pm in the Mountbatten, 6th floor

8.45am – 4.00pm
Cambridge, 5th floor
MODERATED POSTER VIEWING

M10-M15
Real world studies with antifibrotics in IPF
Discussion of abstracts will take place from 2.00pm to 3.00pm in the Cambridge, 5th floor

8.00am – 8.30am
Albert, 2nd floor
BTS JOURNAL CLUB

Clinical trials
Professor Hilary Pinnock (Edinburgh)

Learning objectives:

By the end of the session:

- Participants will be able to critically appraise the clinical trials studies discussed in this session and will be able to discuss the rationale of the methodological approaches and analysis used.

- Participants will develop an appreciation of how the findings from the studies discussed can be applied to clinical practice.

The relevant references will be available on the BTS website so that delegates may review the papers in advance.

8.00am – 9.30am
Gielgud, 2nd floor
OPEN SESSION

Preparing for a move to a consultant post: tips, tactics and potential opportunities
Chaired by: Dr Graeme Wilson (London)

This informal session will include presentations on:

1) Preparing for your consultant interview
Dr Sabrine Hippolyte (Brighton)
2) What to do in your first two years as a consultant
Dr Charles Sharp (Gloucester)
3) What is involved in working in a rural environment
Dr Elin Roddy (Shrewsbury)

Followed by time for trainees to meet with consultants who may have vacancies in their centre, or who might be able to give helpful advice.

8.30am – 10.00am
Mountbatten, 6th floor
SYMPOSIUM

IMMUNOTHERAPY: THE BRAVE NEW WORLD

Chaired by: Dr Ahsan Akram (Edinburgh) and Dr Vidan Masani (Bath)

8.30am Immunotherapy in the treatment of mesothelioma
Dr Anna Bibby (Bristol)

9.00am Management of toxicities in the era of personalised lung cancer therapies
Dr Alastair Greystoke (Newcastle upon Tyne)

9.30am Translational overview of up and coming targets in lung cancer
Dr Frank McCaughan (Cambridge)

Learning objectives:

From this session, attendees will learn how immunotherapy is transforming the management of respiratory malignancies.

- Presentation 1 will describe the current approaches and emerging drugs in the management of mesothelioma.

- Presentation 2 will go on to describe the potentially serious side effects that can be seen with immunotherapy, and how these should be managed.

- Presentation 3 will highlight the up-and-coming targets for targeted lung cancer treatment, and how exploiting these could transform our approach to managing this disease.

8.45am – 10.15am
Churchill, Ground floor
SYMPOSIUM

NEW STRATEGIES FOR COPD EXACERBATIONS

Chaired by: Professor Mona Bafadhel (Oxford) and Professor Charlotte Bolton (Nottingham)

8.45am Patient prioritisation in COPD: what matters to patients?
Professor John Hurst (London)

9.15am Mechanistic insights and clinical consequences of inhibiting PI3K delta in COPD
Dr Edith Hessel (GSK)

9.45am Ongoing trials in COPD exacerbations: new treatments for viral infections
Professor Tom Wilkinson (Southampton)

Overview:

Exacerbations of chronic obstructive pulmonary disease (ECOPD) are important events. They are associated with significant mortality, morbidity, a reduced quality of life and an increasing reliance on social care. ECOPD are common and are increasing in prevalence. Exacerbations beget exacerbations, with up to a quarter of in-patient episodes ending with re-admission to hospital within 30 days. The healthcare costs are immense. Yet despite this, the tools available to diagnose and treat ECOPD are essentially unchanged, with the last new intervention (non-invasive ventilation) introduced over twenty-five years ago. This symposium will highlight emerging therapies and research strategies for ECOPD and discuss a (then to be) completed patient prioritisation in ECOPD, so we can understand what patients want us to focus on.

Learning objectives:

- To understand the process of James Lind patient prioritisation and discuss early results about what matters to patients in terms of research activity and direction.

- To consider new treatment pathways for ECOPD, including those which might be suitable for bacterial infections with neutrophilic inflammation and new strategies for viral infections.

8.45am – 10.15am
Windsor, 5th floor
JOINT BTS/BPRS SYMPOSIUM

THE ASSESSMENT OF LUNG DISEASE IN CHILDREN

Chaired by: Professor Jane Davies (London) and Dr Francis Gilchrist (Stoke on Trent)

8.45am Advances in physiology-based tests
Dr Don Urquhart (Edinburgh)

9.15am Imaging: CT/MRI/functional MRI
Dr Thomas Semple (London)

9.45am Looking to the future: breath-based diagnostics
Professor Anke-Hilse Maitland-van der Zee (Amsterdam)

Learning objectives:

The outlook is improving for the health of children with a number of chronic lung diseases, which poses challenges in

terms of diagnosis and monitoring. Here, we bring together three experts in different techniques seeking to shine a light on potentially hidden aspects of lung disease.

- Whilst spirometry is a blunt tool in the early stages of airway disease, newer modalities including multibreath washout, cardiopulmonary exercise testing may demonstrate abnormalities at an earlier stage.

- CT scans are not used as repeatedly as they might be useful because of concerns over radiation in childhood. Advances in low-dose protocols as well as improvements in the resolution of alternatives such as MRI may improve the utility of imaging.

- Breath has long been considered an attractive substrate for monitoring lung health, but does not, to date, appear to have fulfilled its promise. We will hear about an innovative programme led from the University of Amsterdam, which may provide both diagnostic and longer-term monitoring utility.

8.45am – 10.20am
Moore, 4th floor
SPOKEN SESSION: S38 – S43

Integrative working to improve patient experience in lung disease

Chaired by: Dr Karen Heslop-Marshall (Newcastle) and Dr Louise Restrick (London)

8.50am **S38**

Improving access to psychological therapy services is a cost-effective intervention to reduce hospital burden and improve wellbeing in patients with long term respiratory conditions

K Taylor, C Bainbridge, C Carrier, A Taylor, J Warwick, R Evans, G Lowrey, D Draicchio

9.05am **S39**

Impact of a specialist breathlessness management group

S Pilsworth, J Donohoe, L Jones, J Hillis

9.20am **S40**

A qualitative study exploring the essential elements required for a palliative care service for people with COPD

DG Anderson, S Browne, K Rooney, C Sime

9.35am **S41**

Utilisation of a respiratory non-malignant palliative care MDT

WI Henderson, E Cameron, M Cross, M Embley, C Lee, D Morrison, W Newman, M Spears, M Wilczynska, FT Wood

9.50am **S42**

Where do individuals with idiopathic pulmonary fibrosis (IPF) die?

C McKiernan, D Dosanjh, J Tomas, A Crawshaw

10.05am **S43**

Has introduction of severity criteria improved palliative care provision for patients with idiopathic pulmonary fibrosis?

AR Tyas, AC Boland, S Gillon

9.00am – 10.00am
Victoria, 2nd floor
OPEN MEETING

BTS/ARTP Respiratory Physiology Joint Board

9.00am – 10.20am
Abbey, 4th floor
SPOKEN SESSION: S44 – S48

Novel insights into malignant pleural disease

Chaired by: Dr Judith Lyons (Manchester) and Professor Najib Rahman (Oxford)

9.05am **S44**

Diagnosis of malignant pleural effusion: can CT findings predict pleural fluid cytology results?

Q Lu, R Mercer, G Shepherd, O Castro, R Varatharajah, A Thayanandan, M Hassan, E Bedawi, D Mccracken, R Asciak, D Addala, M Tsikrika, R Hallifax, N Rahman

9.20am **S45**

VISTA expression in malignant pleural mesothelioma

C Rooney, C Nixon, K Blyth, T Sethi, D Murphy, F McCaughan

9.35am **S46**

Evaluation of phosphorylated 70S6K expression in malignant pleural mesothelioma and its association with patient survival

S Tariq, L Oguh, A Campbell, L Cawkwell, MJ Lind

9.50am **S47**

Impact of number of sampling sites and specimen dimension on the performance of nuclear grade and growth patterns in predicting survival in epithelioid malignant pleural mesothelioma: a single institution review of 614 cases

YZ Zhang, C Brambilla, PL Molyneaux, A Rice, JL Robertus, S Jordan, E Lim, L Lang-Lazdunski, S Begum, M Dusmet, V Anikin, E Beddow, J Finch, N Asadi, S Popat, WOC Cookson, MF Moffatt, AG Nicholson

10.05am **S48**

Pleurodesis outcome and survival in patients with malignant pleural effusion – a systematic review

M Hassan, M Gadallah, E Harriss, JP Corcoran, NM Rahman

9.00am – 10.35am
Westminster, 4th floor
SPOKEN SESSION: S49 – S54

Increasing experience of biologics and asthma

Chaired by: Mrs Lynn Elsey (Manchester) and Dr Duncan Wilson (Birmingham)

9.05am **S49**

Dupilumab improves lung function across baseline disease characteristics in patients with evidence of type 2 inflammation at baseline: the Liberty Asthma Quest study

P Paggiaro, M Castro, WG Canonica, JA Douglass, Y Tohda, MS Rice, Y Deniz, P Rowe, N Amin, A Teper

9.20am **S50**

Association of baseline blood eosinophil counts and serum IgE concentrations on exacerbations and benralizumab efficacy for patients with severe, uncontrolled asthma

DJ Jackson, M Humbert, I Hirsch, P Newbold, E Garcia Gil

9.35am **S51**

Characterisation of exacerbations of severe eosinophilic asthma on mepolizumab compared to placebo

R Shrimanker, O Keene, DJ Bratton, SW Yancey, LG Heaney, ID Pavord

9.50am **S52**

Development of a dedicated protocol for screening for occult parasitic infection prior to initiation of anti-IL5 therapy in patients with severe eosinophilic asthma

B Cushen, R Stead, S Malley, D Armstrong-James, J Hull

10.05am **S53**

Response to benralizumab after sub-optimal response to mepolizumab in severe eosinophilic asthma

J Kavanagh, C Roxas, L Green, L Thomson, G d'Ancona, M Fernandes, J Dhariwal, AM Nanzer, BD Kent, DJ Jackson

10.20am **S54**

Evidence of drug antibody development in severe eosinophilic asthmatics treated with benralizumab

L Thomson, J Kavanagh, L Green, M Fernandes, C Roxas, G d'Ancona, J Dhariwal, AM Nanzer, BD Kent, DJ Jackson

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9.15am – 10.15am
St James, 4th floor
RESPIRATORY FUTURES OPEN SESSION

Health inequalities and the future of respiratory care

Chaired by: David Brindle (Public Services Editor, The Guardian)

Speakers:

Professor Sir Michael Marmot (Professor of Epidemiology at University College London, Director of the UCL Institute of Health Equity)

Professor Andrew Menzies-Gow (National Clinical Director, Respiratory, NHS England)

Dr Llinos Jones (Consultant Respiratory Physician, Mid Yorkshire Hospitals NHS Trust)

Dr Paul Walker (Consultant in Respiratory Medicine, Aintree University Hospital NHS Foundation Trust)

Overview:

This session draws upon the emphasis placed in the NHS Long-Term Plan on health inequalities as well as the long history of respiratory work in this area. The updated Atlas of Variation, published 27 September 2019, provides important and highly relevant data and background information. The session will cover the importance of tackling health inequalities, the role of respiratory disease in exacerbating these and good practice within the respiratory community, including:

- community outreach teams

- work with specific excluded individuals, such as providing diagnosis and packages of care for drug users in the community

- work with communities for whom English is not a first language, particularly in relation to stigma around asthma.

10.00am – 11.00am

COFFEE/TEA will be served in the Whittle & Fleming and Britten, 3rd floor

10.30am – 11.45am
Gielgud, 2nd floor
OPEN SESSION

Integrated care network meeting

Chaired by: Dr Justine Hadcroft (Liverpool) and Mrs Kelly Redden-Rowley (Birmingham)

10.30am What do we mean by integrated care?
Dr Sarah Sibley (Liverpool)

10.55am Driving innovation in integrated care
Dr Binita Kane (Manchester)

11.20am Integrated care forum

Overview:

This session will give an opportunity for those working in integrated respiratory care to share experiences or ask questions of others working in integrated care. Bring along the thorny issues you are struggling to resolve to discover how other teams have faced and solved similar issues, share how you have overcome barriers to integration, suggest ways in which BTS can help to promote integrated care, tell us how you have been involved in innovative models of commissioning.

10.30am – 11.50am
St James, 4th floor
SPOKEN SESSION: S55 – S59

The failing lung in COPD

Chaired by: Dr Patrick Murphy (London) and Dr Richa Singh (London)

10.35am **S55**
Ward-based high flow nasal cannula oxygen – the South West experience
RC Jones, A Dipper, H Morrison

10.50am **S56**
Predictors of NIV treatment in patients with COPD exacerbation complicated by respiratory acidaemia
C Echevarria, J Steer, SC Bourke

11.05am **S57**
Predicting outcome from exacerbations of COPD requiring assisted ventilation: results from the NIV Outcome (NIVO) study
TM Hartley, ND Lane, J Steer, MW Elliott, M Sovani, HJ Curtis, ER Fuller, PB Murphy, N Hart, D Shrikrishna, KE Lewis, NR Ward, C Turnbull, SC Bourke

11.20am **S58**
Oxygen therapy and death in COPD exacerbation
C Echevarria, J Steer, SC Bourke

11.35am **S59**
Reduction in fatalities following introduction of an initial home oxygen risk mitigation form (IHORM) for all new patients on home oxygen in England and Wales
J Turner-Wilson, S Smith, S Channon

10.30am – 12.05pm
Mountbatten, 6th floor
SPOKEN SESSION: S60 – S65

Diagnostic and therapeutic advances in paediatrics

Chaired by: Professor Gary Connett (Southampton) and Dr Rishi Pabary (London)

10.35am **S60**

Upper versus lower airway microbiological culture in children with respiratory symptoms

LE Gardner, C Hogg, SB Carr, A Shoemark, G Marsh, JC Davies

10.50am **S61**

Onasemnogene abeparvovec gene-replacement therapy (GRT) for spinal muscular atrophy type 1 (SMA1): preliminary pulmonary and ventilatory findings from the phase 3 study (STR1VE)

R Shell, JW Day, CA Chiriboga, TO Crawford, BT Darras, RS Finkel, AM Connolly, ST Iannaccone, NL Kuntz, LDM Peña, PB Shieh, EC Smith, I Kausar, M Schultz, DE Feltner, FG Ogrinc, TA Macek, E Kernbauer, J L'Italien, DM Sproule, BK Kaspar, JR Mendell

11.05am **S62**

Changing landscape of paediatric tracheostomy ventilation: single centre experience

IM Brookes, M Desai, P Kenia, S Rao, P Nagakumar

11.20am **S63**

Adherence, airway inflammation and adrenal function in a cohort of paediatric asthma patients

L Selby, S Saglani, A Bush, L Fleming

11.35am **S64**

Use of pathological phenotype to determine optimal management for moderate to severe preschool wheeze

Y Bingham, J Moreiras, S Goldring, J Cook, L Selby, L Baynton, A Gupta, L Fleming, I Balfour-Lynn, A Bush, W Banya, M Rosenthal, S Saglani

11.50am **S65**

Capillary carbon dioxide as a measure of disease severity in acute bronchiolitis

SA Unger, C Halliday, A Ziaie, S Cunningham

10.30am – 12.15pm
Churchill, Ground floor
SYMPOSIUM

PLENARY SCIENTIFIC

Chaired by: Professor Louise Donnelly (London) and Professor Gisli Jenkins (Nottingham)

10.30am Endoplasmic reticulum stress and lung disease

Professor Stefan Marciniak (Cambridge)

10.55am Tissue remodelling in chronic lung disease

Dr Amanda Tatler (Nottingham)

11.20am Mucosal host-defence in COPD: medications, microbes and mucus

Dr Aran Singanayagam (London)

11.45am Cystic fibrosis: what does the future hold?

Professor Jane Davies (London)

Overview:

This symposium highlights the breadth and depth of research expertise from across the UK. This year we include both paediatric and adult illnesses, including CF and ILD, but also focus on key intra-cellular pathways including mechanisms of host-defence against respiratory viruses and bacteria in the context of chronic lung diseases and proteostasis and endoplasmic reticulum stress.

Learning objectives:

- To review cutting edge advancements across respiratory science and medicine.

- To learn about protein misfolding in cells and the effect this has on cell function in common and rare diseases.

- To discuss how host-defence mechanisms in chronic lung diseases can predispose to infection and tissue damage.

- To review new models of lung fibrosis and how these may provide insight into disease pathogenesis.

- To consider new treatment pathways for cystic fibrosis and how these might improve patient outcomes.

10.30am – 12.15pm
Victoria, 2nd floor
OPEN SESSION

Global lung health

10.30am From problems to solutions for lung disease in low- and middle-income countries: exciting opportunities for collaboration

Dr Jeremiah Chakaya Muhwa (President of The Union – International Union Against Tuberculosis and Lung Disease)

11.15am Launch of the BTS Global Lung Health Initiative

Overview:

The presentation will cover issues including the burden of lung disease in low- and middle-income countries, drivers of this burden, the response so far, the gaps in the response, what needs to be done and the role of partnerships – like the BTS Global Lung Health Initiative – in getting things done.

The BTS will launch a Global Lung Health Initiative at the Winter Meeting 2019. The initial focus will be on Africa and involve close partnership with the Pan African Thoracic Society (PATS). The launch will follow Dr Muhwa's talk. A Global Health Group, chaired by Professor Kevin Mortimer, with organisational and Officer support from the BTS Chief Executive, Sheila Edwards, and the BTS Honorary Treasurer, Dr Paul Walker, will work then with a delegation of the PATS Executive Committee to develop and agree a three-year strategic plan for the initiative.

12.00pm – 1.30pm
Gielgud, 2nd floor
OPEN MEETING

Working in respiratory: a focus on work-force, service development, education and training in the respiratory specialty

Chaired by: Dr John Park (Reading), Dr David Smith (Bristol) and Dr Graeme Wilson (London)

A joint meeting of the BTS Workforce and Service Development Committee, the BTS Education and Training Committee and the Regional Specialty Trainees Representatives.

Open to all delegates.

12.00pm – 2.00pm

LUNCH will be available to purchase in the café in the Pickwick, 1st floor, and the snack bar in the Whittle & Fleming, 3rd floor.

12.15pm - 12.30pm
Churchill, Ground floor
OPEN SESSION

BREATHE - a Health Data Research UK Hub for Respiratory Disease

Dr Jennifer Quint (Deputy Director and Chief Clinical Officer, BREATHE)

A bold new initiative to transform the UK's respiratory health through leveraging its national, regional and local health data assets.

12.30pm – 1.30pm
Moore, 4th floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

Asthma

12.45pm – 1.30pm
Churchill, Ground floor
THE BTS SCIENTIFIC LECTURE

Microbiome and effect on the lungs

Professor Elizabeth Kovacs (Denver, Colorado)

Introduced by: Dr Mark Elliott (Leeds)

1.45pm – 2.45pm
Gielgud, 2nd floor
OPEN MEETING

British Lung Foundation update: new approaches in COPD

Chaired by: Dr Noel Snell (BLF Vice-President)

1.45pm MicroRNA-570 as a key and novel regulator of accelerated lung ageing in COPD

Dr Jonathan Baker (London)

2.05pm Novel COPD subtype discovery using machine learning approaches on electronic health records

Dr Maria Pikoula (London)

2.25pm The role of pulmonary endothelium in pathogenesis of COPD

Dr Clara Green (Birmingham)

1.45pm – 2.50pm
Westminster, 4th floor
SPOKEN SESSION: S66 – S69

ILD and rare respiratory diseases: cracking the code

Chaired by: Dr Philip Molyneaux (London) and Dr Megan Paynton (Leicester)

1.50pm **S66**

Delivering the 100,000 Genomes Project to establish the functional role of DNA sequence variants in respiratory rare diseases

CL Shovlin, DJ Morris-Rosendahl, F Copeland, A De Soyza, C Hogg, G Jenkins, SJ Marciniak, M Lovett, MF Moffatt, WOC Cookson, M Alikian, S Hasan, R Slade, S Xiao, F Boardman-Pretty, D Brown, M Caulfield, A Devereau, T Fowler, E McDonagh, R Scott, ERA Thomas, Genomics England Research Consortium, EWFW Alton

2.05pm **S67**

Evidence that telomere length is causal for idiopathic pulmonary fibrosis but not chronic obstructive pulmonary disease: a UK Biobank Mendelian randomisation study

A Duckworth, MA Gibbons, AR Wood, K Lunnon, MA Lindsay, J Tyrrell, CJ Scotton

2.20pm **S68***

Understanding the pathological role of a genetic abnormality in DOCK3 in familial pulmonary fibrosis

R Kaur, I Stewart, RG Jenkins, A John, D Brown, L Wain

2.35pm **S69**

Verification of genetic associations with scleroderma associated interstitial lung disease

CJW Stock, A DeLauretis, D Visca, C Daccord, M Kokosi, V Kouranos, G Margaritopoulos, PM George, PL Molyneaux, F Chua, TM Maher, DJ Abraham, CP Denton, V Ong, AU Wells, EA Renzoni

***S68 BTS Medical Student Award Highly Commended**

1.45pm – 3.20pm
St James, 4th floor
SPOKEN SESSION: S70 – S75

Translational science in COPD

Chaired by: Dr Lydia Finney (London) and Professor Tom Wilkinson (Southampton)

1.50pm **S70**

Inaccurate neutrophil migration in symptomatic smokers without chronic obstructive pulmonary disease

KP Yip, M Hughes, R Stockley, E Sapey

2.05pm **S71***

Sustained impairment of neutrophil migration following acute exacerbations of chronic obstructive pulmonary disease

WJ McIver, M Hughes, GM Walton, RA Stockley, E Sapey

2.20pm **S72**

Investigating the neutrophil phenotype in COPD with common co-morbidities

M Hughes, W McIver, H McGettrick, E Sapey

2.35pm **S73**

Neutrophil sub-types across lung diseases

SJ Thulborn, J Cane, M Downs, C Connolly, C Borg, A Gittins, G Hynes, N Talbot, M Bafadhel, I Pavord

2.50pm **S74**

Regulation of mitochondrial transfer between airway smooth muscle cells (ASMCs): relevance to COPD

J Frankenberg Garcia, B Xu, C Hui, KF Chung, T Rodriguez, C Michaeloudes, PK Bhavsar

3.05pm **S75**

Proteinase activated receptor-2 induced autophagy dysregulation

K McCallum, L Dunning, L McGarvey, M Hollywood, J Brzeszczynska, A Crilly, JC Lockhart, GJ Litherland

***S71 BTS Medical Student Award Winner**

1.45pm – 3.20pm
Rutherford, 4th floor
SPOKEN SESSION: S76 – S81

An update in lung physiology

Chaired by: Mrs Joanna Shakespeare (Coventry) and Dr Karl Sylvester (Cambridge)

1.50pm **S76**

Use of parasternal intercostal electromyography to investigate the impact of comorbid heart failure on neural respiratory drive in COPD

M Crossley, L Estrada, M Lozano-García, A Moore, S Maxwell, PSP Cho, HV Fletcher, A Torres, J Moxham, GF Rafferty, R Jané, CJ Jolley

2.05pm **S77**

Effects of bisoprolol and celiprolol on cardiopulmonary performance in COPD

WJ Anderson, PM Short, S Jabbal, RW Kuo, RA Ross, AE Morrison, BJ Lipworth

2.20pm **S78**

Estimating residual volume and predicting presence or absence of significant hyperinflation from spirometry data: validating two described equations

S Dawson, D MacFarlane, C Carlin

2.35pm **S79**

Quality of spirometry in community led physiologist services

S Hawkes, R Peat, M Hopkinson, S Town, L Lukehirst

2.50pm **S80**

Can 'computer vision' using a convolutional neural network be used to identify obstructive sleep apnoea from overnight oximetry tracings?

JWS Davidson, F Easton, JCT Pepperell

3.05pm **S81**

Use of the diaphragm electromyogram to investigate the effect of healthy ageing on neural respiratory drive

V Wong, R Shah, W Zhang, A Mohindra, HV Fletcher, GF Rafferty, J Moxham, SDR Harridge, NR Lazarus, CJ Jolley

1.45pm – 3.30pm
Abbey, 4th floor
SYMPOSIUM

BTS AUDIT AND QUALITY IMPROVEMENT: HIGHLIGHTS FROM 2019

Chaired by: Professor Michael Steiner (Leicester)

1.45pm Introduction to BTS audit and quality improvement

Professor Michael Steiner (Leicester)

1.55pm 10-year low in pneumonia mortality – BTS CAP Audit data

Professor Wei Shen Lim (Nottingham) and Dr Hannah Lawrence (Nottingham)

2.20pm The National BTS Adult NIV Audit 2019

Dr Michael Davies (Cambridge)

2.45pm NIV QI – putting improvement into practice

Dr Daniel Smith (Nottingham)

3.10 pm Preliminary results from the BTS Smoking Cessation Audit

Dr Zaheer Mangera (London)

1.45pm – 3.30pm
Windsor, 5th floor
POSTER DISCUSSION: P72 – P85

Lung cancer diagnostics: challenges and solutions

Chaired by: Dr Haval Balata (Manchester) and Dr Mamta Ruparel (London)

P72 Prevalence and outcomes of unexpected findings in the Liverpool Healthy Lung Project (LHLP)

Y Cheng, JK Field, E Gaynor, M Timoney, R Arvanitis, C McCann, S Hill, D Fidoe, S Mason, M Ledson

P73 Implications and outcomes of clinical and radiological incidental lung cancer screening findings for primary care – results from a pilot screening study

EC Bartlett, S Kemp, J Derbyshire, K Morris, J Addis, C Ridge, S Mirsadraee, S Padley, SR Desai, A Devaraj

P74 Outcome of nodules detected during a healthy lung screening project

S Raghunath, F Frost, F Kutubudin, A Mciver, M Walshaw, M Ledson

P75 Effectiveness of straight to test and post CT scan triage of lung cancer patients

MA Pittman, E Capuano, B Yung

P76 Is a normal CT thorax sufficient to exclude thoracic malignancy in patients referred to fast-track clinic with haemoptysis? Data from eight years of referrals to a large NHS teaching hospital

JA Quinn, WL Chia, RS Raju, MEJ Callister, MPT Kennedy

P77 Use of the new South West chest X-ray reporting tool (SW CXR RT) to assist implementation of the National Optimal Lung Cancer Pathway (NOLCP)

C Pearce, S Alaee, P Sugden, S Foster, H Steer, T Hall, V Masani

P78 The role of computer-assisted radiographer reporting in lung cancer screening programmes

H Hall, M Ruparel, S Quaife, JL Dickson, C Horst, S Tisi, J Batty, N Woznitza, A Ahmed, S Burke, P Shaw, MJ Soo, M Taylor, N Navani, A Bhowmik, DR Baldwin, SW Duffy, A Nair, A Deveraj, SM Janes

P79 Incidence of brain metastases at diagnosis in otherwise stage I non-small cell lung cancer

HA Farne, T Banks, SA Bloch, CL Ross

P80 The role of physician-led supraclavicular node sampling in the histological diagnosis of lung cancer

R Patel, G Tsaknis, M Naeem, R Reddy

P81 Bedside measurement of exhaled breath condensate hydrogen peroxide differentiates lung cancer and interstitial lung disease from healthy controls

DM Lodge, D Neville, T Brown, H Rupani, KS Babu, L Bishop, E Heiden, J Gates, J Longstaff, J Winter, S Begum, AJ Chauhan

P82 Evaluation of the LENT and PROMISE score for malignant pleural mesothelioma by histological subtype

R Banka, R Ferris, A Hung, P Gkogkou, E Mishra

P83 Early experience of multimodally directed slim/ultraslim bronchoscopy at a UK centre

V Chew, HJ Carlin, K Dasgupta, J Dunleavy, V Jeebun

P84 The effect of establishing single site diagnostic services in improving lung cancer pathway timelines, to help implement the National Optimal Lung Cancer Pathway (NOLCP)

K Millington, C Marchand, J Walters, V Masani

P85 A retrospective analysis of five years of referrals for haemoptysis under the two-week-wait pathway to a university teaching hospital

F Hameed, J Kang, F Gleeson, J Wrightson, A Moore, A Sykes

2.00pm – 3.00pm
Cambridge, 5th floor
MODERATED POSTER DISCUSSION: M10 – M15

Real world studies with antifibrotics in IPF

Chaired by: Dr Anjali Crawshaw (Birmingham) and Dr Katie Ward (London)

M10 Persistence on antifibrotic medication in idiopathic pulmonary fibrosis (IPF) is not dependent on distance travelled to tertiary centre

A Babu, T McLellan, P Verghese, E Harris, K Harding, N Simler, C Fiddler, H Parfrey, F Woodhead, M Thillai

M11 Nintedanib and pirfenidone for idiopathic pulmonary fibrosis (IPF) in North East England – real life data

CJ Murphy, C Donaldson, L Langlands, S Wiscombe, AJ Simpson, IA Forrest

M12 52 month follow up of patients with IPF receiving nintedanib via the Compassionate Use Programme

K Ward, P Ind, D Woods, J Springett, C Dos Santos, C Hunt, R Coker

M13 From interstitial lung disease (ILD) multidisciplinary team meeting (MDT) to anti-fibrotic medication – review of regional MDT referrals

CJ Murphy, C Donaldson, L Langlands, S Wiscombe, AJ Simpson, IA Forrest

M14 Has antifibrotic therapy altered outcomes in patients with idiopathic pulmonary fibrosis? A real-world analysis

WA Wright, P Nightingale, D Dosanjh, A Crawshaw, DR Thickett

M15 Antifibrotic medications for idiopathic pulmonary fibrosis (IPF): a real world single centre experience of 447 patients over a 6 year period

E Harris, K Harding, T McLellan, A Babu, P Verghese, H Parfrey, N Simler, C Fiddler, M Thillai

2.00pm – 3.30pm
Churchill, Ground floor
SYMPOSIUM

IMMUNITY TO RESPIRATORY INFECTIONS: FROM MECHANISMS TO THERAPY

Chaired by: Dr Anand Shah (London) and Professor Sarah Walmsley (Edinburgh)

2.00pm Mucosal innate immune activation in the susceptibility to viral infection

Dr Ryan Thwaites (London)

2.30pm Improving innate immune response in older adults

Dr Elizabeth Sapey (Birmingham)

3.00pm GM-CSF to improve neutrophil phagocytosis in critical care patients

Professor John Simpson (Newcastle upon Tyne)

Learning objectives:

This session will showcase the latest research in understanding the impact of viral infection on secondary bacterial infections and report on a translational study to directly modulate in-vivo neutrophil function in critically unwell patients. It aims to:

- Enhance understanding of how prior viral infection can suppress innate immunity to bacterial infection.

- With increasing concerns about antibiotic resistance, this talk will discuss whether we can target the innate immune system to improve responses during infection.

- Assess the impact of granulocyte-macrophage colony-stimulating factor (GM-CSF) on in-vivo neutrophil phagocytosis in critical care unit patients.

2.00pm – 3.30pm
Mountbatten, 6th floor
SYMPOSIUM

HIGHLIGHTS FROM JAMA AND THORAX

Chaired by: Professor George O'Connor (Associate Editor, JAMA) and Professors Nicholas Hart, Gisli Jenkins and Alan Smyth (Joint Editors-in-Chief, Thorax)

Three cutting edge papers from this year's Journal of the American Medical Association and Thorax will be presented. In order to include the most recently published papers, details will be confirmed nearer to the time and will be publicised on the BTS website.

2.00pm – 3.30pm
Albert, 2nd floor
POSTER DISCUSSION: P86 – P97

Biologics in asthma

Chaired by: Dr Binita Kane (Manchester) and Dr Paul Pfeffer (London)

P86 Does adherence to ICS/LABA therapy change following initiation of benralizumab in the treatment of severe asthma and does this affect outcome?

G d'Ancona, S Bains, P Bakrania, L Green, M Fernandes, C Roxas, L Thomson, L Osman, K Stewart-Knight, J Dhariwal, AM Nanzer, J Kavanagh, DJ Jackson, BD Kent

P87 Reduced long-term cumulative OCS exposure for benralizumab-treated patients with severe asthma

D Shaw, A Menzies-Gow, A Bourdin, P Barker, E Garcia Gil

P88 Real-world effectiveness of anti-IL-5/5R therapies in severe atopic eosinophilic asthmatics eligible for anti-IgE therapy

DJ Jackson, J Kavanagh, C Roxas, G D'Ancona, L Green, L Thomson, M Fernandes, J Dhariwal, AM Nanzer, BD Kent

P89 Real-world 1 year effectiveness of benralizumab in severe eosinophilic asthma

J Kavanagh, C Roxas, L Thomson, M Fernandes, L Green, G d'Ancona, J Dhariwal, AM Nanzer, BD Kent, DJ Jackson

P90 Steroid dose reduction and weight loss in patients with severe asthma who respond to mepolizumab

N Thomas, B Hama, L Elsey, C Ustabasi, L Maguire, S Fowler, T Pantin, D Allen, G Tavernier, R Niven

P91 A review of severe asthma patients' adherence to preventer inhalers after 12 months of mepolizumab

L Elsey, LJ Holmes, K Johnson, R Niven

P92 Effectiveness and safety of mepolizumab in real-world clinical practice: UK patient outcomes from the REALITI-A study

WAF Kerr, TW Harrison, K Loveday, S Joksaite, N Kwon

P93 Response to reslizumab in severe asthma patients unresponsive to mepolizumab or with suspected vasculitis

B Hama, N Thomas, L Elsey, K Hince, R Waye, D Allen, L Holmes, T Pantin, G Tavernier, S Fowler, R Niven

P94 Can early changes in asthma control and quality of life predict mepolizumab response at 12 months?

JF Yang, WT Lee, SJ Smith, M Shepherd, J Lei, R Chaudhuri

P95 Baseline predictors of response to omalizumab and mepolizumab in severe adult asthma

S Natarajan, C Boddy, A Murphy, P Bradding, S Siddiqui

P96 Is long-term omalizumab therapy associated with increased sputum microbiology positivity?

JPD Griffiths, S Fowler, G Tavernier, D Allen, L Holmes, R Sheehan, R Niven

P97 Rituximab treatment for eosinophilic granulomatosis with polyangiitis

K Ward, A Douglas, A Tanna, SP McAdoo, C Pusey, PW Ind

2.00pm – 3.45pm
Moore, 4th floor
POSTER DISCUSSION: P98 – P111

Malignant pleural disease

Chaired by: Mrs Jennifer Latham (Aberdeen) and Dr James Murray (Edinburgh)

P98 Investigation of unilateral pleural effusion: what CT scan should be ordered?

TJ Syer, D Arnold, A Edey, N Maskell

P99 Beyond the pleura: bedside ultrasound evaluation of extravascular lung water in patients undergoing haemodialysis

JP Corcoran, M Hew, B Attwood, M Shyamsundar, S Sutherland, K Ventura, R Benamore, V St Noble, HE Piotrowska, CW Pugh, CB Laursen, FV Gleeson, NM Rahman

P100 Variations in the rate of pleural infection referrals and relation to influenza hospitalisations seasonal trends

M Hassan, JP Corcoran, C Daneshvar

P101 Inflammatory pleural effusions: differentiating the diagnosis

D Addala, RM Mercer, Q Lu, G Shepherd, R Varatharajah, A Thayanandan, M Hassan, E Bedawi, D McCracken, R Asciak, N Rahman

P102 Discordant exudative pleural effusions: demographics and aetiology

D Addala, RM Mercer, Q Lu, G Shepherd, O Castro, R Varatharajah, A Thayanandan, M Hassan, E Bedawi, D McCracken, R Asciak, M Tsikrika, R Hallifax, N Rahman

P103 Antibiotic use and comorbid pleural infection in patients with malignant pleural effusion

V George, R Mercer, E Bedawi, A Dudina, N Rahman

P104 Computed tomography evidence of lymphangitis associated to malignant pleural effusion: its prevalence and impact on survival

O Castro-Anon, A Dudina, V George, R Mercer, D McCracken, R Asciak, M Hassan, R Hallifax, N Russel, F Rodriguez-Panadero, N Rahman

P105 Does the extent of pleural involvement by malignancy affect pleurodesis outcome in patients with pleural effusion? A systematic review

M Hassan, M Gadallah, E Harriss, JP Corcoran, NM Rahman

P106 Clinical outcomes of patients diagnosed with non-specific pleuritis following medical thoracoscopy

Z Lin, T Rajaratnam, K Slaven, S Karia, T Pulimood, M Knolle, J Herre

P107 Designing an optimum pleural pathway: impact of one stop pleural clinic and radiographer pathway on time to diagnosis

R Banka, C Hardy, C Twose, R Tovell, E Smerdon, L Idris, E Mishra

P108 Survival outcomes in patients with high risk LENT malignant pleural effusions managed with indwelling pleural catheter intervention; a specialist centre experience

HS Hardeep Kalsi, M Park, H Owles, S Wyndham, C Ross

P109 The effect of pleural fluid on survival in patients with a malignant pleural effusion

N Sreejith, R Mercer, Q Lu, G Shepherd, D Addala, O Castro, R Vartharajah, A Thayanandan, M Hassan, E Bedawi, R Asciak, M Tsikrika, R Hallifax, NM Rahman

P110 Establishing a pleural nurse service

A LeBon, RJ Hallifax, T Nicholson, L Curry, J Park

P111 Chest drain troubleshooting by trainee physicians: an easily deliverable multi-component training module

T Patel, A Munro, G Hettiarachchi, R Sarkar

3.00pm – 4.30pm
Gielgud, 2nd floor
OPEN SESSION

National Asthma and COPD Audit Programme (NACAP)

- Key findings and quality improvement priorities from the first NACAP adult asthma audit report

- A summary of improvements in COPD care, as seen in the COPD audit data, and relevance to the Long-Term Plan for respiratory

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3.00pm – 4.30pm
COFFEE/TEA will be served in the Whittle & Fleming and Britten, 3rd floor

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3.15pm – 4.15pm
Victoria, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

Nurse

3.15pm – 4.55pm
Westminster, 4th floor
POSTER DISCUSSION: P112 – P124

Pulmonary hypertension: advances in diagnosis and treatment

Chaired by: Dr Sheila Ramjug (Manchester) and Dr Elaine Soon (Cambridge)

P112 Addressing the problem of variants of uncertain significance in genetic diagnosis of vascular pulmonary disease: a role for transcript expression in blood monocytes?

AYL Shurr, C Maurer, IG Turbin, M Bernabeu-Herrero, M Aldred, D Patel, CL Shovlin

P113 Sildenafil in the treatment of group 3 pulmonary hypertension

S Sathianandan, C McCabe, K Dimopoulos, A Kempny, C Harries, AU Wells, T Semple, SJ Wort, LC Price

P114 Thermostable intravenous epoprostenol for the treatment of pulmonary arterial hypertension – a transition study

A MacLellan, K Carson, M Brewis, M Johnson, M McGettrick, P McCaughey, A Crozier, R Thomson, C Church

P115 A segmental LPS challenge study to investigate the pharmacodynamics of a TRPV4 antagonist (GSK2798745) in healthy participants

S Mole, A Harry, A Fowler, S Hotee, J Warburton, S Waite, M Beerahee, D Behm, P Badorrek, M Müller, C Faulenbach, A Lazaar, JM Hohlfeld

P116 Effects of macitentan on right ventricular remodelling in pulmonary arterial hypertension – results from the REPAIR study interim analysis

D Kiely, S Rosenkranz, N Galiè, R Channick, E Cottreel, N Martin, A Peacock, A Tawakol, A Torbicki, A Vonk Noordegraaf

P117 Machine learning tool provides new insights into risk assessment in pulmonary endarterectomy

K Bunclark, J Liley, M Newnham, A Ruggiero, JE Cannon, G Coghlan, J Lordan, L Howard, D Jenkins, M Johnson, DG Kiely, C Ng, N Screaton, K Sheares, D Taboada, S Tsui, SJ Wort, J Pepke-Zaba, M Toshner

P118 Defining a minimal clinically important difference in CAMPHOR

K Bunclark, N Abraham, S Ali, JE Cannon, K Sheares, N Speed, D Taboada, M Toshner, J Pepke-Zaba

P119 Evolving surgical expertise and patient choice in pulmonary endarterectomy

A Babu, A Ruggiero, JE Cannon, G Coghlan, J Lordan, L Howard, D Jenkins, M Johnson, DG Kiely, C Ng, N Screaton, K Sheares, D Taboada, J Taghavi, M Toshner, S Tsui, SJ Wort, J Pepke-Zaba

P120 International similarities and differences in hereditary haemorrhagic telangiectasia (HHT) pathways reported by patients and clinicians

EJ Boother, SJ von Widekind, M Post, AD Kjeldsen, HJ Mager, F Pagella, C Sabba, U Sure, E Buscarini, S Dupuis-Girod, CL Shovlin

P121 Haemorrhage adjusted iron-requirements and exercise capacity in hereditary haemorrhagic telangiectasia patients

A Soni, N Badiani, F Gawecki, H Finnamore, C Shovlin

P122 Identifying differences between patients with pulmonary arteriovenous malformations in the presence and absence of hereditary haemorrhagic telangiectasia

N Badiani, A Soni, F Gawecki, C Shovlin

P123 Critical aspects in the management of submassive and proximal pulmonary embolism (PE): real world clinical practice

S Looi, A Yeo, A Ghareeb, K Whitfield, M Hamad, G Antunes

P124 Catheter directed thrombolysis for acute pulmonary embolism: is it a service worth setting up?

A Bhamani, K Devadas, U Dawar, S Hossain, A Kabir, K Pannu, DK Mukherjee

3.30pm – 5.05pm
St James, 4th floor
SPOKEN SESSION: S82 – S87

There is more to ILD than IPF

Chaired by: Dr Nazia Chaudhuri (Manchester) and Dr Chris Scotton (Exeter)

3.35pm **S82**

How do specialists treat hypersensitivity pneumonitis in Britain?

CM Barber, PS Burge, JR Feary, EA Renzoni, LG Spencer, GI Walters, RE Wiggans

3.50pm **S83**

Pigeon fanciers with normal spirometry and no known ILD, display forced oscillometry findings suggestive of sub-clinical interstitial lung disease

M Spears, W Henderson, S Dickson, E Johnson, SJ Bourke, B Gooptu, R Allen, LV Wain, C McSharry

4.05pm **S84**

Idiopathic pulmonary fibrosis, asbestosis, or asbestos-related UIP? Findings from the Idiopathic Pulmonary Fibrosis Job Exposures study (IPFJES)

C Reynolds, R Sisodia, C Barber, P Cullinan

4.20pm **S85**

Analysis of blood cell counts as predictors of survival in patients with hypersensitivity pneumonitis versus idiopathic pulmonary fibrosis in a multicentre retrospective cohort

SL Barratt, H Adamali, A Creamer, A Duckworth, R Wollerton, J Fallon, MA Gibbons, B Gooptu, S Fidan, T Nancarrow, J Pepperell, RA Stone, FA Woodhead, CJ Scotton

4.35pm **S86**

Serum biomarkers in SSc-ILD: association with presence, severity and prognosis

CJW Stock, D Visca, A DeLauretis, C Daccord, M Kokosi, V Alfieri, V Kouranos, G Margaritopoulos, PM George, PL Molyneaux, F Chua, TM Maher, V Ong, DJ Abraham, CP Denton, AU Wells, EA Renzoni

4.50pm **S87**

2-year follow up of patients with incidental findings of thoracic lymph-nodal non-caseating granulomas

O Thomas-Orogan, A Kwok, A Simons, EP Judge, R Daly, A Jeyabalan, M Plummeridge, LG Spencer, SL Barratt, HI Adamali, ARL Medford

3.45pm – 4.55pm
Rutherford, 4th floor
POSTER DISCUSSION: P125 – P133

Lung physiology: something old, something new

Chaired by: Professor Anthony De Soyza (Newcastle upon Tyne) and Dr Wayomi Perera (Eastbourne)

P125 Using adaptive principal component analysis and age-varying kernel distributions to characterise COPD in data collected by structured light plethysmography (SLP)
A Grafton, S Motamedi, J Lasenby, R Iles

P126 Female COPD patients have a greater prevalence of a low muscle mass and weaker quadriceps muscles than male patients
SA Sathyapala, A Rochester, PR Kemp, C Brightling, M Steiner, MI Polkey

P127 Is FeNO a useful measure in the assessment of acute exacerbations of COPD?
A Price, E Linacre, N Gill, L McDonnell, D Jackson, A Dewar

P128 Pre-operative spirometry identifies undiagnosed lung disease in cardiac patients
R Peat, S Town, S Hawkes, D Price, F Frost, D Wat

P129 User experience and accuracy of continuous cardio-respiratory physiology data from a wearable photoplethysmography wristband
G Sneddon, C Carlin

P130 Direct access lung function service in a district general hospital
M Shahidi, C McGillicuddy

P131 Respiratory abnormalities in a local cohort of patients with lysosomal storage disorders
A Shah, N Devani, D Hughes, S Mandal

P132 Impulse oscillometry in obstructive sleep apnoea syndrome and its response to CPAP: feasibility and insights into pulmonary mechanics
G McDowell, C Carlin

P133 Does spirometry alone capture all respiratory abnormalities associated with abnormal lung function?
R Beech, L Youngs, K Sylvester, M Rutter

3.45pm – 5.00pm
Windsor, 5th floor
POSTER DISCUSSION: P134 – P143

Respiratory infections: getting it right

Chaired by: Dr Anand Shah (London) and Dr Anita Sullivan (Birmingham)

P134 Penicillin allergy in patients being treated for pneumonia – making a case for quality improvement project
T Mahendiran, MK Omar, H Moudgil, E Crawford, K Srinivasan, A Makan, N Ahmad

P135 Study of hospital acquired pneumonia in chest trauma patients
A Jaafar, K Tun

P136 Microbiological trends in COPD patients undergoing thoracic surgical intervention
J Bowie, K Jeffreys, M Bafadhel, E Belcher

P137 Who gets a laboratory positive diagnosis of mycoplasma pneumonia? A 10 year retrospective analysis
CA Patteron, M Lipman, DJF Mack, TD McHugh

P138 Improving anti-fungal stewardship and the management of chronic pulmonary aspergillosis through a complex lung infection MDT
A Browne, M Wilkie, A Waqar, A Shaw, K Hill, N Rae, JD Chalmers, TC Fardon, DW Connell

P139 Are wind instrument musicians at a greater risk of developing a chest infection when compared to the general UK population?
H Drover, E Douglas, TC Harvey-Dunstan, S Gates, K Hyndes

P140 How important is mycobacterium chimaera isolation in patients who have not had cardiac surgery?
M Kamalanathan, F Perrin, D Somasunderam, R Breen

P141 Persistent bacterial bronchitis in adults – a precursor to bronchiectasis?
S Finch, L Carreto, H Abo-Leyah, A Browne, TC Fardon, JD Chalmers

P142 Does the appearance of the chest radiograph matter in pleural infection?
EO Bedawi, NI Kanellakis, A Kim, AL Pattabi, A Dudina, RM Mercer, V George, NM Rahman, RJ Hallifax

P143 Association between platelet count and pleural infection

AL Dudina, EO Bedawi, RM Mercer, V George, R Hallifax, NM Rahman

3.45pm – 5.15pm
Abbey, 4th floor
POSTER DISCUSSION: P144 – P155

Asthma epidemiology: understanding the problem

Chaired by: Dr Neil Holden (London) and Dr Jennifer Quint (London)

P144 Regional variation in OCS use for UK patients with asthma: heat map analysis

A Menzies-Gow, T Haslam, T Morris, LH Gylvin, ER Bleecker, C Nan

P145 Identifying people most at risk of a severe asthma attack using routine electronic healthcare record data

A Clark, S Stirling, D Price, S Musgrave, A Sheikh, H Pinnock, M Al Sallakh, M Noble, AM Wilson

P146 Characteristics of patients in the UK Severe Asthma Registry

A Menzies-Gow, J Busby, DJ Jackson, AH Mansur, S Siddiqui, R Chaudhuri, PE Pfeffer, M Patel, LG Heaney

P147 How accurate are primary care electronic databases at counting asthma exacerbations?

JF Yang, WTN Lee, NC Thomson, SJ Smith, M Shepherd, R Chaudhuri

P148 Asthma-related mortality in sport – still relevant? An analysis of United States competitive athletes

OJ Price, KL Kucera, HM Price, JA Drezner, A Menzies-Gow, JH Hull

P149 The impacts low emission zones have on improving health and decreasing health inequalities

TR Campbell, NJ Roberts

P150 Increased national mortality rates for asthma are associated with increased financial inequality as calculated by the GINI index

GJ Connett, S Rudrappa

P151 Association between asthma and shift work: evidence from UK Biobank

J Turner, R Maidstone, MK Rutter, D Ray, HJ Durrington

P152 Characteristics of patients in the UK Severe Asthma Registry: variation by ethnicity

J Busby, DJ Jackson, AH Mansur, A Menzies-Gow, LG Heaney, R Chaudhuri, PE Pfeffer

P153 Characterization of uncontrolled severe asthma patients with type 2 inflammation (T2) in Latin America

I Kosoy, O Ledanois, E Lew

P154 Characterization of uncontrolled severe asthma patients with type 2 inflammation (T2) in the Eurasian Middle East (EME) region

I Kosoy, O Ledanois, E Lew

P155 Prevalence of urinary incontinence within a difficult asthma population

H Hylton, AL Long, SJ Quantrill, FR Ali, PE Pfeffer

3.45pm – 5.30pm
Mountbatten, 6th floor
POSTER DISCUSSION: P156 – P169

Targeted assessment of asthma

Chaired by: Mrs Natalie Harper (Dorset) and Dr Oliver Price (Leeds)

P156 Use of the breathing pattern assessment tool within the difficult asthma service

H Hylton, AL Long, SJ Quantrill, FR Ali, PE Pfeffer

P157 Severe asthma questionnaire (SAQ): validation and continuing use

J Lanario, M Hyland, R Jones, M Masoli

P158 Increase of medication usage for asthma, COPD and rhinitis during three decades in Finland

T Mattila, V Jormanainen, T Vasankari, S Toppila-Salmi, A Lammi, F Herse, T Haahtela, M Erhola

P159 Care for patients attending emergency departments in England with an acute asthma exacerbation: can targeted interventions improve compliance with suggested British Thoracic Society standards?

S Faruqi, A Macnair, M Barik, J Thompson, A Diviney, M Baker, M Crooks

P160 Asthma in the emergency department (ED), a continued matter for concern

E Sadler, MJ Doherty, FS Rands

P161 Chronic pain is prevalent in severe asthma and is associated with impairment in patients' activity

A Cass, AH Mansur, A Vigus

P162 The impact of day-case multidisciplinary assessment on asthma control and quality of life scores of patients referred to the Manchester severe asthma service

LJ Holmes, L Elsey, C Sommerton, GA Tavernier, D Allen

P163 Assessment of novel electronic adherence monitoring devices in children with asthma

S Makhecha, AHY Chan, CJ Pearce, A Jamalzadeh, L Fleming

P164 Is adequate monitoring being done for patients on long-term oral corticosteroids for severe asthma (adults)?

R Bhugra, H Joplin, K Mortimer, H Burhan

P165 Effects of interval exercise training on asthma symptoms and inflammation

AT Freeman, D Hill, K Gove, D Cellura, S Jack, KJ Staples, MPW Grocott, TMA Wilkinson

P166 Discharge from the emergency department with asthma: an unmet need?

JTY Ting, TJT Sutherland, I Clifton, J Slough

P167 The contribution of extra-pulmonary symptoms of quality of life in severe asthma are important and may be overlooked

J Lanario, M Hyland, Y Wei, R Jones, M Masoli

P168 Transformation from mild to severe asthma; the severe asthma clinic perspective

D Viswam, AH Mansur

P169 Is there an association between receiving a respiratory specialist review and receipt of discharge bundle when admitted for asthma?

A Adamson, S Robinson, CM Roberts, JK Quint, J Calvert

4.00pm – 5.00pm
Albert, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

Specialist Trainee

4.00pm – 5.30pm
Churchill, Ground floor
SYMPOSIUM

UPDATES IN CYSTIC FIBROSIS

Chaired by: Dr Caroline Elston (London) and Dr Joanna Whitehouse (Birmingham)

4.00pm CFTR and bowel cancer

Professor James Abraham (Minneapolis, Minnesota)

4.30pm Ionocytes, bicarbonate and mucin: do we really understand what CFTR is doing in the lungs?

Professor Andres Floto (Cambridge)

5.00pm The direct role of CFTR in regulation of antibacterial immunity and epithelial cell inflammation

Dr Audrey Bernut (Sheffield)

Learning objectives:

- Understand how single cell RNA sequencing has revealed new lung cell types, particularly the ionocyte, and implications for cystic fibrosis pathophysiology and treatment.

- Understand the emerging evidence for a direct role of CFTR in inflammation and immunity and how these may inform understanding of CF disease.

- Appreciate the new epidemiological and experimental data implicating CFTR as a tumour suppressor gene and how this knowledge is changing clinical practice.

5.30pm – 7.00pm
Britten, 3rd floor

THE PRESIDENT'S RECEPTION

All participants are warmly invited to attend this social occasion

8.00am – 9.00am

COFFEE/TEA will be served in the Whittle & Fleming, 3rd floor

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8.45am – 2.00pm
Whittle & Fleming, 3rd floor
POSTER VIEWING
Authors present: 10.00am – 11.00am

P170-P176
Community and integrated care: joining the dots
Discussion of abstracts will take place from 1.45pm to 2.45pm in the Moore, 4th floor

P177-P186
Sleep miscellany
Discussion of abstracts will take place from 1.45pm to 3.00pm in the Westminster, 4th floor

P187-P200
Acute and domiciliary NIV in COPD: advances in practice
Discussion of abstracts will take place from 1.45pm to 3.30pm in the Rutherford, 4th floor

P201-P210
Clinical studies in TB
Discussion of abstracts will take place from 2.00pm to 3.15pm in the Albert, 2nd floor

P211-P222
Beyond airways disease: ILO and cough
Discussion of abstracts will take place from 2.00pm to 3.45pm in the Victoria, 2nd floor

P223-P236
Asthma and inhalers: all the colours of the rainbow
Discussion of abstracts will take place from 3.00pm to 4.45pm in the Moore, 4th floor

P237-P250
Cystic fibrosis and bronchiectasis: updates and controversies
Discussion of abstracts will take place from 3.00pm to 4.45pm in the Abbey, 4th floor

P251-P265
Clinical studies in COPD: new evidence to guide practice
Discussion of abstracts will take place from 3.15pm to 5.15pm in the Windsor, 5th floor

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8.45am – 3.30pm
Cambridge, 5th floor
MODERATED POSTER VIEWING

M16-M27
Bronchiectasis: clinical phenotyping and outcomes
Discussion of abstracts will take place from 2.00pm to 3.30pm in the Cambridge, 5th floor

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8.00am – 8.30am
Albert, 2nd floor
BTS JOURNAL CLUB

Critiquing basic science
Professor Terry Tetley (London)

Learning objectives:

By the end of the session:

- Participants will be able to critically appraise the basic science studies discussed in this session, and will be able to discuss the rationale of the methodological approaches and analysis used.

- Participants will develop an appreciation of how the findings from the studies discussed can be applied to clinical practice.

The relevant references will be available on the BTS website so that delegates may review the papers in advance.

8.30am – 10.05am
Moore, 4th floor
SPOKEN SESSION: S88 – S93

Modelling lung disease in vitro/vivo
Chaired by: Professor Louise Donnelly (London) and Dr Kyren Lazarus (London)

8.35am **S88**
A human model of lung fibrosis for the assessment of anti-fibrotic strategies in idiopathic pulmonary fibrosis
KM Roach, P Tongue, E Castells, G Elliot, H Marshall, M Richardson, S Mason, L Chachi, P Bradding

8.50am **S89**
Ex vivo studies of the Gal-3-fibrosome hypothesis in IPF and non-fibrotic control lung tissue and myofibroblasts
A Miah, P Stylianou, P Tongue, K Roach, P Bradding, B Gooptu

9.05am **S90**

A novel organotypic model of bronchial dysplasia for preclinical screening of potential therapeutic agents for early squamous lung cancer (SQC)

LJ Porter, L Correia, F McCaughan

9.20am **S91**

Investigating the role of AKAP13 in epithelial cells on TGF-β activation

J Porte, A John, RG Jenkins, L Organ

9.35am **S92**

Calcium-sensing receptor as a therapeutic target for pulmonary fibrosis

K Wolffs, B Mansfield, R Bruce, L Verckist, R Paes De Araújo, R Attanoos, J Ward, C Corrigan, P Kemp, D Adriaensen, L Mur, B Hope-Gill, D Riccardi

9.50am **S93**

Toll-like receptor 2 has a tumour suppressor function in murine non-small cell lung cancer

FR Millar, A Quintanilla, P Hari, M Muir, M Arends, M Frame, S Wilkinson, JC Acosta

8.30am – 10.05am
Abbey, 4th floor
SPOKEN SESSION: S94 – S99

Genetic and cellular mechanisms of pulmonary hypertension

Chaired by: Dr Rachel Davies (London) and Dr Joanna Pepke-Zaba (Cambridge)

8.35am **S94**

Identification of natural targets of nonsense-mediated decay relevant to pulmonary vascular diseases

AM Bielowka, M Bernabeu-Herrero, D Patel, FS Govani, NJ Dibb, L Game, M Aldred, IG Mollet, CL Shovlin

8.50am **S95**

Identifying new hereditary haemorrhagic telangiectasia genes by applying a machine learning approach to screen whole genome sequencing data

S Xiao, D Brown, IG Mollet, FS Govani, D Patel, L Game, HHT/PAVM GeCIP, Genomics England Research Consortium, CL Shovlin

9.05am **S96**

Identifying genetic modifiers of disease severity using whole genome analyses of families with hereditary haemorrhagic telangiectasia recruited to the 100,000 Genomes Project

RT Slade, S Xiao, D Brown, HHT/PAVM GeCIP, Genomics England Research Consortium, CL Shovlin

9.20am **S97***

Haemoglobin challenge induces dysfunction in human pulmonary artery endothelial cells: potential relevance to pulmonary artery hypertension

MS Bukhari, M Mohd-Ghazaly, QK Toe, GJ Quinlan, SJW Wort

9.35am **S98**

The effects of BMPRII loss on endothelial shear adaptation in the pulmonary vascular endothelium

AS Mahomed, A Burke-Gaffney, S Moledina, SJ Wort

9.50am **S99**

Hepcidin down regulates BMPRII in pulmonary artery endothelial cells mimicking pulmonary artery hypertension phenotypes

QK Toe, H Ying, T Issitt, M Mohd-Ghazaly, GJ Quinlan, SJ Wort

***S97 BTS Medical Student Award Highly Commended**

8.30am – 10.30am
Churchill, Ground floor
SYMPOSIUM

PNEUMOTHORAX: INSIGHTS TO AETIOLOGY AND NOVEL TREATMENT DIRECTIONS

Chaired by: Dr Anna Bibby (Bristol) and Professor Najib Rahman (Oxford)

8.30am Inflammation and structure in primary pneumothorax: what's wrong with the lung?

Dr Jenny Dickens (Cambridge)

9.00am	Conservative management for primary spontaneous pneumothorax: results of the Australian randomised trial
	Professor Gary Lee (Perth)
9.30am	Ambulatory treatment for primary spontaneous pneumothorax: results of the RAMPP trial
	Dr Robert Hallifax (Oxford)
10.00am	Ambulatory treatment for secondary pneumothorax management: results of the HiSPEC trial
	Dr Steve Walker (Bristol)

Learning objectives:

- Review the current literature and new data on early definitive management of primary pneumothorax and whether there is sufficient evidence to alter the current BTS pathway of initial medical management in all cases.

- Review the current evidence for safety and efficacy of ambulatory pneumothorax management in PSP and SSP, including patient selection, risks and benefits and whether this should be taken up in current practice.

- To understand the structural basis of primary pneumothorax and the need to look for underlying causes for future management.

8.45am – 10.15am
Westminster, 4th floor
SYMPOSIUM

UNDERSTANDING OCCUPATIONAL LUNG DISEASE: LESSONS FROM THE PAST AND INTO THE FUTURE

Chaired by: Professor David Fishwick (Sheffield) and Dr Ruth Wiggans (Manchester)

8.45am	Occupational asthma: the benefits of early diagnosis
	Dr Johanna Feary (London)
9.15am	Trends in occupational lung disease in the UK: celebrating 30 years of the SWORD reporting scheme
	Dr Chris Barber (Sheffield)
9.45am	STING-dependent sensing of self-DNA and silicosis
	Professor Valérie Quesniaux (Orleans, France)

Overview:

Occupational and environmental exposures cause a wide-range of respiratory disease and this symposium has been put together to be of interest to participants with a number of different sub-speciality interests, including asthma and ILD. The talks selected are topical, based on recent research published in high impact international journals, and the speakers are known to be experienced in contributing to high-quality symposia at international meetings.

The first talk discusses the need to be vigilant for occupational lung disease, as these are often missed by clinicians, allowing toxic exposures to continue. The second talk highlights that the UK has one of the best national reporting schemes for occupational lung disease (SWORD) in the world, which is reliant on many BTS members voluntarily notifying cases to the University of Manchester. The HSE use this information to review topic areas for future research planning and workplace intervention strategies. The symposium is timely as in 2019, the SWORD scheme is 30 years-old, and one of the talks will be used to highlight the important achievements that this scheme has had over this period. The third talk brings occupational lung disease back to the laboratory, discussing pathways of interest in silicosis, with the potential for new treatment in time.

Learning objectives:

- To review the contribution of occupational exposures to lung disease and the need for a high level of suspicion to improve outcomes, with occupational asthma as a highly relevant exemplar.

- To better understand the importance of the UK's national reporting scheme, and review temporal trends in occupational lung disease incidence and causation.

- To discuss newly identified mechanisms of occupational lung disease (silicosis) and learn about potential new treatment pathways.

8.45am – 10.15am
Windsor, 5th floor
OPEN SESSION

New UK-wide guidance on the management of asthma: why, how and when?

Chaired by: Dr Simon Hart, British Thoracic Society

Speakers:

Dr Paul Chrisp, Director, Centre for Guidelines, NICE

Dr James Paton, Consultant Paediatric Respiratory Consultant

Professor Angela Timoney, Chair, SIGN Council

Representatives from the British Thoracic Society (BTS), Scottish Intercollegiate Guideline Network (SIGN) and the National Institute for Health and Care Excellence (NICE) will provide further details about the planned new guidance for the diagnosis and management of chronic asthma in adults, young people and children which will be produced jointly by the three organisations.

8.45am – 10.20am
St James, 4th floor
SPOKEN SESSION: S100 – S105

COPD: inflammation, smoking and exacerbations

Chaired by: Dr Linzy Houchen-Wolloff (Leicester) and Professor John Hurst (London)

8.50am **S100**

Reduction of inflammatory cytokine production in chronic obstructive pulmonary disease (COPD) epithelial cells by protease activated receptor 2 (PAR2) antagonism

M Bailo, L Dunning, J Brzeszczynska, K McIntosh, R Plevin, SL Martin, GP Sergeant, CS Goodyear, GJ Litherland, J C Lockhart, A Crilly

9.05am **S101**

The impact of smoking on improving COPD outcomes with umeclidinium/vilanterol: a pre-specified analysis of the EMAX trial

L Bjermer, IH Boucot, CF Vogelmeier, P Jones, F Maltais, IP Naya, L Tombs, C Compton, DA Lipson, EM Kerwin

9.20am **S102**

Eosinophil counts as a predictor of future COPD exacerbations in the DYNAGITO trial

PMA Calverley, C Jenkins, JA Wedzicha, A de la Hoz, F Voß, KF Rabe, A Anzueto

9.35am **S103**

Using salivary pepsin and the reflux symptom index as objectives markers of gastro-oesophageal reflux to predict exacerbations of COPD

MS Nootigattu, RA Evans, MC Steiner, NJ Greening

9.50am **S104**

Home based respiratory point of care testing (R-POCTc) to improve the diagnosis and management of COPD exacerbations in the community

K Roy, A Marau, G Esmond, M Buxton, C Ciobanu, C Cucciniello, S Mengoni, D Wellsted

10.05am **S105**

Paracrine-mediated transfer of mitochondria between airway smooth muscle cells

A dela Cruz, J Frankenberg Garcia, C Michaeloudes, P Bhavsar

9.00am – 10.30am
Mountbatten, 6th floor
SYMPOSIUM

E-CIGARETTES: SIGNALS OF BENEFIT AND SIGNALS OF HARM

Chaired by: Dr Lisa Davies (Liverpool) and Professor David Thickett (Birmingham)

9.00am Cell based studies

Professor Robert Tarran (Chapel Hill, North Carolina)

9.30am E-cigarettes in smoking cessation

Dr Katherine Myers Smith (London)

10.00am European Respiratory Society Taskforce report

Professor Robert Bals (Marburg, Germany)

Overview:

There remains considerable controversy about e-cigarettes and vaping, with some studies suggesting benefit in terms of smoking cessation, and others reporting cell-based signals of harm. This symposium provides a cutting-edge review of the evidence base, including the most comprehensive study of smoking cessation and translational science, followed by a summary of the evidence as collated by the European Respiratory Society Taskforce.

Learning objectives:

- To review the latest study of smoking cessation using e-cigarettes including quit rates and patient experience.

-To consider the potential signals of harm from cell-based studies and consider if this has implications for long term use and health.

-To discuss the ERS Taskforce report in the context of UK Public Health strategy.

9.15am – 10.15am
Albert, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING
Critical Care

9.30am – 10.30am
Gielgud, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING
Interstitial and Rare Lung Disease

10.00am – 11.00am
COFFEE/TEA will be served in the Whittle & Fleming and Britten, 3rd floor

10.30am – 11.30am
Victoria, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING
Pulmonary Vascular Disease

10.30am – 11.30am
Rutherford, 4th floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING
Pharmacist

10.30am – 11.35am
St James, 4th floor
SPOKEN SESSION: S106 – S109
Improving outcomes in community acquired pneumonia
Chaired by: Dr Davinder Dosanjh (Birmingham) and Dr Sarah Elkin (London)

10.35am **S106**
Reducing the use of broad spectrum antibiotics in community-acquired pneumonia using point-of-care testing
O Burbidge, H Staniforth, S Ali, L Hollingshead, V Payne, G Cresswell, T Bewick

10.50am **S107**
Predictors of 30 day readmission following hospitalization with community acquired pneumonia
B Chakrabarti, T Jenks, S Lane, J Higgins, E Kanwar, DG Wootton

11.05am **S108**
Primary care re-consultation after community acquired pneumonia: a large population-based cohort study
V Baskaran, WS Lim, T McKeever

11.20am **S109**
Human metapneumovirus lower respiratory tract infection in adults: chest CT imaging features and correlation with clinical outcomes
LA Marinari, MA Danny, WT Miller Jr

10.30am – 11.35am
Abbey, 4th floor
SPOKEN SESSION: S110 – S113
TB: from diagnosis to treatment
Chaired by: Dr Helen Booth (London) and Dr David Connell (Dundee)

10.35am **S110**
Concise whole blood transcriptional signatures for incipient tuberculosis: a systematic review and individual participant data meta-analysis
RK Gupta, CT Turner, C Venturini, H Esmail, MX Rangaka, A Copas, M Lipman, I Abubakar, M Noursadeghi

10.50am **S111**
FDG-PET/CT appearances in MDR-TB patients with residual CT abnormalities
M Park, D Dave, G Russell, L Martin, A Lalvani, T Barwick, OM Kon

11.05am **S112**
Diagnostic accuracy of Xpert Ultra for the detection of MTB in bronchoalveolar lavage samples for pulmonary tuberculosis in a tertiary TB centre
M Park, G Satta, M Coleman, L Martin, G Russell, OM Kon

11.20am **S113**

Pulmonary drug-resistant tuberculosis and surgery: report of 39 patients treated in a tertiary care hospital in Mumbai

E Intini, J Mullerpattan, G Kishore, K Malu, D Rana, T Sarkar, H Wagh, S Ganatra, R Amale, ZF Udwadia

10.30am – 12.05pm
Westminster, 4th floor
SPOKEN SESSION: S114 – S119

Clinical care in COPD

Chaired by: Dr Alice Turner (Birmingham) and Dr Rama Vancheeswaran (Watford)

10.35am **S114**

Non-invasive assessment of lung inhomogeneity for early identification of COPD

NMJ Smith, S Magor-Elliot, J Redmond, GAD Ritchie, PA Robbins, N Petousi, NP Talbot

10.50am **S115**

How do the UK countries compare for chronic obstructive pulmonary disease primary care?

PW Stone, JR Feary, CM Roberts, JK Quint

11.05am **S116**

The quality of COPD patient care – outcomes from the British Lung Foundation Patient Passport

KEJ Philip, S Gaduzo, J Rogers, M Laffan, NS Hopkinson

11.20am **S117**

Chronic obstructive pulmonary disease exacerbations – characterising the relationship between symptom severity and airway inflammation

A Halner, C Brightling, M Bafadhel

11.35am **S118**

Risk factors for all-cause COPD readmission: a systematic review and meta-analysis

J Alqahtani, C Njoku, B Bereznicki, B Wimmer, G Peterson, L Kinsman, Y Aldabayan, A Alrajeh, A Aldhahir, S Mandal, J Hurst

11.50am **S119**

Impact of patient activation measure (PAM®) and tailored interventions on respiratory patients

MS Wood, J Belcher, J Haines, B Kane

10.45am – 11.45am
Albert, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

Occupational and Environmental Lung Disease

10.45am – 12.30pm
Mountbatten, 6th floor
SYMPOSIUM

ASTHMA: GENES, DRIVERS AND HEALTH INEQUALITIES

Chaired by: Dr Alexandra Nanzer (London) and Professor Angela Simpson (Manchester)

10.45am Genetic risk of asthma: an overview
Professor Miriam Moffatt (London)

11.15am Health inequalities and admission risk in asthma
Dr Sherif Gonem (Nottingham)

11.45am Neutrophil cytoplasts and their link to inflammation in severe asthma
Professor Bruce Levy (Harvard)

Overview:

Asthma remains a common and debilitating lung condition. Although many respond to simple treatments, there are vast health inequalities in access to care which impact on outcomes and a proportion of patients (up to 50% in some studies of severe disease) have an abundance of neutrophils in their lung secretions. This symposium will consider our understanding of genetic risk of asthma, why neutrophils might be important in severe disease (and how they could be targeted) and how we might improve asthma care for all.

Learning objectives:

- To review the differences in access to healthcare across socioeconomic groups and assess its impact on asthma admissions and outcomes.

- To consider the latest evidence about asthma risk.

- To understand the relevance of the neutrophil in asthma, and its potential as a therapeutic target.

11.00am – 12.00pm
Moore, 4th floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

Pleural Disease

11.00am – 12.30pm
Churchill, Ground floor
SYMPOSIUM

ADVANCEMENTS IN IDIOPATHIC PULMONARY FIBROSIS

Chaired by: Dr Shaney Barratt (Bristol) and Dr Katy Roach (Leicester)

11.00am	Airway macrophage ontogeny, phenotype and metabolism in the fibrotic lung
	Dr Adam Byrne (London)
11.30am	Targeting fibroblast extracellular matrix production in fibrosis
	Dr Hannah Woodcock (London)
12.00pm	Aged epithelium in IPF
	Dr Mareike Lehmann (Munich)

Learning objectives:

- The recent resurgent interest in macrophage biology has led to a new understanding of lung macrophage origins, biology, and phenotypes. Here we will discuss recent advances in the field and focus on the role of macrophages in fibrotic lung disease.

- Myofibroblasts are thought to be one of the key effector cells responsible for the excessive extracellular matrix deposition underlying the development of idiopathic pulmonary fibrosis. Here we will review the signalling pathways by which TGF-β1 exerts its potent fibrogenic effects and provide support for selectively targeting this pathway in IPF and potentially other fibrotic conditions.

- The incidence of IPF increases with age, and ageing-related mechanisms such as cellular senescence have been proposed as pathogenic drivers. Here we will review the evidence surrounding the contribution of alveolar epithelial cell senescence to lung repair and remodelling and how this ultimately contributes to the development of lung fibrosis.

11.30am - 12.00pm
Windsor/5th
OPEN MEETING

Taskforce for Lung Health: end of year one report

This session will cover the work of the Taskforce since the launch of the five year plan in December 2018, looking at progress made in prevention, diagnosis, medicines optimisation and pulmonary rehabilitation

The five year plan is a framework to improve the nation's lung health and provide better care for people with lung disease.

11.45am – 12.45pm
Rutherford, 4th floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

Tobacco

11.45am – 12.45pm
Abbey, 4th floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

Tuberculosis

12.00pm – 2.00pm

LUNCH will be available to purchase in the café in the Pickwick, 1st floor, and the snack bar in the Whittle & Fleming, 3rd floor.
EXHIBITION closes at 2.00pm

12.30pm – 1.30pm
Victoria, 2nd floor
BTS SPECIALIST ADVISORY GROUP OPEN MEETING

Cough

1.00pm – 1.45pm
Churchill, Ground floor
THE BTS GRAND CHALLENGE LECTURE

Health impacts of air pollution

Professor Annette Peters (Munich)

Introduced by: Dr Mohammed Munavvar (Preston)

1.45pm – 2.45pm
Moore, 4th floor
POSTER DISCUSSION: P170 – P176

Community and integrated care: joining the dots

Chaired by: Dr Justine Hadcroft (Liverpool) and Dr Sarah Sibley (Liverpool)

P170 Reducing non-elective respiratory admissions: initial experience of the Derby integrated ImpACT+ respiratory service

D Subramanian, A Baguneid, R Evans, R Aldridge, G Lowrey

P171 "It's a great idea, but I didn't really see how it was integrated". A qualitative interview study to understand the collaboration between secondary care, community care and commissioners to deliver an integrated respiratory service

TJ Stone, J Banks, JW Dodd

P172 General practice feedback on multidisciplinary respiratory virtual clinics

T Perkins, PD Hughes

P173 The Grenfell fire: experience of a community clinic

B Stone, HLB Owles, E Wong, P Mallia, S Ghafur, V Mak, M Wickremasinghe, SL Elkin

P174 Initial process evaluation findings from the at-risk registers integrated into primary care to stop asthma crises in the UK (ARRISA-UK) trial: practice characteristics, engagement and early experiences of the intervention

JR Smith, MJ Noble, R Winder, L Poltawski, PA Ashford, S Musgrave, S Stirling, S Morgan-Trimmer, AL Caress, AM Wilson

P175 Domiciliary visits by specialist respiratory clinicians for patients with COPD: patient experience, outcomes and predicting those that may benefit most

E Linacre, K Ryan, L McDonnell, A Dewar

P176 The changing face of home oxygen therapy; seamless communication between hospital, primary, and community care is essential

MCP Apps, L Ateli, C Morgan, G Oliver, T Gisby, L Champion

1.45pm – 2.50pm
St James, 4th floor
SPOKEN SESSION: S120 – S123

Occupational lung disease – "danger at work"

Chaired by: Dr Chris Barber (Sheffield) and Dr Claire Burton (Sheffield)

1.50pm **S120**

Causes of negative specific inhalational challenge (SIC) in patients with occupational asthma; the experience of two UK centres

H Badri, VC Moore, GI Walters, PS Burge

2.05pm **S121**

BTS Standards of Care for Occupational Asthma

HA Norman, PS Burge, GI Walters, AS Robertson, VC Moore

2.20pm **S122**

Positive versus negative specific inhalational challenges in occupational asthma; review of 9 years of testing in a single UK centre

H Badri, P Whittemore, JL Hoyle

2.35pm **S123**

Occupational exposures to wood, metal and stone in IPF; findings from the Idiopathic Pulmonary Fibrosis Job Exposures study (IPFJES)

C Reynolds, R Sisodia, C Barber, P Cullinan

1.45pm – 2.50pm
Abbey, 4th floor
SPOKEN SESSION: S124 – S127

"Under your skin" – imaging in lung disease

Chaired by: Dr Joseph Jacob (London) and Professor Jim Wild (Sheffield)

1.50pm **S124**

Multi-centre reproducibility of 19F-MR ventilation imaging in healthy volunteers

B Pippard, M Neal, A Maunder, R Lawson, AJ Simpson, J Wild, P Thelwall

2.05pm **S125**

Quantitative CT and hyperpolarised 129-xenon diffusion-weighted MRI in interstitial lung disease

JA Eaden, H-F Chan, PJC Hughes, ND Weatherly, M Austin, LJ Smith, J Lithgow, S Rajaram, AJ Swift, SA Renshaw, RA Karwoski, BJ Bartholmai, CT Leonard, S Skeoch, N Chaudhuri, GJM Parker, SM Bianchi, JM Wild

2.20pm **S126**

Evaluating brain structure and cerebrovascular function in idiopathic pulmonary fibrosis using MRI

KL Hett, E Patitucci, H Chandler, BDM Hope-Gill, RG Wise

2.35pm **S127**

A comparison of CT and MRI volumetric assessment of malignant pleural mesothelioma

S Tsim, GW Cowell, A Kidd, R Woodward, L Alexander, C Kelly, JE Foster, KG Blyth

1.45pm – 3.00pm
Westminster, 4th floor
POSTER DISCUSSION: P177 – P186

Sleep miscellany

Chaired by: Dr Sonya Craig (Liverpool) and Dr Sophie West (Newcastle upon Tyne)

P177 Patient reported outcome measures (PROMS) following maxillomandibular advancement (MMA) surgery in patients with obstructive sleep apnoea syndrome

MJ Martin, A Khanna, D Srinivasan, MP Sovani

P178 National survey of opinions regarding pre-operative screening for obstructive sleep apnoea

R Davidson, J Hughes, SD West

P179 Is trying CPAP for a second time (after giving up previously) worth it?

CPL Simmons, H Groves, P Close, S Uddin, J Littlemore, M Tomlinson, G Olds, S West

P180 Apnoea-hypopnoea-index comparing the AASM 2007 and 2012 criteria in COPD/obstructive sleep apnoea overlap syndrome

BT He, M Sherif, S Higgins, E Schwarz, YM Luo, A Said, J Steier

P181 Obstructive sleep apnoea (OSA) severity in patients with chronic opioid use: a risk factor matched study

K Lee, M Mason, I Smith

P182 Awareness of sleep hygiene amongst healthcare practitioners (HCP)

N Devani, A Shah, S Mandal

P183 Positive experience with service transformation to asynchronous consultations, virtual clinic and remote-managed CPAP for patients with suspected OSAS

D MacFarlane, R Tourish, P Hodkinson, C Carlin

P184 A cost-saving pathway for diagnosing patients with suspected obstructive sleep apnoea (OSA) in the community

N Devani, T Aslan, S Morgan, S Mandal

P185 Reducing waiting times for sleep apnoea diagnostics – are group clinics the answer?

N Zuhra, R Singh, B Prathibha

P186 The effect of healthy ageing on human phrenic nerve function

R Shah, V Wong, D Robinson, HV Fletcher, L Estrada, J Moxham, GF Rafferty, SDR Harridge, NR Lazarus, CJ Jolley

1.45pm – 3.05pm
Windsor, 5th floor
SPOKEN SESSION: S128 – S132

Advances in asthma science and treatment

Chaired by: Dr Hans Haitchi (Southampton) and Dr Alexandra Nanzer (London)

1.50pm **S128**

CyTOF and in vitro analysis of the role of IL-17A in asthma

GM Hynes, TL Downs, ST Thulborn, C Connolly, C Borg, A Gittins, R Shrimanker, A Moran, MA Brown, TJ Powell, SB Morgan, ID Pavord, TSC Hinks

2.05pm **S129**

Progenitor cell-derived basophil activation test (PCBAT) predicts clinical reactivity in cat allergic asthmatics – a proof of concept study

M Bennett, J Wu, CS Murray, G Gauvreau, R Cusack, S Bulfone-Paus, A Simpson

2.20pm **S130**

Maternal allergic airway inflammation during pregnancy alters offspring's airway hyperresponsiveness dependent on muscarinic receptor and ADAM33 mediated mechanisms

M Wandel, ER Davies, JFC Kelly, ST Holgate, JA Whitsett, DE Davies, HM Haitchi

2.35pm **S131**

Dietary intake of long-chain n-3 polyunsaturated fatty acids and risk of childhood asthma

M Talaei, PC Calder, S Shaheen

2.50pm **S132**

Ten-year efficacy and safety following bronchial thermoplasty for asthma – the BT10+ study

R Chaudhuri, A Rubin, J Fiterman, K Sumino, J Lapa e Silva, R Niven, S Siddiqui, K Klooster, P Shah, D Duhamel, S Khatri, R Barbers, GM Grubb, M Laviolette

1.45pm – 3.30pm
Rutherford, 4th floor
POSTER DISCUSSION: P187 – P200

Acute and domiciliary NIV in COPD: advances in practice

Chaired by: Dr Carlos Echevarria (Newcastle upon Tyne) and Dr Swapna Mandal (London)

P187 Acute NIV: factors associated with clinical outcomes at a central London teaching hospital

E Mackay, P Cho, A Papamanoli, A Burney, R Lyall, A Patel, V Metaxa, KK Lee

P188 The NEWS score as a surrogate marker for pH during NIV

S Aziz, A Robbins, C Tweed, J Gittens

P189 Delays in doctor-led arterial blood gases may impact timely implementation and optimisation of acute non-invasive ventilation (NIV)

I Tang, A Talwar, R Manalac, K Dawson, J Lightowler, N Petousi, AH Nickol

P190 The significance of clinical frailty scoring in the outcomes of patients receiving non-invasive ventilation

DP McMahon, B Donnelly, N Chamberlin

P191 Can real-time data collection improve mortality and delivery of acute non-invasive ventilation (NIV)?

DP Smith, LA Boast, L Kempster, S Allen, J Wyatt, ME Roberts, AW Molyneux

P192 Behind the mask: improved mortality outcomes in acute non-invasive ventilation following service redesign at a district general hospital

K Millington, R Anstey, F Easton, R Mason

P193 Impact of a multidisciplinary approach to delivering acute NIV in a large teaching hospital

E Parkes, J Shakespeare, A Bishopp, A Ali

P194 Investigating the psychological impact of ward based acute non-invasive ventilation

N Meghani, I Ifrah, A Phyo Naing, T Bongers

P195 Domiciliary non-invasive ventilation reduces re-admissions in persistent hypercapnic respiratory failure due to COPD, but are we missing a trick?

PI Ehilawa, B Chisanga, P Smith, R Holt, JA Colt, MP Sovani

P196 Outcome of COPD patients started on inpatient domiciliary NIV following an acute admission with hypercapnic respiratory failure

C Shere, C Dalton, J Oldham, A Dushianthan

P197 Non-invasive ventilation (NIV) multi-disciplinary meetings (MDM) – improving support and access to specialist care

B Prathibha, E Jagger, A Scott, S Haliwell, S McCrossan, B Kennedy

P198 Domiciliary NIV (DomNIV) in a real world setting: a retrospective study in a district general hospital

S Craik, A Nasir, A Ali, H Moudgil, K Srinivasan, A Makan, E Crawford, J Wilson, N John, N Ahmad

P199 Impact of the increasing evidence base of the benefits of home mechanical ventilation in patients with chronic obstructive pulmonary disease on a home mechanical ventilation service: one regional service's experience

L Campbell, PB Messer, HM Tedd

P200 Pre-flight assessment in home NIV users: do we get it right?

V Lostarakos, A Armstrong, B Baudouin

2.00pm – 3.15pm
Albert, 2nd floor
POSTER DISCUSSION: P201 – P210

Clinical studies in TB

Chaired by: Dr Thomas Gorsuch (Manchester) and Professor Marc Lipman (London)

P201 A 15 year retrospective study of outcomes in paediatric tuberculosis disease in a large tertiary centre

K Dominiak, L Turnbull, R Anderson, S Hough, A Wilcock, S Bhowmik, F Child, C Bell

P202 Evaluation of a latent tuberculosis infection screening and treatment programme for recent migrants

K O'Brien, S Ikram, M Burman, A Rahman, H Kunst

P203 Social complexity remains a challenge for the provision of TB care

YO Abunga, R Davies, T Molefe, J Faccenda, SO Brij

P204 Barriers and facilitators to delivering latent tuberculosis infection (LTBI) screening and treatment to recent migrants: a survey of providers in a high prevalence TB setting in the UK

S Ikram, K O'Brien, A Rahman, J Potter, M Burman, H Kunst

P205 Why do radiologists under-report pulmonary TB on chest X-rays in South London?

M Kamalanathan, G Benedetti, A Azam, R Breen

P206 Attitudes towards treating latent tuberculosis in healthcare workers

C Wilson, P Mitchelmore, H Dunning, T Burden

P207 Prospective investigation of tuberculosis treatment delays

S Black, S Menzies

P208 Tuberculous pleural disease is associated with a high rate of hospital admission

PI Webb, SO Brij, T Gorsuch, C Bell

P209 Chest wall tuberculosis presentations in East London

DX Pang, E Skyllberg, A Sundaralingam, A Rahman, M Burman, S Tiberi, H Kunst

P210 Tuberculomas epidemiology and treatment – experience in a referral centre

C Cabo, S Freitas, P Cravo Roxo

2.00pm – 3.30pm
Churchill, Ground floor
SYMPOSIUM

PROGRESSIVE-FIBROSING INTERSTITIAL LUNG DISEASE: IF THEY LOOK AND BEHAVE THE SAME, ARE THEY?

Chaired by: Dr Michael Gibbons (Exeter) and Dr Hannah Woodcock (London)

2.00pm Idiopathic pulmonary fibrosis and rheumatoid arthritis associated ILD: is there a connection?

Dr Joyce Lee (Aurora, Colorado)*

2.30pm Beyond IPF: the world of progressive-fibrosing ILD

Professor Athol Wells (London)

3.00pm The management of progressive-fibrosing ILD

Professor Toby Maher (London)

*Kindly supported by a generous grant from Action for Pulmonary Fibrosis

Learning objectives:

- Given the phenotypic similarities between rheumatoid arthritis (RA)-associated interstitial lung disease (ILD) and idiopathic pulmonary fibrosis (IPF) we will explore the genetic links between the two conditions with specific focus on the MUC5B promoter variant rs35705950.

- Progressive fibrosis (PF-ILD) is associated with worsening respiratory symptoms, lung function decline, decreased quality of life and, potentially, early death. Here we focus on the differential diagnosis of these ILDs which can be challenging, and requires detailed consideration of clinical, radiological and histopathological features.

- Similarities in the histological, radiological and clinical picture of multiple ILDs that may present with a progressive-fibrosing phenotype provide a rationale to suggest that therapeutic options may overlap. We will review the therapeutic options currently available for patients with a progressive phenotype, and explore the status of ongoing randomised controlled trials.

2.00pm – 3.30pm
Mountbatten, 6th floor
SYMPOSIUM

PULMONARY VASCULAR DISEASE: FROM BENCH TO BEDSIDE

Chaired by: Dr Melanie Brewis (Glasgow) and Dr Robin Condliffe (Sheffield)

2.00pm GWAS: what has it taught us about PAH?
Dr Chris Rhodes (London)

2.30pm Novel PAH therapies: pathways to patients
Professor Nicholas Morrell (Cambridge)

3.00pm Pulmonary AVMs: the whys and hows of diagnosis and management
Professor Claire Shovlin (London)

Learning objectives:

- Understand what insight into the pathogenesis of PAH 'omics, and especially GWAS, have given us.

- Understand the current understanding of the molecular pathobiology of PAH and the therapeutic potential these pathways provide.

- Gain an understanding of the epidemiology, presentation, diagnosis and management of pulmonary arteriovenous malformations, especially in the context of HHT.

2.00pm – 3.30pm
Cambridge, 5th floor
MODERATED POSTER DISCUSSION: M16 – M27

Bronchiectasis: clinical phenotyping and outcomes

Chaired by: Dr Dorothy Grogono (Cambridge) and Dr Holly Keir (Dundee)

M16 Blood and sputum eosinophils, interleukin 5 and bronchiectasis
V Chew, R Davidson, J Davison, K Jiwa, G Davies, G Jones, A De Soyza

M17 Investigating indoleamine 2,3 dioxygenase (IDO) activity in bronchiectasis and COPD
R Potter, Lei Huan, A De Soyza, A Mellor

M18 Heparin-binding protein as a biomarker inflammation, symptoms and severity in bronchiectasis
H Abo-Leyah, HR Keir, A Shoemark, S Finch, A Smith, H Barclay, JD Chalmers

M19 A pilot study of endotyping in bronchiectasis
V Chew, R Davidson, J Davison, G Davies, G Jones, K Jiwa, A De Soyza

M20 Development of the New Zealand Bronchiectasis Registry
B Diggins, W Good, P Dawkins, B Poot, E Stroil-Salama, L Morgan, CA Wong

M21 Clinical review of nebulised colomycin for Pseudomonas colonisation in COPD and non-CF bronchiectasis
C Anyanor, J Horno, T Havelock

M22 Nebulised antibiotic challenges: can the process be made more efficient for patient and clinician?
J Forrester, C Paramasivan, C Pickover, C Sander

M23 Does Pseudomonas aeruginosa colonisation cause more rapid decline in FEV1 in non-cystic fibrosis bronchiectasis?
K Millington, F Hamilton, H Casey, F Easton, A Malin

M24 Validation of the COPD assessment test (CAT) as an outcome measure in bronchiectasis
S Finch, IF Laska, TC Fardon, JD Chalmers

M25 Outcomes of pulmonary rehabilitation in patients with bronchiectasis
J Chapman, J Duckers, T Lines, D Proud, E Hilsden

M26 Convergent validity of bronchiectasis quality of life tools in the BronchUK registry
J Brown, J Bradley, F Copeland, M Carroll, M Crichton, J Duckers, C Haworth, RA Floto, AT Hill, M Loebinger, R Wilson, J Hurst, W Cookson, C Winstanley, A McGuire, R McNally, P Mawson, P Kelleher, D Denning, V Navaratnam, R Hubbard, M Kelly, J Steer, A Sullivan, T Gatheral, P Walker, JS Elborn, JD Chalmers, A De Soyza

M27 Bronchiectasis multicentre cohort; baseline demographics from BronchUK

J Brown, J Bradley, F Copeland, M Carroll, M Crichton, J Duckers, C Haworth, RA Floto, AT Hill, M Loebinger, R Wilson, J Hurst, W Cookson, C Winstanley, A McGuire, R McNally, P Mawson, P Kelleher, D Denning, V Navaratnam, R Hubbard, M Kelly, J Steer, A Sullivan, T Gatheral, P Walker, JS Elborn, JD Chalmers, A De Soyza

2.00pm – 3.45pm
Victoria, 2nd floor
POSTER DISCUSSION: P211 – P222

Beyond airways disease: ILO and cough

Chaired by: Mrs Jemma Haines (Manchester) and Dr Julia Selby (London)

P211 Comorbidity between asthma, inducible laryngeal obstruction and breathing pattern disorder

C Slinger, H Wilson, A Vyas, R Slinger

P212 Characterisation of patients with expiratory large airway collapse

A Bikov, S Bokhari, R Niven, D Allen, C Somerton, R Sheehan, S Fowler

P213 Falling flat: a comparison of inspiratory flow volume loops in patients with inducible laryngeal obstruction and asthma

C Slinger, H Wilson, A Vyas, R Slinger

P214 The prevalence of upper thoracic breathing pattern in patients with breathing pattern disorder and inducible laryngeal obstruction

JL Harrison, R Slinger, H Wilson, C Slinger

P215 Patterns of respiratory co-morbidity and treatment strategies in inducible laryngeal obstruction and breathing pattern disorders

SF Ludlow, C Somerton, T Pantin, J Haines, S Fowler

P216 Tracheobronchomalacia in severe asthma

M Marquette, C Paramasivan, C Owen, J Herre, RB Gore, MD Knolle

P217 Multi-dimensional assessment and outcomes of dysfunctional breathing (DFB) in a specialist physiotherapy intervention

C Paramasivan, M Knolle, R Gore, C Owen, J Fuld

P218 Prospective study of primary cough headache in a cough unit

D Moreno Ajona, P Cho, S Becker, J Hoffmann, PJ Goadsby, S Birring

P219 Comparing the sensations and triggers of cough in asthma and idiopathic chronic cough

S Saeed, J Yorke, KJ Holt, JA Smith, DK Birchall, JA Smith

P220 Urinary incontinence in chronic cough

PSP Cho, PV Dicpinigaitis, HV Fletcher, RD Turner, SS Birring

P221 The effect of a heat and moisture exchange mask to reduce exercise induced cough and bronchoconstriction

A Jackson, J Hull, J Hopkins, H Fletcher, S Birring, J Dickinson

P222 Psychological impact in cough hypersensitivity syndrome

SF Ludlow, J Haines, H Hope, P Marsden, S Fowler

2.45pm – 3.45pm
COFFEE/TEA will be served in the Britten, 3rd floor

3.00pm – 4.20pm
St James, 4th floor
SPOKEN SESSION: S133 – S137

Fuelling the fire: inflammation and infection in lung disease

Chaired by: Professor Alison Condliffe (Sheffield) and Dr Charlotte Summers (Cambridge)

3.05pm **S133**

Hypoxia drives a hyperinflammatory neutrophil phenotype in the lung

ER Watts, AJM Howden, J Hukelmann, A von Kriegsheim, B Ghesquiere, P Sadiku, F Murphy, AS Mirchandani, DC Humphries, TM Plant, R Grecian, EM Ryan, P Coelho, RS Dickinson, A Finch, W Vermaelen, DA Cantrell, MK Whyte, SR Walmsley

3.20pm **S134**

A retrospective analysis of respiratory infections and nasopharyngitis rates in trials of anti-IL-17A therapies

GM Hynes, ID Pavord, TSC Hinks

3.35pm **S135**

The clinical impact of Streptococcus pneumoniae serotype shift to non-PCV13 vaccine serotypes

C Hyams, Z Amin, S Ladhani, A Malin, NA Maskell, A Finn, OM Williams

3.50pm **S136**

Relationship between inflammatory type of obstructive airways disease and lung function in a cohort of the Oxford Special Airways Clinic

A Moran, G Hynes, L Lehtimaki, R Shrimanker, S Thulborn, C Borg, C Connolly, A Gittins, T Downs, R Russell, C Brightling, J Cane, I Pavord, M Bafadhel, T Hinks

4.05pm **S137**

Short-acting and long-acting β2-agonists upregulate asthma-relevant pro-inflammatory mediators in human airway epithelial cells while short-acting muscarinic antagonists do not

K Kumar, F Losa, T Kebadze, A Singanayagam, MR Edwards, SL Johnston

3.00pm – 4.45pm
Moore, 4th floor
POSTER DISCUSSION: P223 – P236

Asthma and inhalers: all the colours of the rainbow

Chaired by: Professor Anna Murphy (Leicester) and Dr Omar Usmani (London)

P223 Once-daily low-dose indacaterol/mometasone via Breezhaler® reduces exacerbations in patients with inadequately controlled asthma: phase III QUARTZ study

O Kornmann, J Mucsi, N Kolosa, L Bandelli, LC Satlin, B Sen, P D'Andrea

P224 Efficacy and long-term safety of QMF149 (indacaterol acetate/mometasone furoate) versus mometasone furoate and versus salmeterol xinafoate/fluticasone propionate in patients with inadequately-controlled asthma: the PALLADIUM study

R van Zyl-Smit, M Krull, C Gessner, Y Gon, A Richard, A de los Reyes, X Shu, A Pethe, P D'Andrea

P225 Comparison of ICS containing open triple and dual therapy on small airways function in the smoking asthma phenotype

CRW Kuo, S Jabbal, B Lipworth

P226 Combined analysis of two randomized controlled trials of budesonide/formoterol reliever therapy in adults with mild asthma

M Weatherall, M Holliday, C Baggott, I Braithwaite, J Fingleton, J Hardy, RJ Hancox, T Harrison, A Papi, I Pavord, HK Reddel, M Williams, R Beasley

P227 Clinical effectiveness, health-related quality of life and patient satisfaction after switch from metered dose inhaler to Easyhaler dry powder inhaler in patients with asthma and COPD; a real-life study

G Gálffy, M Szilasi, L Tamási

P228 Analysis of the potential clinical impact of an environmentally driven transition from pressurised metered dose inhalers (pMDIs) to dry powder inhalers (DPIs)

D Jenkins, J Johal, J Mahon

P229 A retrospective database study of persistence and adherence in patients with asthma in the UK (UK-THIN): fluticasone furoate/vilanterol (FF/VI) versus beclometasone dipropionate/formoterol (BDP/FM)

H Svedsater, M Parimi, Q Ann, CM Gray, M Nixon, N Boxall

P230 A retrospective database study of persistence and adherence in patients with asthma in the UK (UK-THIN): fluticasone furoate/vilanterol (FF/VI) versus budesonide/formoterol (BUD/FM)

H Svedsater, M Parimi, Q Ann, CM Gray, M Nixon, N Boxall

P231 Pharmacological basis of inhaled corticosteroid (ICS) dose equivalence and duration of action

PT Daley-Yates

P232 Patient lungpower and inhalation manoeuvre quality with inhalers of different resistance

J Haikarainen, M Vahteristo, R Jõgi, S Lähelmä, V Vartiainen, LP Malmberg

P233 Patient knowledge and opinions of their healthcare devices

C Rowe, K Young, S Singh, A Suresh-Nair, O Usmani

P234 Improving inhaler technique: a community pharmacy service

TGD Capstick, M Burnley, H Higgins

P235 Optimising inhaler technique: ward-based service for asthma and COPD patients

TGD Capstick, N Azeez, G Deakin, A Goddard, D Goddard

P236 Cardiovascular risk following the use of long-acting bronchodilators of the UK's asthma population: a nested case-control study

AA Almazrua, V Sundaram, JK Quint, CI Bloom

3.00pm – 4.45pm
Abbey, 4th floor
POSTER DISCUSSION: P237 – P250

Cystic fibrosis and bronchiectasis: updates and controversies

Chaired by: Professor Judy Bradley (Belfast) and Dr William Flowers (Cambridge)

P237 Healthcare utilisation of remote capillary blood testing in a tertiary respiratory outpatient setting

K McLaren, J Donovan, M Loebinger, A Shah

P238 Superior yield of positive bacterial cultures from sputum induction versus cough swab in children, and its utility in assessing success of Pseudomonas aeruginosa eradication therapy

D Amin, JC Davies, N Collins, K Kentosova, N Murrat, C Worger-Ridgley

P239 Eradication of new Pseudomonas aeruginosa isolates in adults with cystic fibrosis

WL Boyes, R McVean, RJ Bright-Thomas

P240 Lung function and low bone mineral density in cystic fibrosis

DK Edwards, SB Carr, P Cullinan

P241 Fertility success rates in adult males with cystic fibrosis

J Wilkinson, B Bianco, R Bright-Thomas, M Akhtar, A Heck, AK Webb

P242 Does gastro-oesophageal reflux influence the respiratory tract microbiome in cystic fibrosis patients?

RW Lord, GG Einarsson, AJ Lee, B Bianco, PJ Whorwell, JS Elborn, MM Tunney, AM Jones

P243 Outcome measures for airway clearance in adults with cystic fibrosis (CF): a randomised controlled crossover trial

GE Stanford, F Cathcart, Z Beverley, C Short, M Jones, D Bilton, JC Davies, NJ Simmonds

P244 A quality improvement project to optimise multidisciplinary team communication about unplanned admissions of clinical trial patients

R Dobra, K Huband, S Madge, NJ Simmonds, JC Davies

P245 Serratia marcescens (SM): a significant pathogen in the adult bronchiectasis microbiome?

S Kalam, A Al-Fahad, H Simmons, V Bradshaw, A Ghareeb, K Lang Ping Nam, G Antunes

P246 A systematic review of self-management support interventions for adult bronchiectasis patients: a realist synthesis

A Tsang, D Lynes, H McKenzie, S Spencer, CA Kelly

P247 Adult bronchiectasis patients' perceptions of exercise: a qualitative study

H Evans, C Kelly

P248 Operationalising the CFHealthHub criteria for chronic Pseudomonas aeruginosa infection among adults with cystic fibrosis in clinical practice

LA Hitchcock, ZH Hoo, R Curley, MJ Wildman

P249 CF BOOST – engaging the disengaged

H Green, M Clegg, F Dowdall, V Kendall, L Kinsey, J Hildage, H Oxley, J Pickles, A Jones

P250 The microbial landscape of the upper and lower respiratory tract in PWCF and healthy individuals

GG Einarsson, RW Lord, AJ Lee, JA Smith, JS Elborn, AM Jones, MM Tunney

3.15pm – 5.15pm
Windsor, 5th floor
POSTER DISCUSSION: P251 – P265

Clinical studies in COPD: new evidence to guide practice

Chaired by: Professor Lorcan McGarvey (Belfast) and Dr Nicola Roberts (Glasgow)

P251 Importance of sputum culture in patients hospitalized for exacerbated chronic obstructive pulmonary disease

EJ Soto Hurtado, M Arredondo López, E Salcedo Lobera

P252 COPD readmission rates: turning the tide

RE Sobala, KP Conroy, ND Lane, SC Bourke

P253 Evaluation of the Ottawa COPD Risk Scale (OCRS) at Royal Stoke University Hospital (RSUH), UK in predicting adverse outcome in COPD exacerbation

M Marathe, S Oh, K Leech, H Stone, I Hussain

P254 Association of low serum creatinine and mortality in COPD

A Afzal, K Heyes, S Baksi, S Khalid

P255 The relationship between body mass index and COPD exacerbations

RJ Jose, A Manuel, JA Wedzicha, GC Donaldson

P256 Patients' perceptions of COPD exacerbations leading to hospitalisation

A Pooler, MA Allen

P257 Effectiveness of a holistic COPD early supported discharge service

K Converso, H Bakere

P258 Evaluation of the feasibility of providing patients with a self-management COPD toolkit for breathlessness – "Breath-in-a-Bag"

L Clinch, L Houchen-Wolloff, K McSporran, AC Murphy

P259 A better approach to COPD case finding is required in people with HIV

PJ Collini, C Mitchell, DH Dockrell, R Hubbard, R Lawson

P260 Improving end of life care for people with COPD; outcomes of a newly established integrated palliative COPD MDT

AC Boland, CM Kane, J Ward, C Hosker, AE Wilkinson, SDW Miller, S Gillon

P261 Primary care review of patients on long-term azithromycin for chronic lung conditions

T Tembo, J Higgins, R Mohammed, L Greenhalgh, H Francis, G Ng Man Kwong

P262 Can we improve upon clinician prediction of survival in advanced COPD using clinically measurable prognostic factors?

MA Jones, NJ Greening, R Free, G Woltmann, T Ward, MC Steiner, RA Evans

P263 Relationship between comorbidity and quality of life in the patient with chronic obstructive pulmonary disease

EJ Soto Hurtado, J Bujalance Zafra, L García López, I Millán Pinilla, MJ Bujalance Zafra

P264 Global treatment guidelines and patterns in COPD: focus on triple therapy

N Sharma, B Singh, MK Siddiqui, E de Nigris, U Holmgren, C Cabrera, S Arnetorp

P265 The effect of high frequency airway oscillations on the lung clearance index when compared to a placebo device

E Daynes, NJ Greening, J Owers-Bradley, S Sidiqqui, SJ Singh

RELVAR ELLIPTA
fluticasone furoate/vilanterol

CHOOSING RELVAR COULD HELP 25% MORE PATIENTS IMPROVE ASTHMA CONTROL VS. OTHER ICS/LABAs

In a real-world study, ACT responders for Relvar were 70% vs. 56% for the other ICS/LABA arm; absolute difference 14%. Study had minimal exclusion criteria and minimal intervention.[1]

Prescribing information and details on adverse reporting can be found on the next page.

The most commonly used ICS/LABAs in the ITT population were: Seretide® (fluticasone propionate/salmeterol) 30%, Symbicort 15%, and Fostair 12%.[2]

ISN'T IT TIME YOU TRIED RELVAR?

Relvar is indicated for the regular treatment of patients with asthma ≥12 years where the use of a combination product (ICS/LABA) is appropriate.[3]
- patients not adequately controlled with ICS and 'as needed' inhaled short-acting beta$_2$-agonists[3]
- patients already adequately controlled on both ICS and LABA[3]

RELVAR ELLIPTA
fluticasone furoate/vilanterol

VIEW THE EVIDENCE AT **RELVARVIDEO.CO.UK**

References:
1. Woodcock A *et al. Lancet* 2017; 390:2247-2255.
2. GSK. Clinical Study Report. 2017; HZA115150.
3. Relvar Ellipta SmPC, 2018.

Relvar Ellipta Prescribing Information

Please consult the full Summary of Product Characteristics (SmPC) before prescribing.
Relvar Ellipta (fluticasone furoate/vilanterol [as trifenatate]) inhalation powder.

Each single inhalation of fluticasone furoate (FF) 100 micrograms (mcg) and vilanterol (VI) 25 mcg provides a delivered dose of 92 mcg FF and 22 mcg VI. Each single inhalation of FF 200 mcg and VI 25 mcg provides a delivered dose of 184 mcg of FF and 22 mcg of VI. **Indications:** *Asthma:* Regular treatment of asthma in patients ≥12 years where a long-acting β_2-agonist (LABA) and inhaled corticosteroid (ICS) combination is appropriate; i.e. patients not adequately controlled on ICS and "as needed" short-acting inhaled β_2-agonists or patients already adequately controlled on both ICS and LABA. COPD: Symptomatic treatment of adults with COPD with a FEV1<70% predicted normal (post-bronchodilator) and an exacerbation history despite regular bronchodilator therapy. **Dosage and administration:** Inhalation only. *Asthma:* Adults and adolescents ≥12 years: one inhalation once daily of Relvar 92/22 mcg for patients who require a low to mid dose of ICS in combination with a LABA. If patients are inadequately controlled then the dose can be increased to one inhalation once daily Relvar 184/22 mcg. Relvar 184/22 mcg can also be considered for patients who require a higher dose of ICS in combination with a LABA. Regularly review patients and reduce dose to lowest that maintains effective symptom control. COPD: one inhalation once daily of Relvar 92/22 mcg. Relvar 184/22 mcg is not indicated for patients with COPD. **Contraindications:** Hypersensitivity to the active substances or to any of the excipients (lactose monohydrate & magnesium stearate). **Precautions:** Pulmonary tuberculosis, severe cardiovascular disorders or heart rhythm abnormalities, thyrotoxicosis, uncorrected hypokalaemia, patients predisposed to low levels of serum potassium, chronic or untreated infections, diabetes mellitus, paradoxical bronchospasm. In patients with moderate to severe hepatic impairment 92/22 mcg dose should be used. *Acute symptoms:* Not for acute symptoms, use short-acting inhaled bronchodilator. Warn patients to seek medical advice if short-acting inhaled bronchodilator use increases. Therapy should not be abruptly stopped without physician supervision due to risk of symptom recurrence. Asthma-related adverse events and exacerbations may occur during treatment. Patients should continue treatment but seek medical advice if asthma symptoms remain uncontrolled or worsen after initiation of Relvar. *Systemic effects:* Systemic effects of ICSs may occur, particularly at high doses for long periods, but much less likely than with oral corticosteroids. *Possible Systemic effects include:* Cushing's syndrome, Cushingoid features, adrenal suppression, decrease in bone mineral density, growth retardation in children and adolescents. Eye symptoms such as blurred vision may be due to underlying serious conditions such as cataract, glaucoma or central serous chorioretinopathy (CSCR); consider referral to ophthalmologist. More rarely, a range of psychological or behavioural effects including psychomotor hyperactivity, sleep disorders, anxiety, depression or aggression (particularly in children). Increased incidence of pneumonia has been observed in patients with COPD receiving inhaled corticosteroids. Risk *factors for pneumonia include:* current smokers, old age, patients with a history of prior pneumonia, patients with a body mass index <25 kg/m^2 and patients with a FEV$_1$<50% predicted. If pneumonia occurs with Relvar treatment should be re-evaluated. Patients with rare hereditary problems of galactose intolerance, the Lapp lactase deficiency or glucose-galactose malabsorption should not take Relvar. **Interactions with other medicinal products:** Interaction studies have only been performed in adults. Avoid β-blockers. Caution is advised when co-administering with strong CYP3A4 inhibitors (e.g. ketoconazole, ritonavir, cobicistat-containing products). Concomitant administration of other sympathomimetic medicinal products may potentiate the adverse reactions of FF/VI. Relvar should not be used in conjunction with other long-acting β_2-adrenergic agonists or medicinal products containing long-acting β_2-adrenergic agonists. **Pregnancy and breast-feeding:** Experience limited. Balance risks against benefits. **Side effects:** Very *Common (≥1/10):* headache, nasopharyngitis. *Common (≥1/100 to <1/10):* candidiasis of the mouth and throat, dysphonia, pneumonia, bronchitis, upper respiratory tract infection, influenza, oropharyngeal pain, sinusitis, pharyngitis, rhinitis, cough, abdominal pain, arthralgia, back pain, fractures, pyrexia, muscle spasms. Other important side effects include: *Uncommon (≥1/1,000 to <1/100);* blurred vision, hyperglycaemia. Rare *(≥1/10,000 to <1/1,000)* paradoxical bronchospasm and hypersensitivity reactions including anaphylaxis, angioedema, rash, urticaria. See SmPC for other adverse reactions. **Legal category:** POM. **Presentation and Basic NHS cost:** Relvar Ellipta. 1 inhaler x 30 doses. *Relvar Ellipta 92/22-*£22.00. *Relvar Ellipta 184/22-*£29.50. **Marketing authorisation (MA) nos. 92/22 mcg 1x30 doses [EU/1/13/886/002]; 184/22 mcg 1x30 doses [EU/1/13/886/005]. MA holder:** Glaxo Group Ltd, 980 Great West Road, Brentford, Middlesex TW8 9GS, UK. **Last date of revision:** September 2018. UK/FFT/0227/15(6). Trademarks are owned by or licensed to the GSK group of companies. Relvar Ellipta was developed in collaboration with Innoviva Inc.

Adverse events should be reported. Reporting forms and information can be found at www.mhra.gov.uk/yellowcard or search for MHRA Yellowcard in the Google Play or Apple App store. Adverse events should also be reported to GlaxoSmithKline UK on 0800 221 441

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SPEAKERS' BIOGRAPHICAL DETAILS

Dr James M Abraham is Assistant Professor of Medicine, Department of Medicine, Division of Gastroenterology at the University of Minnesota. His primary clinical interests in gastroenterology revolve around the complex care dynamics in patients with cystic fibrosis (CF), inflammatory bowel disease (IBD), and coeliac disease; he has been providing specialised expertise caring for these patients since joining the University of Minnesota Faculty in 2011. In recognition of his dedication to the care of adults living with gastrointestinal manifestations of CF, Dr Abraham was awarded the DIGEST Career Development Grant by the Cystic Fibrosis Foundation in 2014, and he participates in the multidisciplinary training of CF care providers in the United States and internationally with the CF community through speaking engagements and clinical teaching. This work led to recognition as National Teaching Faculty for the CFF's DIGEST Grant Training Programme in 2019.

Professor Ibrahim Abubakar is Director of the UCL Institute for Global Health. He was head of TB at Public Health England. He qualified in medicine in 1992 and initially trained in general medicine before specialising in public health medicine. Professor Abubakar trained at the London School of Hygiene and Tropical Medicine, University of Cambridge and University of East Anglia. He is currently Chair of the WHO Scientific and Technical Advisory Group for TB, and a member of the WHO HIV and Hepatitis Strategic Advisory Committee and the MRC Global Health Board. He has published over 300 peer reviewed papers.

Professor Alvar Agustí, MD, PhD, FRCP, FERS is currently Director of the Respiratory Institute at Hospital Clinic in Barcelona (www.hospitalclinic.org) and Professor of Medicine at the University of Barcelona. His main research interest is about clinical and translational research in chronic airway diseases. He has published more than 500 papers in peer-reviewed journals (H-Index 85) and has over 40 contributions to books. He is regularly invited to speak at international conferences and symposia. Professor Agustí is a member of several professional societies, including the American Thoracic Society (where he has been associated editor of the Am J Respir and Crit Care Med), and the European Respiratory Society (in which he has been a Member of its Executive Committee). He has a seat at the Royal Academy of Medicine of the Balearic Islands, is an Honorary Fellow of the Royal College of Physicians of Edinburgh (FRCP), a Fellow of the European Respiratory Society (FERS), Honorary member of ERS, and current Chair of the Board of Directors of GOLD (www.goldcopd.org).

Dr Ahsan Akram is a Cancer Research UK Clinician Scientist at the University of Edinburgh and Honorary Consultant in Respiratory Medicine in NHS Lothian. He completed a PhD in optical molecular imaging in 2015 and his clinical training in 2017. His research interests include understanding the mechanisms of immunotherapy failure in non-small cell lung cancer, with a focus on the tumour microenvironment as mediators of immune recognition evasion. He is also interested in developing and translating imaging techniques to patients to allow for better treatment stratification.

Dr Darius Armstrong-James is a Reader in Infectious Diseases and Medical Mycology in the Department of Microbiology, Imperial College London and Honorary Consultant Physician in Infectious Diseases and Medical Mycology to the Royal Brompton and Harefield NHS Trust and Imperial College Healthcare. His research is primarily on innate immunity to Aspergillus fumigatus with a particular focus on macrophage cell biology and signal transduction. In the laboratory they are increasingly studying how Aspergillus interacts with other opportunistic bacterial pathogens in the lung during co-infection, in particular Mycobacterium tuberculosis and Pseudomonas aeruginosa. He also has a strong interest in fungal genomics, mainly through collaboration with Matt Fisher in the School of Public Health, which is underpinned by clinical responsibility for medical mycology at the Royal Brompton and Harefield NHS Trust.
Dr Armstrong-James initially studied trypanosomal peroxidases with John Kelly and David Horn at the London School of Hygiene and Tropical Medicine during his MSc in pathogen molecular biology. He went on to undertake his PhD with Ken Haynes, Tom Rogers and Elaine Bignell at Imperial on fungal host adaptation. He was subsequently awarded an MRC Clinician Scientist Fellowship to retrain in immunology and established the fungal immunobiology laboratory in the Department of Medicine at Imperial in 2010.

Dr Rachelle Asciak is a Specialist in Respiratory Medicine, currently working at Mater Dei Hospital, Malta. She has completed a clinical and research pleural Fellowship in Oxford, UK, and has gained experience in thoracic ultrasound, ultrasound-guided pleural

procedures, including ultrasound-guided pleural biopsies and thoracoscopy, and teaches on ultrasound and pleural skills courses. She is reading for her PhD in the biological properties of pleural fluid.

Professor Mona Bafadhel, MBChB, FRCP, PhD, completed medical training at the University of Birmingham, followed by training at Birmingham Heartlands Hospital and The Royal Brompton Hospital. Professor Bafadhel is a clinical researcher, working in the Nuffield Department of Medicine as an Associate Professor in Respiratory Medicine at the University of Oxford and an Honorary Respiratory Consultant Physician at the Oxford University Hospitals NHS Foundation Trust. Her interests in respiratory medicine led to specialist training in the Oxford deanery and subsequently gaining a PhD at the University of Leicester studying biomarkers in exacerbations of chronic obstructive pulmonary disease (COPD). Professor Bafadhel leads a group with research interests in the field of airways disease, particularly the investigation of the mechanisms underlying exacerbations of COPD. This has led to studying the role of the eosinophil in COPD, using statistical approaches to define particular sub-groups and to the delivery of therapeutic strategies to patients, working across the translational spectrum.

Professor David Baldwin works as a Consultant Respiratory Physician sub-specialising in lung cancer and mesothelioma and interventional procedures. He is Honorary Professor in the School of Medicine at the University of Nottingham. He is Chair of the National Clinical Expert Group for Lung Cancer, NHS England and Clinical Director of the East Midlands Cancer Alliance. Professor Baldwin is Chair of the Screening Prevention and Early Diagnosis Group for the National Cancer Research Institute. He has obtained research grants from a variety of charities and NIHR. His primary research interests are in CT screening and lung cancer epidemiology. He is lead respiratory physician on the UK CT Lung Cancer Screening Trial (UKLS). He has published over 180 papers, including three influential guidelines. Professor Baldwin has held the positions of Honorary Secretary of the British Thoracic Society, Clinical Lead on the NICE Lung Cancer Guideline Development Group and Chair of the Quality Standards Group on Lung Cancer. He works with Public Health England as a member of the Lung Cancer Site Specific Reference Group. He enjoys time with his family and is a keen windsurfer and advanced instructor.

Professor Dr Robert Bals studied medicine and biology at the Ludwig-Maximilian University Munich. He obtained doctoral degrees in both areas and worked as a post-doctoral fellow at the University of Pennsylvania, Philadelphia, USA. Back in Germany, he continued his career as physician-scientist with board certifications in internal medicine, pulmonology, intensive care medicine, allergology, emergency medicine, and sleep medicine. After spending ten years at the Philipps University Marburg, Professor Bals was appointed director of the Saarland University's Department of Pulmonology, where he focuses on teaching, research, and patient care. In the research area, Professor Bals covers preclinical and clinical research and has contributed to 250 papers and several books. His research areas are inflammatory lung disease, asthma, COPD and infection. In the basic science laboratory, he and his team investigate the mechanisms of how the lung interacts with the environment including smoke, allergens, and microorganisms. In clinical research, he performs investigations in COPD, asthma, pneumonia and cystic fibrosis. He established and manages the German alpha-1-antitrypsin registry and is a member of the steering committee of COSYCONET.

Dr Chris Barber is a Respiratory Consultant with a clinical and research interest in occupational lung disease. His time is split between NHS clinical work in Sheffield and HSE sessions at the Centre for Workplace Health in Buxton. He is a member of the Group of Occupational Respiratory Disease Specialists (GORDS), and the current Chair of the BTS Occupational and Environmental Lung Disease Specialist Advisory Group.

Professor Peter J Barnes, FRS, FMedSci, is Margaret Turner-Warwick Professor of Medicine and previous Head of Respiratory Medicine at the National Heart and Lung Institute, Imperial College London. He has published >1000 peer-reviewed papers on asthma, COPD and related topics and has been the most highly cited respiratory researcher in the world over the last 30 years (h-index=170). Professor Barnes was President of ERS 2013/14.

Dr Shaney Barratt is a Respiratory Physician and Joint Clinical Lead for the Interstitial Lung Disease (ILD) Service at North Bristol NHS Trust. She is an Honorary Associate Researcher at the University of Bristol (UOB). She completed her PhD in 2016 and published her work that investigated the basic science mechanisms underpinning a role for vascular

endothelial growth factor in the development of idiopathic pulmonary fibrosis (IPF). Dr Barratt has active research interests in CTD-ILD and clinical outcomes in hypersensitivity pneumonitis.

Dr Rachel Benamore has been a Consultant Chest Radiologist at the Oxford University Hospitals NHS Foundation Trust since 2006. Her subspecialty is thoracic radiology. She undertook her radiology training in Leicester and spent a year as a fellow in thoracic radiology in Toronto, Canada.

Professor Jonathan Bennett is Chair of the British Thoracic Society Board. From a non-medical background, he still has to pinch himself about how lucky he was to have found respiratory medicine and, with that, the great support that he has received from the BTS and his respiratory colleagues during his career. He has been a consultant since 2000, firstly in Derby, and then from 2004 in the nationally renowned Glenfield Hospital, Leicester, where he continues to age disgracefully.
He can be seen doing his bit for the environment; cycle commuting most days to and from Glenfield Hospital. As a native Wulfrunian he has the curse of supporting the mighty Wolverhampton Wanderers.
Clinical interests include: lung cancer, interventional respiratory procedures, medical education and general respiratory medicine.

Dr Audrey Bernut, PhD is a microbiologist and Curie Intra-European Fellow at the University of Sheffield, with a long-standing interest in infectious and inflammatory lung diseases, especially tuberculosis and cystic fibrosis (CF). In particular, she is interested in the role of the vicious circle of inflammation and infection which contributes to adverse outcomes in CF. Her research uses zebrafish larvae models to elucidate the physiological functions of CFTR in regulating innate immune responses in CF and identify new therapeutic molecules to restore host immunity in CF. Loss of CFTR in zebrafish recapitulates aspects of the infectious and immune pathogenesis of CF, generating a superb model for discovery of novel immune-targeted therapies in CF.

Dr Anna Bibby is a Respiratory Consultant and Co-Lead for Lung Cancer at North Bristol NHS Trust. She holds an NIHR Research Fellowship at the University of Bristol to investigate intra-pleural immunotherapy in mesothelioma. She is a faculty member of the BTS Thoracic Ultrasound Course and the ERS Ultrasound and Pleural Procedures Courses. Dr Bibby coordinated the recent ERS Taskforce Statement on Malignant Pleural Effusions and is contributing to the 2019 update of the BTS Pleural Disease Guideline.

Professor Charlotte Bolton is Professor of Respiratory Medicine at the University of Nottingham. Her clinical focus is COPD and her research has been on the extrapulmonary manifestations of chronic respiratory disease and pulmonary rehabilitation. In addition, she is interested in the long-term respiratory sequelae of being born preterm and also global lung health challenges.

Dr Dawn Bowdish, PhD is a Professor in the Department of Pathology and Molecular Medicine, McMaster University. She is the Canada Research Chair in Ageing and Immunity. Her lab studies how the innate immune system changes with age and how this impacts host-microbiome interactions, chronic inflammatory diseases and anti-pneumococcal immunity.

Dr Corry-Anke Brandsma graduated from the University of Groningen in 2003 (Medical Biology) and is currently appointed as Assistant Professor and staff member of the Department of Pathology and Medical Biology of the University Medical Center Groningen. Her research line is focused on abnormal tissue repair and lung ageing in COPD, with an expertise in integration and translation of clinical, patient-derived, data towards unraveling disease mechanisms. She is an active member of the Groningen Research Institute of Asthma and COPD research (GRIAC), which has the mission of multidisciplinary translational study of obstructive airway and pulmonary diseases and healthy ageing.

Dr Melanie Brewis is a Consultant Respiratory Physician at the Scottish Pulmonary Vascular Unit in Glasgow. After completion of training in respiratory and general internal medicine, she was appointed as a Respiratory Consultant in 2015 in NHS Greater Glasgow and Clyde. She was awarded an MD by the University of Glasgow in cardiac magnetic resonance imaging of the right ventricle in pulmonary hypertension, and appointed an Honorary Clinical Senior Lecturer. She has interests in respiratory training and is a member of the Respiratory STC for West of Scotland. Clinical interests include pulmonary hypertension, cardiac MRI and PE.

Dr Hassan Burhan is a Consultant Respiratory Physician at the Royal Liverpool University Hospital.

He leads the Liverpool Severe Asthma and Knowsley Community Asthma Services. He is the North West Coast NIHR CRN Respiratory co-lead and holds honorary academic positions at the University of Liverpool and the Liverpool School of Tropical Medicine. Dr Burhan's research focuses on improving access to healthcare in non-communicable respiratory disease. He has developed innovative partnerships with chronic disease and substance misuse service commissioners and service providers in order to screen heroin smokers for COPD and develop strategies to improve outcomes.

Dr Adam Byrne completed his undergraduate studies in chemistry at University College Dublin and subsequently undertook a PhD in medicinal chemistry, Trinity College Dublin in 2002. After a period in industry, he carried out postdoctoral work at Northwestern University, Chicago; this work focused on immune pathways involved in asthma, allergy and anaphylaxis. In 2011, he joined the laboratories of Professor Irina Udalova at the University of Oxford and Professor Clare Lloyd at Imperial College London, in a collaborative project funded by the American Asthma Society entitled "Does IRF5 control allergic airways disease?". He was appointed as a Lecturer in Chronic Lung Disease at the Inflammation, Repair and Development Section, NHLI in 2016 and was awarded a Joan Bending, Evelyn Bending, Mervyn Stephens, Olive Stephens Memorial Fellowship in 2017. His work focuses on the role of airway macrophage ontogeny, metabolism and roles in chronic lung diseases.

Professor James Chalmers is the British Lung Foundation Chair of Respiratory Research at the University of Dundee and an Honorary Consultant Physician at Ninewells Hospital. His clinical and research interests are in bronchiectasis, respiratory infections and COPD. He is Chair of the BTS Respiratory Infection Specialist Advisory Group, Chair of the Respiratory Infections Group of the European Respiratory Society and chaired the recent European Bronchiectasis Guidelines. Professor Chalmers is Deputy Chief Editor of the European Respiratory Journal. In 2017 he won the Patrick Neil Medal from the Royal Society of Edinburgh and the Romain Pauwels award from the European Respiratory Society for his contribution to airways disease research.

Dr Andrea Collins is a Senior Clinical Lecturer in Respiratory Medicine at the Liverpool School of Tropical Medicine and Honorary Consultant at Liverpool University Hospitals FT. She is co-lead of the NIHR CLRN Respiratory. Her research focuses on respiratory infection, namely LSTM's unique human pneumococcal challenge model as well as bronchiectasis, interstitial lung disease and research bronchoalveolar lavage. She is passionate about working towards improved pneumococcal vaccines globally.

Professor Alison Condliffe is Professor of Respiratory Medicine at the University of Sheffield. She is an Honorary Consultant in Respiratory Medicine and her clinical interests include the respiratory complications of immune deficiency, respiratory infections, and non-CF bronchiectasis. Her research investigates host-pathogen interactions, neutrophil-mediate tissue injury, and the impact of hypoxia on innate immune cell function, with a particular focus on the PI3-kinase signalling pathway. She serves on a number of peer-review and scientific committees.

Dr Robin Condliffe is a Consultant Respiratory Physician in the Sheffield Pulmonary Vascular Disease Unit. He is the Chair of the BTS Pulmonary Vascular Disease Specialist Advisory Group. He has published widely on clinical and radiological aspects of pulmonary vascular disease. He has been a member of guideline and clinical statement groups for out-patient PE management, pulmonary vascular exercise haemodynamics and pulmonary arteriovenous malformations and was a member of the 5th World PH Symposium Task Force.

Dr Sonya Craig is a Sleep and Respiratory Physician working at University Hospital Aintree, Liverpool where she is Lead Clinician for Sleep Medicine. She trained at Cambridge University and the Royal Brompton Hospital, London, before completing an MD investigating cardiovascular risk and obstructive sleep apnoea (MOSAIC trial) with Professor John Stradling in Oxford. Her main research interests are vascular risk in OSA and the delivery of sleep medicine and care effectively and efficiently within the NHS.

Professor Adnan Custovic is Professor of Paediatric Allergy at Imperial College London. In 2015 he was awarded European Respiratory Society Gold Medal for research in asthma. In 2013 he received the BSACI William Frankland Medal for outstanding contributions to clinical allergy, and the CIPP President's Award for distinguished achievements in childhood asthma. He has delivered numerous prestigious keynote/named lectures, including Ann Woolcock Lecture, Nemacolin Asthma Conference Keynote Lecture, Cas Motala

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Memorial Lecture (South African Allergy Society), and James Hutchison's Memorial Lecture (Hong Kong Paediatric Society). He is Associate Editor of the Blue Journal, and serves on 13 journal editorial boards.

Professor Jane Davies is Professor of Paediatric Respirology and Experimental Medicine at the National Heart and Lung Institute, Imperial College London and Honorary Consultant in Paediatric Respiratory Medicine at the Royal Brompton and Harefield NHS Foundation Trust. She specialises in cystic fibrosis, providing clinical care to a large group of children and conducting translational research with both paediatric and adult patients. As part of the European CF Society's Clinical Trials Network, and more recently the UK Clinical Trials Accelerator Platform, she has been closely involved in the design and conduct of many clinical trials of new therapies for CF. She also leads on research programmes in airway microbiology and physiology.

Dr Lisa Davies is a Consultant Respiratory Physician at University Hospital Aintree, Liverpool and is an Honorary Senior Lecturer at the University of Liverpool. She has been the clinical lead for COPD management and smoking cessation services in the Trust. She is actively involved in COPD research, with a particular interest in the clinical management of the disease and has published widely in peer reviewed journals. Dr Davies is currently the Director of Medical Education and Clinical Sub-Dean at University Hospital Aintree and is a recent Chair of the British Thoracic Society.

Dr Martin Dedicoat is a Consultant in Infectious Diseases at University Hospitals Birmingham Trust. He is the TB lead for Birmingham and Solihull. His main research interests are the epidemiology of TB in urban settings and improving latent TB screening.

Dr Duneesha de Fonseka is a Consultant Respiratory Physician at Sheffield Teaching Hospitals Foundation Trust, with a specialist interest in pleural disease. She recently completed a PhD in asbestos related pleural disease at the Academic Respiratory Unit in Bristol. She is level 2 US competent and undertakes regular thoracoscopy and pleural procedure lists. Dr de Fonseka has an interest in pleural research and recruits patients to national pleural trials. She was a member of the BTS Mesothelioma Guideline Committee and is a current member of the BTS Pleural Disease Guideline Committee.

Dr Jenny Dickens is an MRC Clinician Scientist and Honorary Consultant at Addenbrooke's and Royal Papworth Hospitals. A University of Cambridge graduate, she undertook an MRC Clinical Research Training Fellowship during which she studied the cellular handling of Z alpha-1-antitrypsin. Her research remains focused on protein folding and trafficking, with a particular interest in familial pulmonary fibrosis through the study of type 2 pneumocyte biology. Her clinical subspecialty interest is also in interstitial lung disease.

Professor Louise Donnelly is Professor of Respiratory Cell Biology at the National Heart and Lung Institute, Imperial College London. Her research interests are primarily focussed on the cell biology underlying the pathophysiology of a number of respiratory conditions including asthma and COPD. Her group focus on understanding aberrant cell biology in disease and identifying novel targets for therapeutic intervention. To this end, Professor Donnelly's group have established a number of human primary cell systems, both in health and disease, to investigate this.

Dr Mark Elliott is a Consultant Physician in Respiratory Medicine at St James's University Hospital, Leeds. He has been responsible for developing the home sleep and assisted ventilation service, for acute in hospital NIV and weaning of patients with prolonged ventilator dependence at St James's University Hospital. He has research interests in acute and chronic NIV and OSA.
Dr Elliott is President of the British Thoracic Society 2018-2019, and was Treasurer of the European Respiratory Society (2013 to 2016). He was a core member of the Guidelines Writing Group for both the BTS (2016) and ERS/ATS Acute NIV Guidelines (2017) and the ERS Guidelines on Long-term Home NIV for Management of COPD (2019).

Dr Caroline Elston is a Consultant in Adult Cystic Fibrosis and is the CF Centre Director and Clinical Director for Medicine at King's College Hospital, London. She has served on a number of national committees and is currently the Chair of the UK CF Medical Association. She has a particular interest in CF associated gastrointestinal disease and nutrition and was a co-author on the CF Trust Nutrition guidelines published in 2018.

Dr Johanna Feary is a Senior Clinical Fellow at the National Heart and Lung Institute, Imperial College

and Honorary Respiratory Consultant at Royal Brompton Hospital. She carried out a large epidemiological study of laboratory animal allergy as part of an NIHR post-doctoral fellowship. Her clinical interests include the assessment and management of occupational lung disease, and difficult asthma. She is a member of GORDS (Group of Occupational Respiratory Disease Specialists) and, until recently, a member of the BTS Specialist Advisory Group for Occupational and Environmental Medicine.

Professor R Andres Floto is a Wellcome Trust Investigator and Professor of Respiratory Biology in the Molecular Immunity Unit of the University of Cambridge (based at the MRC Laboratory of Molecular Biology), Research Director of the Cambridge Centre for Lung Infection at Papworth Hospital, and Director of the UK Cystic Fibrosis (CF) Innovation Hub. His basic research is focused on understanding how macrophages interact with bacteria, how bacteria evolve during chronic infection and transmission, and how forward and reverse genetics can be combined with fragment-based drug discovery to develop novel antibiotics and host-directed therapies.
Professor Floto's clinical research is centred around finding new ways to treat non-tuberculous Mycobacteria (NTM), tackling chronic inflammation in CF and non-CF bronchiectasis, and using graphical model-based machine learning to understand and predict pulmonary exacerbations in CF.
Clinically he specialises in the management of non-tuberculous Mycobacteria, cystic fibrosis, non-CF bronchiectasis, and recurrent chest infections.
He co-chairs the British Thoracic Society NTM Guidelines Committee, the Joint US CF Foundation-European CF Society (ECFS) NTM Guidelines Group, and the ECFS working group on NTM.

Professor David Gems is Professor of Biogerontology at the UCL Institute of Healthy Ageing, of which he is a founder member and a co-director. He has a BSc in Biochemistry from Sussex University, and a PhD in Genetics from Glasgow University. He was a postdoc at Imperial College, and the University of Missouri-Columbia, USA before founding his own research group at UCL in 1997 as a Royal Society University Research Fellow. His research uses simple animal models to understand the causes of ageing, and identify general principles of pathophysiology for late-life diseases.

Dr Michael Gibbons graduated from the University of Glasgow with an intercalated BSc (Hons) (1st Class) in Molecular Biology in 1995, and MB ChB in 1998. He undertook his basic medical training in Glasgow before moving to Edinburgh in 2001 to train in respiratory medicine. He was awarded an MRC Clinical Research Training Fellowship in 2007 to study mechanisms in the pathogenesis of pulmonary fibrosis. He completed his registrar training in 2010 and graduated with a PhD from the University of Edinburgh in the same year. He trained in interstitial lung disease (ILD) in Edinburgh under the supervision of Dr Nik Hirani, Professor John Simpson and Professor Chris Haslett. He has also spent time at the National Jewish ILD Programme in Denver.
Dr Gibbons moved to Exeter in 2010 where he is currently the Clinical Director for the South West Peninsula ILD Service. He is a past Chair of the BTS Specialist Advisory Group for ILD, a previous member of the BTS ILD Registry Steering Committee and member of the BLF IPF Advisory Board. He is a member of the BTS Science and Research Committee and BTS Council.
Dr Gibbons has a local programme of research working closely with colleagues at the University of Exeter, he is Chief Investigator of the PETFIB Study, and he has developed a programme of tissue bio-banking locally. He is Principal Investigator for multiple clinical trials in ILD and IPF (Phase I-IV).
Additionally, Dr Gibbons was previously the Clinical Research Speciality Lead for Respiratory Disorders and Clinical Research Lead (Cluster 6) of the NIHR Clinical Research Network: South West Peninsula; he has recently been appointed Clinical Director.

Dr Francis Gilchrist qualified from the University of Manchester with Honours in 2002. He undertook his Paediatric Respiratory Training in the West Midlands before working as a Clinical Fellow at the Manchester Adult CF Centre. He was awarded his PhD by Keele University in 2014 and is currently a Senior Lecturer at Keele University and Honorary Consultant in Paediatric Respiratory Medicine at University Hospitals of North Midlands NHS Trust. Current roles include Paediatric Director of the North West Midlands Cystic Fibrosis Centre, Trustee for the British Lung Foundation and Associate Editor for BMC Paediatrics. His research interests include the diagnosis and treatment of lower respiratory infections particularly protracted bacterial bronchitis and cystic fibrosis.

Professor Fergus Gleeson is a Consultant Radiologist and Professor of Radiology in Oxford. He trained in Cambridge, Papworth and London, and was a

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Fellow in Radiology at UCLA in Los Angeles. He was appointed to Oxford in 1992, is Head of Academic Radiology and the Director of the Oxford Imaging Trials Unit at Oxford University Hospitals NHS Foundation Trust. He has published over 200 peer review papers and book chapters, and has more than £20 million in grant income. His specialist interests are in thoracic imaging, PET-CT and Hyperpolarized xenon MRI. Professor Gleeson is also the Chief Medical Officer of the National Consortium of Intelligent Medical Imaging (NCIMI): this aims to bring together the NHS, university and industry partners to promote the development and implementation of artificial intelligence and machine learning both into the NHS and global medical care.

Dr Sherif Gonem is a Consultant Respiratory Physician at Nottingham University Hospitals NHS Trust, where he contributes to tertiary severe asthma services for patients in the East Midlands. He has wide-ranging research interests related to asthma, respiratory physiology and the use of digital technology for remote patient monitoring.

Dr Alastair Greystoke joined Newcastle University and the Northern Centre for Cancer Care in 2014 after eight years spent at the University of Manchester/ Christie NHS Trust. He is one of three consultants who run the Sir Bobby Robson Early Clinical Trials Centre at the Freeman Hospital in Newcastle, and has a special interest in the development of new anti-cancer drugs for patients with thoracic malignancies. In addition, he is the Joint Chief Investigator of the CONCORDE platform (adding in new drugs to radical radiotherapy in NSCLC), Clinical Lead for Cancer for the Yorkshire, Hull and North East England Genomic Laboratory Hub, and he leads the Pharmacodynamic Biomarker team at the Northern Institute for Cancer Research, Newcastle University.
Dr Greystoke's research interests are in: lung cancer; early drug development; personalised medicine; circulating biomarkers; and treatment of cancer in the elderly.
You can follow him on Twitter @alastairgreyst2

Dr Justine Hadcroft is a Consultant Respiratory Physician with an interest in COPD and sleep apnoea, and is COPD Lead at the Royal Liverpool University Hospital. She co-leads the North Merseyside Community Respiratory Team whose role is to manage COPD exacerbations outside the hospital environment. She is currently involved in discussions with Liverpool CCG about the redesign of respiratory services in Liverpool, and is Chair of the Redesign Committee's Airways Subgroup. Dr Hadcroft is co-Chair of the British Thoracic Society's Workforce and Service Development Committee, a multidisciplinary group of professionals working in the NHS tasked with providing an overview of integrated care delivery and new ways of working in respiratory medicine.

Dr Robert Hallifax is an NIHR Academic Clinical Lecturer at the University of Oxford. He studied an MSc in Natural Sciences in Cambridge before training in medicine at the University of Oxford. He won an MRC Clinical Training Fellowship for his DPhil: "Understanding pneumothorax: epidemiology, physiology and outcomes", and recently published in JAMA and Thorax. Dr Hallifax is the trial coordinator for RAMPP (randomised ambulatory management of primary pneumothorax) – a multi-centre trial of 24 sites around the UK – which has now completed recruitment. He is trained in thoracoscopy, advanced pleural ultrasound and clinical trials methodology.

Professor Nicholas Hart was appointed as the Clinical Director of the Lane Fox Respiratory Service in 2012, which is an internationally recognised weaning, rehabilitation and home mechanical ventilation service. It is the largest weaning and rehabilitation service in the UK. Professor Hart established the Lane Fox Clinical Respiratory Physiology Research Centre in 2007 and he has developed a programme of translational physiological research focused on (1) admission prevention in COPD (2) muscle wasting prevention during critical illness and (3) improving outcome in chronic respiratory failure and sleep disordered breathing. He is currently Thorax Joint Editor-in-Chief and Director of Research Delivery for Guy's and St Thomas' Foundation Trust.

Professor John Hurst is Professor of Respiratory Medicine at University College London. He has clinical and research interests in COPD and bronchiectasis. He qualified from the University of Edinburgh Medical School in 1997 and has worked at UCL since 2007. He is COPD lead for the UK National Audit Programme (NACAP). He has national and international roles with the British and American Thoracic, and European Respiratory Societies. He is Editor-in-Chief of the European Respiratory Monograph and on the Editorial Board of AJRCCM.
You can follow him on Twitter @ProfHurst.

Professor Sam Janes won an MRC Training Fellowship to perform a PhD and then a post-doctoral period working in the CRUK Lincoln's Inn Fields Institute with Fiona Watt working on lung cancer biology. He then moved as an MRC Clinician Scientist to UCL leading a group interested in the role of stem cells in lung cancer pathogenesis and treatment of lung disease using cell therapies. Professor Janes was awarded a Wellcome Trust Senior Clinical Fellowship in October 2010 to work on novel cell therapies for lung cancers resulting in a DPFS first-in-man award and in 2015 won his Wellcome Senior Fellowship renewal to study the genetic and cellular changes in lung cancer pathogenesis. He is the lead of four academically randomised clinical trials and most notably recently launched the SUMMIT study, a 50,000 participant London based study examining CT and blood screening for lung and other cancers.
Professor Janes works as a Respiratory Consultant at UCLH with a particular interest in lung cancer, mesothelioma, interventional and diagnostic bronchoscopy and early lung cancer detection. He is Head of Respiratory Research Department at UCL and Vice-Chair of the National 'Clinical Expert Group' on Lung Cancer.

Professor Debbie Jarvis is Professor in Public Health at the National Heart and Lung Institute, London. She conducts large epidemiological surveys looking at the burden of and risk factors for asthma, allergy and COPD. As part of this work she has been involved in examining the association of COPD with occupation in large population-based survey and cohorts.

Professor Gisli Jenkins is an NIHR Research Professor and Professor of Experimental Medicine at the University of Nottingham and joint Editor-in-Chief of Thorax. He completed his medical training at University of Southampton before undertaking postgraduate training in respiratory medicine in London. During this time, he undertook basic scientific training funded by an ARC Fellowship and obtained a PhD in Biochemistry from UCL before doing post-doctoral studies at UCSF as part of an ARC Clinician Scientist Fellowship. His clinical and research focus is on interstitial lung disease, and pulmonary fibrosis in particular. He is Academic Lead at the Nottingham Interstitial Lung Diseases Unit and runs the pulmonary fibrosis work strands for the MRC Nottingham Molecular Pathology Node, and the Genomics England Clinical Interpretation Partnership in Respiratory Medicine. His research has been published in leading academic journals including the Journal of Clinical Investigation, Lancet Respiratory Medicine and Science Signalling.
Professor Jenkins is a Trustee of the patient charity Action for Pulmonary Fibrosis and his research group has received funding from academic organisations including the Wellcome Trust, the Medical Research Council, Arthritis Research UK and Asthma UK, as well as industrial contracts with Biogen, Galecto, GlaxoSmithKline, MedImmune and Novartis.

Dr Binita Kane is a Consultant Respiratory Physician at Manchester University Foundation Trust (MFT). She has an interest in airways disease, quality improvement (QI) and leadership. She is currently the lead for integrated respiratory care at MFT, the Greater Manchester COPD Health Innovation programme and the North West Severe Asthma Network. Dr Kane is a member of the PCRS Service Delivery Committee, RCP QI Faculty and the National Asthma and COPD Audit Programme (NACAP) Board.

Professor Elizabeth Kovacs received her BA degree from Reed College in Portland, OR and her PhD from the University of Vermont. Her postdoctoral training was at the National Institutes of Health, where she explored gene expression in macrophages. After 20+ years of working at Loyola University Chicago, where she served as Director of Research of the Burn and Shock Trauma Institute and Director of the Alcohol Research Programme, in 2016, Professor Kovacs relocated her laboratory to the University of Colorado Denver. In Colorado, she is a Professor of Surgery and Director of Burn Research. For most of her career, Professor Kovacs investigated innate immunity in the lung. Over the past decade, her research has expanded to include the gut-liver axis and its role in regulating pulmonary inflammatory responses following remote injury.

Professor Dr Christian B Laursen is Consultant and Head of Research at the Department of Respiratory Medicine, Odense University Hospital (Odense, Denmark) and Associate Professor at University of Southern Denmark (Odense, Denmark). His PhD assessed the use of point-of-care ultrasound for the assessment of patients with acute respiratory failure. Apart from this research area he has also been involved in studies assessing the use of advanced thoracic ultrasound and in developing educational tools for competency assessment. In his clinical work he is

primarily working with the assessment of patients with suspected malignancy or infections in the chest.

Professor Joyce Lee is an Associate Professor of Medicine at the University of Colorado Denver. Her research focus is on clinical and translational research in interstitial lung disease, in particular, idiopathic pulmonary fibrosis and rheumatoid arthritis associated interstitial lung disease and the relationship between the two conditions.
She completed her medical training at Northwestern University and went on to complete her pulmonary and critical care fellowship at the University of California San Francisco. As a fellow, she undertook coursework to gain expertise in clinical research and obtained a master's degree through the UCSF Department of Epidemiology and Biostatistics. She was then recruited to the University of Colorado to head their interstitial lung disease program. Professor Lee is NIH funded and has published in high-impact journals.

Dr Richard Lee is Consultant Respiratory Physician and Champion for Early Diagnosis at the Royal Marsden Institute of Cancer Research Biomedical Research Centre, where he advises on strategy and leads on transformation in clinical innovation and research in early diagnosis across all cancer types with a focus on lung cancer.
Dr Lee is joint clinical lead for the NHS England Targeted Lung Health Check Service, which will pilot lung cancer screening in a population of ~600,000 people across the UK. Dr Lee leads on biomarker development in the RM Partners Lung Cancer Case-finding pilot and also serves on the BTS Specialist Advisory Group on Lung Cancer and Mesothelioma.

Professor Y C Gary Lee, MBChB, PhD, FRACP, FRCP, FCCP, is a Professor of Respiratory Medicine at the University of Western Australia, Sir Charles Gairdner Hospital and Institute for Respiratory Health. He leads a pleural programme that includes a laboratory and clinical research arm closely integrated with an active tertiary clinical pleural disease service which he directs. He has published over 250 manuscripts (H-index 49; citations >8000), delivered ~300 invited lectures on pleural diseases at 100+ conferences in 32 countries and trained over 20 clinical fellows from 10 countries.

Dr Mareike Lehmann is currently a Team Leader in the laboratory of Professor Melanie Königshoff at the Comprehensive Pneumology Center in Munich. She studied molecular biomedicine at the University of Bonn, Germany. After completing a PhD at the University of Zürich, Switzerland, she joined the research group at the CPC and started working on epithelial cell phenotypes in lung ageing and IPF. She is currently spearheading the ageing projects in the lab.

Dr Bruce Levy is the Parker B Francis Professor of Medicine at Harvard Medical School and Chief of the Pulmonary and Critical Care Medicine Division at Brigham and Women's Hospital. Dr Levy's laboratory aims to identify new pathways to resolve pulmonary inflammation, infection or injury through the roles of naturally-derived, specialized pro-resolving mediators, and to translate these findings to the pathobiology of airway diseases. He is an elected member of the ASCI, AAP and Interurban Clinical Club. He is active in the American Thoracic Society and serves as Chair of the Publication Policy Committee and member of the Board of Directors.

Professor Wei Shen Lim is a Consultant Respiratory Physician at Nottingham University Hospitals NHS Trust and Honorary Professor of Medicine, University of Nottingham. He leads the BTS National Community Acquired Pneumonia (CAP) in Adults Audit. He was Chairman of the BTS CAP Guidelines Committee and Chairman of the BTS Respiratory Infection Specialist Advisory Group. In 2016, he was awarded the BTS Meritorious Award for contributions towards respiratory infections. He is a member of the Joint Committee on Vaccination and Immunisation (JCVI) and the New and Emerging Respiratory Virus Threats Advisory Group (NERVTAG).

Professor Michael Loebinger is a Consultant Respiratory Physician at the Royal Brompton Hospital with a specialist interest in respiratory infections, bronchiectasis and non-tuberculous Mycobacteria (NTM). He co-chaired the BTS bronchiectasis guidelines and co-wrote the BTS NTM and ERS bronchiectasis guidelines. He is a founding member of the UK and European clinical and research bronchiectasis networks, and leads global multicentre clinical trials. He chaired the BTS Respiratory Infection Specialist Advisory Group (2013-2016) and is Secretary of the ERS Respiratory Infection Group. He was appointed Professor of Practice (Respiratory Medicine) at Imperial College in 2018 and supervises PhD, MSc and medical students.

Professor Toby Maher is British Lung Foundation Chair in Respiratory Research and Professor of Interstitial Lung Disease at the National Heart and

Lung Institute at Imperial College London. He holds a prestigious National Institute of Health Research Clinician Scientist Fellowship and is Director of Respiratory Research and a Consultant Physician at Royal Brompton Hospital, London.
Professor Maher's research interests include biomarker discovery, the lung microbiome and host immune response in the pathogenesis of IPF and clinical trials in fibrotic lung disease. He has been actively involved in the running of over 45 trials in fibrotic lung disease. Professor Maher is an associate editor for the American Journal of Respiratory and Critical Care Medicine. He is on the editorial board of the European Respiratory Journal and European Respiratory Review as well as the International Advisory Board for Lancet Respiratory Medicine. He has authored over 200 papers and book chapters on IPF and ILD.

Dr Anke-Hilse Maitland-van der Zee, PharmD, PhD, was educated as a pharmacist, clinical pharmacologist and epidemiologist. She obtained her PhD at Utrecht University in 2003, and worked as a postdoc in the Human Genetics Center, University of Texas, Houston Texas, USA from 2003-2005. From 2005-2016 she worked at the division of Pharmacoepidemiology and Clinical Pharmacology of Utrecht University, first as an assistant-Professor and later as an associate-Professor of Personalized Medicine. In 2016 she became a full Professor of Precision Medicine in Respiratory Disease at the Academic Medical Center (AMC) in Amsterdam. She is also Head of the research group at the Respiratory Medicine Department and of the Pediatric Respiratory Medicine and Allergy Department in the AMC. Dr Maitland-van der Zee's current research focusses on patient, environmental characteristics and molecular biomarkers (genome, epigenome, transcriptome, microbiome, metabolome) that can predict the optimal treatment for the individual patient with respiratory disease. She is the PI of several large (international) studies. She is the Vice-President of the European Association of Systems Medicine (EASYM), the President of the Federation Innovative Drug Research in the Netherlands (FIGON), Secretary/ Treasurer of the Netherlands Society of Clinical Pharmacology and Biopharmacy (NVKFB) and the President of the Netherlands Respiratory Society (NRS). She has published >200 peer reviewed articles, delivered 13 PhD fellows and 17 are currently working under her supervision. She has obtained many research grants from governmental, charity and industrial funds.

Professor Stefan Marciniak, MA, FRCP, PhD, is Professor of Respiratory Science at the University of Cambridge where his laboratory studies the role of abnormal protein folding in lung disease. He is an Honorary Consultant Respiratory Physician at Addenbrooke's and Papworth Hospitals with a clinical focus on pleural medicine including familial pneumothorax.
http://www.med.cam.ac.uk/marciniak/

Dr Vidan Masani is a Consultant Respiratory Physician in the Royal United Hospital, Bath, where he was appointed in 2004 after graduating from The Royal Free Hospital School of Medicine. He is the current Chair of the BTS Lung Cancer and Mesothelioma Specialist Advisory Group.

Dr Liza McCann is Consultant Paediatric Rheumatologist at Alder Hey Children's NHS Hospital Liverpool, where she has worked for the last 14 years. She has a research interest and expertise in juvenile dermatomyositis (JDM) and is the Chair of the Paediatric Rheumatology European Society (PReS) JDM Working Group. She sits on the Steering Committees of Euromyositis and the International Myositis Assessment and Clinical Studies (IMACS) group.

Professor Miriam F Moffatt is Professor in Respiratory Genetics based at the National Heart and Lung Institute, Imperial College London. Following a first degree in microbiology, she has worked in the field of complex disease genetics and genomics over the last 30 years. She is a leader in large scale genome wide association studies of asthma, showing the central importance of the mucosa in asthma and identifying genes that are targeted by new asthma therapies. She and her long-standing research partner William Cookson, were the first to find that the normal lungs support a characteristic microbiome, with implications for many respiratory diseases.

Professor Mary Morrell is Professor of Sleep and Respiratory Physiology, National Heart and Lung Institute, Royal Brompton Hospital, Imperial College London. Her research focuses on the causes and consequences of sleep disordered breathing; particularly the impact of intermittent hypoxia on the brain. The aim of her research group is to translate physiological research into improvements in patient care. Recently, she developed a UK respiratory-sleep network facilitating multi-centre trials. The network has previously completed a trial to determine the impact of treating OSA in older people, and more recently the

treatment of mild OSA. Professor Morrell has served on the American Thoracic Society Board of Directors, the Physiological Society Executive Board and she is a Past-President of the British Sleep Society.

Professor Nick Morrell is the British Heart Foundation Professor of Cardiopulmonary Medicine at the University of Cambridge and Head of the Division of Respiratory Medicine in the Department of Medicine. He is a Clinician Scientist with a research focus in pulmonary arterial hypertension. His research approach to identifying disease mechanisms and new treatments for this condition includes genetics, epidemiology, structural biology, stem cells, cell biology, cell-based models of disease, preclinical animal models, biomarker identification and experimental medicine. He has published over 250 research articles in this field and has held a BHF Programme Grant continuously since 2001. In addition, he has been the recipient and principal investigator on major awards including MRC Experimental Challenge (2013) and MRC Experimental Medicine Awards (2006), a Fondation Leducq Transatlantic Network of Excellence Award (2011), as well as a personal BHF Chair Award (since 2009). Professor Morrell's research group is best known for determining how mutations in the bone morphogenetic protein type II receptor (BMPR-II) cause the majority of cases of heritable pulmonary arterial hypertension via loss of bone morphogenetic protein signalling. He is a National Institute of Health Research Emeritus Senior Investigator and was elected to the Fellowship of the Academy of Medical Sciences in 2011.

Dr Jeremiah Chakaya Muhwa is a graduate of the University of Nairobi where he obtained his basic degree in medicine and surgery (MBChB) in 1985 and a master's degree in medicine specializing in internal medicine in 1992. He received further training in respiratory medicine from the University of London at the National Heart and Lung Institute, Royal Brompton Hospital in London and Kyorin University Hospital in Tokyo Japan. Since qualifying as a respiratory physician, Dr Muhwa has served in many positions including as a Director of the Centre for Respiratory Diseases Research at the Kenya Medical Research Institute, the Head of the National TB and Leprosy Programme of the Ministry of Health, Chair of the DOTS Expansion Working Group of the Stop TB Partnership, Vice Chair of the Stop TB Partnership Coordinating Board, Chair of the Strategic and Technical Advisory Group for TB (STAG-TB) of the World Health Organization, member of the board of the International Union Against TB and Lung Disease (IUATLD or the Union) and is currently the President of this organisation. He has also served as a member of the Global Fund's Technical Review Panel where he was chair between August 2017 and July 2019. Dr Muhwa is a founder member of the Kenya Association for the Prevention of Tuberculosis and Lung Disease, which recently rebranded to the Respiratory Society of Kenya (ReSoK) and has served in various capacities in this organization including serving as the Chief Executive Officer, Technical Director and Head of the Research Unit. He currently serves on the Executive Committee of the Pan African Thoracic Society. In all these roles Dr Muhwa is driven by his passion to advance lung health not only in Kenya but across low- and middle-income countries.

Dr Mohammed Munavvar has been a Consultant Chest Physician/Interventional Pulmonologist at Lancashire Teaching Hospitals, Preston, UK for 20 years. He is President-Elect, British Thoracic Society, President of the European Association of Bronchology and Interventional Pulmonology, active in the Educational Committee of the World Association of Bronchology, Editorial Board of the Journal of Bronchology and Regional Speciality Adviser for RCP London. He was Regional Adviser, RCP Edinburgh for seven years.

Dr Munavvar has been the founder/organiser of the Preston Basic Bronchoscopy course for over 15 years, BTS Interventional Bronchoscopy/Thoracoscopy course for more than 10 years, and The Semirigid Thoracoscopy Course at Preston. He has been an active faculty member at the ERS and EABIP Interventional Bronchoscopy courses at Athens/Ancona/Lille. He Chaired the BTS Basic Bronchoscopy Guideline Development Committee, has been a council member of the British Thoracic Society and member of the BTS Education and Training Committee for two terms.

Dr Katie Myers Smith is a Senior Research Fellow and Chartered Health Psychologist with a track record in health behaviour change related to smoking cessation and weight management. Since 2005 she has worked in the Wolfson Institute of Preventive Medicine, Barts and The London School of Medicine and Dentistry. Dr Myers Smith has been involved in the development and management of the research projects undertaken at the Health and Lifestyle Research Unit (HAL), including the recently published large randomised study looking at smoking cessation using e-cigarettes.

Dr Alexandra Nanzer, PhD, is a Consultant Respiratory Physician at Guy's Severe Asthma Centre, Guy's and St Thomas' NHS Foundation Trust. She obtained a PhD at the MRC and Asthma UK Centre at King's College London, in collaboration with the Blizard Institute at Barts and The London School of Medicine and supported by Asthma UK. She has a specialist interest in the adverse metabolic, skeletal and psychological effects of steroid therapy in severe asthma as well as asthma in the young adult and leads the King's Health Partners Asthma Transition Clinic alongside her paediatric colleagues at King's College Hospital.

Dr Neal Navani, MA, MSc, PhD, FRCP, qualified in Medicine from Cambridge and UCL in 2000 with distinction and several University prizes. He trained in Respiratory Medicine at the Brompton and Hammersmith Hospitals before winning a Medical Research Council Fellowship in 2008 and completing his PhD at UCL in 2011. He has also completed an MSc in Clinical Trials and Biostatistics at the London School of Hygiene and Tropical Medicine.
Dr Navani is lead clinician for the lung cancer and interventional bronchoscopy services at UCLH, co-lead of the UK National Lung Cancer Audit and is the respiratory representative on the current NICE lung cancer guideline and quality standards. Dr Navani is also an Associate Professor at UCL. He is a co-applicant on >£3m of grant funding and holds a CRUK grant for the early diagnosis of lung cancer. In August 2019, Dr Navani won a prestigious MRC/NIHR fellowship to research novel predictors of cancer in lung nodules.
https://scholar.google.co.uk/citations?hl=en&pli=1&user=3So-2IsAAAAJ
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Dr Chad A Newton is an Assistant Professor of Internal Medicine at the University of Texas Southwestern Medical Center in Dallas, Texas, USA. He has a clinical and research interest in interstitial lung diseases with a focus on discovering and characterizing clinically useful genomic biomarkers that inform disease course and response to therapy.

Professor George T O'Connor, MD, MS, is Professor of Medicine in the Division of Pulmonary, Allergy, Sleep and Critical Care Medicine at Boston University School of Medicine. He has been the Boston University PI of many NIH-sponsored multi-centre studies including the Inner-City Asthma Consortium, the Sleep Heart Health Study, the Feasibility of Retinoid Treatment for Emphysema, and the Vitamin D Antenatal Asthma Reduction Trial. He also conducts research at the Framingham Heart Study. He is the JAMA Associate Editor for Pulmonary Disease and Allergy.

Dr Emma O'Dowd is a Respiratory Consultant at Nottingham University Hospitals NHS Trust and Honorary Assistant Professor at the University of Nottingham, with a research interest in lung cancer screening and early diagnosis. She is also a member of the National Cancer Research Institute Screening, Prevention and Early Diagnosis (SPED) Advisory Group and the British Thoracic Society Lung Cancer and Mesothelioma Specialist Advisory Group.

Dr Anne O'Garra is an Associate Research Director, and Senior Group Leader, Laboratory of Immunoregulation and Infection, at The Francis Crick Institute, London. She obtained her PhD at the MRC National Institute for Medical Research (NIMR), London, in microbial biochemistry then changed fields in her Postdoctoral Fellowship to work on cytokines and the immune response in the Division of Immunology, NIMR. After a short Postdoctoral Fellowship at the DNAX Research Institute (now Merck), California, USA (1987 – 2001), she soon became an independent Group Leader and in the next years directed her laboratory in defining key functions and mechanisms for cytokine expression and function in the immune response. Dr O'Garra identified IL-10 as a major regulator of immune responses by its effects on macrophages and dendritic cells at the level of antigen presentation and cytokine production. She also showed that microbial products stimulate the production of IL-12 and IL-18 to direct Th1 responses and the production of IFN-g, critical for eradication of intracellular pathogens. In turn, she showed IL-10 as a feedback regulator to inhibit damage to the host, but conversely contributing in other contexts to chronic infections. She was recruited back to the NIMR in 2001, and formed the new Division of Immunoregulation, NIMR, (2001) which now forms part of the Francis Crick Institute, to interface the divisions of immunology and infectious diseases, continuing research on immunoregulation, also with major emphasis on the immune response in tuberculosis, in mouse models where she demonstrated that IL-10 can exacerbate TB and in human disease. In keeping with this, in a landmark study published in 2010, Dr O'Garra demonstrated a transcriptional signature of active

tuberculosis dominated by type I interferon inducible genes, which she has shown contributes to chronic disease in part by induction of the suppressive cytokine IL-10 and inhibition of IL-12. More recently her lab and collaborators have published a reduced blood signature of active TB which does not detect other lung diseases. This signature was detected early after infection, transiently in a proportion of TB contacts who remained healthy, but stably expressed in contacts of TB patients who progressed to active TB.
Dr O'Garra was elected as a Fellow of the Academy of Medical Sciences, UK in 2005; as a Fellow of the American Association for the Advancement of Science, 2006; as a Fellow of the Royal Society, UK in 2008; and as a member of EMBO in 2009. She is a member of many scientific advisory boards to research institutions world-wide, and an Editor of the Journal of Experimental Medicine. She has given numerous named lectureships and colloquium talks at major academic institutions and conferences in the UK, the US and abroad. Of relevance to promoting careers of women in science, a few examples are: The Almroth-Wright lecture, St Mary's Hospital, NHLI, Imperial College, 2003; Eberly Distinguished Lecture, University of Pittsburgh, 2013; Distinguished Lecture, 99th annual AAI conference, Boston, 2013; Keynote Speaker, Science and Career in Science, UCL PhD Colloquium, 2014; 55th JS and HR Blumenthal Memorial Lecture, University of Minnesota, 2017; Plenary Lecture, University of Bonn, Symposium for Women-InScience, 2017; Dorothy Jones Memorial Lecture, University of Leicester, celebration of International Women's Day, 2018.

Professor Jean-Louis Pépin is Professor of Clinical Physiology and Head of the Clinic of Physiology, Sleep and Exercise at Grenoble University Hospital. He is Director of the HP2 Laboratory (Inserm U1042, UGA: Hypoxia Pathophysiology), vice-Dean of the Faculty of Medicine in charge of research and Scientific Director of Clinical Research at CHUGA. His interests include clinical and translational research on cardiovascular consequences of chronic and intermittent hypoxia and sleep apnoea. He runs the French National Registry of Sleep Apnoea (> 120,000 subjects) and is involved in the European Sleep Apnoea Database (ESADA). He is author or co-author of > 420 scientific publications (index H=57).

Dr Felicity Perrin is a Respiratory Consultant and leads the TB/NTM service at King's College Hospital. She undertook an MD in TB and has been involved in trials of new TB agents and regimens. She is a member of the BTS Tuberculosis Specialist Advisory Group. Her specialist interests are TB, NTM and adult cystic fibrosis.

Professor Annette Peters is Director of the Institute of Epidemiology at the Helmholtz Zentrum München and Professor of Epidemiology at the Ludwig-Maximilians-Universität in Munich, Germany. She studied biology and mathematics in Germany and epidemiology at the Harvard School of Public Health and has pioneered work identifying the link between ambient particulate matter and cardiovascular disease. As head of the KORA cohort in Augsburg and the German National Cohort, her research focus today is to understand the role of epigenetics, metabolism and immune activity in the interaction of genes and environment. In 2019, she received the prestigious John Goldsmith Award for her achievements in the field of environmental epidemiology.

Professor Hilary Pinnock is Professor of Primary Care Respiratory Medicine, University of Edinburgh, and a GP, Whitstable, Kent. Her research interests focus on delivery of care including implementing supported self-management for asthma, telehealthcare for monitoring respiratory disease, and supportive care for people with severe COPD. She is actively involved with the European Respiratory Society, the International Primary Care Respiratory Group, the Primary Care Respiratory Society and the BTS/SIGN Asthma Guideline.

Dr Manuela Platé is a Senior Post-doctoral Research Associate at the Centre for Inflammation and Tissue Repair in the UCL Respiratory Department at University College London, UK. Her research is focussed on the use of cutting-edge technology such as laser capture microdissection and NGS to delineate the genetic, epigenetic and transcriptional profiles of the epithelium and fibrotic foci in idiopathic pulmonary fibrosis (IPF). Her current work also focusses on the potential application of a liquid biopsy to the study of IPF. Furthermore, Dr Platé is interested in studying the contribution of mTOR in IPF pathomechanisms. She also sits on the Committee for the British Association for Lung Research.

Dr Valérie Quesniaux completed a PhD in Biochemistry in France and post-doctoral fellowships at the Max Planck Institute for Immunobiology, Freiburg, Germany, after which she worked for 12 years at Novartis Pharma Basel, Switzerland on

immunosuppressants and anti-inflammatory drugs. Back to public research in 2000, she is now Research Director heading the research unit UMR7355 'Experimental and Molecular Immunology and Neurogenetics' at CNRS, Orleans, France. Her research interests extend to the immune responses involved in lung inflammation, and host-pathogen interactions, in particular in tuberculosis. Her lab analysed the role of TLRs, inflammasomes, and, more recently DNA sensing by cGAS/STING pathway, as well as TNF, IL-1, or IL-17 in these conditions. Dr Quesniaux is former coordinator of the European project "TB REACT" and contributes to several European, national or international research projects, including an International Associated Laboratory "TB Immunity" with the University of Cape Town, South-Africa (2007-2014), and a second one on "Lung Inflammation" with the University of Sao Paulo, Brazil (since 2012).

Dr Jennifer Quint is a Reader in Respiratory Epidemiology at the National Heart and Lung Institute, Imperial College and Honorary Consultant Physician in Respiratory Medicine at the Royal Brompton Hospital, London. Dr Quint's research interests centre on the use of electronic health records to study respiratory and cardiovascular diseases, including bronchiectasis, asthma and chronic obstructive pulmonary disease (COPD). In addition, she is involved in clinical work and is active on a number of international committees. She is currently the Information Governance Trustee for the British Thoracic Society.

Professor Najib M Rahman runs the Oxford Pleural Unit, Directs the Oxford Respiratory Trials Unit and conducts research in pleural disease at the Oxford Centre for Respiratory Medicine. Having qualified in Oxford he underwent the medical SHO rotation at Queen's Medical Centre, Nottingham, and re-joined Oxford as a Specialist Registrar in 2003. He undertook a DPhil and MSc in this period and was appointed Senior Lecturer and Director of the Oxford Respiratory Trials Unit, Consultant and Lead for Pleural Disease in Oxford in 2011. He was appointed as Associate Professor in 2014 and Professor of Respiratory Medicine in 2018. Professor Rahman is currently involved in randomized and observational studies in pleural infection, pneumothorax and malignant pleural effusion intervention. He is trained in thoracoscopy, thoracic ultrasound and clinical trials methodology, and has published over 180 papers with citations of >6000.

Mrs Kelly Redden-Rowley is a Respiratory Physiotherapist and Service Lead for Sandwell Community Respiratory and Heart Failure Service for Sandwell and West Birmingham NHS Trust. She developed and implemented the community respiratory service in Sandwell, which has been operating since 1997. Mrs Redden-Rowley is involved with the BTS Workforce and Service Development Committee, the West Midlands Respiratory Expert Advisory Group, the Quality Review Service and is Chair of the West Midlands Pulmonary Rehabilitation Network. She was the former chair of the Association of Chartered Physiotherapists in Respiratory Care and was also part of the Royal College of Physician's Future Hospitals Programme. Her main interests are the development of integrated respiratory care services and pulmonary rehabilitation.

Dr Chris Rhodes is a BHF Intermediate Fellow and Lecturer in Pulmonary Vascular Diseases at Imperial College London. Based at the Hammersmith campus, his group focuses on defining clinical phenotypes using high throughput 'omics techniques. By identifying the biological pathways associated with disease progression they aim to characterise novel therapeutic strategies.

Dr Katy Roach is a Senior Researcher in the Department of Respiratory Sciences at the University of Leicester. Her research focuses on the pathophysiology of idiopathic pulmonary fibrosis, understanding the mechanisms of TGFb1-mediated tissue remodelling and discovering new ways in which we can model this disease in human tissue.

Dr Elizabeth Sapey is a Reader within the Institute of Inflammation and Ageing and an Honorary Respiratory Consultant Physician at the Queen Elizabeth Hospital, Birmingham. Her research interests focus on non-communicable inflammatory diseases associated with ageing, and the impact of inflammation in an ageing host during hospitalization.
Dr Sapey's interests span translational science, physiological testing and delivering new or repurposed therapies into clinical trials. Her translational science focuses on neutrophil biology, strongly implicated in ageing, COPD related tissue damage and susceptibility to bacterial infections.
Dr Sapey is passionate about increasing participation in translational research, by scientists, health care professionals and patients, so that scientific advancements/changes in clinical practice reflect our diverse population. She is Chair of the British Thoracic

SPEAKERS' BIOGRAPHICAL DETAILS

Society Science and Research Committee and Managing Director of the NIHR Clinical Research Facility in Birmingham, a state-of-the-art clinical research facility.

Dr Chris Scotton is a Senior Lecturer in Lung Pathobiology and Head of the Respiratory Medicine Group at the University of Exeter, and also holds an honorary appointment at UCL. His current research focuses on interstitial lung disease, COPD and bronchiectasis. Through close links with the clinic and external collaborators, Dr Scotton is investigating novel therapeutic opportunities and biomarkers. He is Chair of the British Association for Lung Research, and also sits on the Scientific Committee of the British Lung Foundation and the Science and Research Committee of the British Thoracic Society.

Dr Thomas Semple is a Consultant Cardiothoracic and Paediatric Radiologist at The Royal Brompton Hospital. He completed his radiology training on the University College London training scheme before undertaking an academic fellowship at The Royal Brompton under the supervision of Professors Padley, Hogg and Davies.
Working in close collaboration with Dr Catherine Owens at Great Ormond Street Hospital, Dr Semple's clinical and research interests include childhood interstitial lung disease imaging, ventilation and pulmonary perfusion MRI, neonatal respiratory-gated CT and implementation and optimization of paediatric cardiac CT, particularly for neonatal coronary imaging.

Dr Anand Shah is a Consultant Respiratory Physician at the Royal Brompton and Harefield NHS Foundation Trust specialising in adult cystic fibrosis, bronchiectasis and pulmonary fungal infection. He is also an Honorary Clinical Senior Lecturer at Imperial College London and has an active research interest with a number of ongoing projects focussed on understanding the host immune response to lung infection with a specific interest in fungal pathogens and also defining and managing antimicrobial resistance in chronic lung disease.

Professor Claire Shovlin is Professor of Practice (Clinical and Molecular Medicine) at Imperial College London, based at Hammersmith Hospital. Since 1999, she has run in parallel, national clinical services, and research programmes focussing on patients with inherited vasculopathies, particularly pulmonary arteriovenous malformations (PAVMs) and hereditary haemorrhagic telangiectasia (HHT) where she is the National and European lead (https://vascern.eu/vascern-spotlights-professor-claire-shovlin/). With a first degree in Genetics (Cambridge 1984), she chairs the Genomics England Respiratory GeCIP and HHT/PAVM subdomains. Current laboratory research foci include identification of new pathogenic vasculopathy genes via the 100,000 Genomes Project, and therapeutic reversal of molecular defects that cause HHT.

Dr Sarah Sibley is a Consultant Respiratory Physician and Community Respiratory Clinical Lead at Liverpool Heart and Chest Hospital. Over the last seven years she has led and developed the award winning 'Knowsley Community Respiratory Service' delivering integrated care services for the local population. More recently she has been working in partnership with NHSE/I, Rightcare, HEE and others, leading work across the North of England and Cheshire and Merseyside to reduce care variation and improve health outcomes.

Dr Gerard Silvestri, MD, MS, FCCP, is the George Sr and Margaret Hillenbrand Professor of Thoracic Oncology, Division of Pulmonary and Critical Care Medicine at the Medical University of South Carolina. He completed his training in pulmonary and critical care at Dartmouth. He has an advanced degree in the evaluative clinical sciences, also from Dartmouth. He is widely regarded as an international expert in lung cancer and procedures related to the management of that disease. His research includes screening for lung cancer, lung nodule evaluation, diagnosis and staging of lung cancer and technology assessment. Dr Silvestri is a writer and editor of the American College of Chest Physicians Lung Cancer Guidelines. He is a past president of the American Association of Bronchology and Interventional Pulmonology. Dr Silvestri has authored more than 200 scientific articles, book chapters and editorials. He has served on multiple editorial boards of medical journals and currently serves on the editorial board of the journal Chest. Dr Silvestri was the president of the American College of Chest Physicians in 2017.

Professor Angela Simpson is Professor of Respiratory Medicine at University of Manchester and an Honorary Consultant Respiratory Physician at Manchester University NHS Foundation Trust (Wythenshawe Hospital). Her research focusses on early life risk factors for asthma and allergies, in particular phenotypes, endotypes and genetic

epidemiology. She has published >180 peer reviewed original papers and reviews in academic journals and has an H-index of 52 with >9000 citations.

Professor John Simpson is Professor of Respiratory Medicine at Newcastle University and Director of the NIHR Newcastle In Vitro Diagnostics Co-operative. His research group studies ways of restoring the acquired disruption in innate immunity that develops in critically ill patients, with a view to developing better treatments and diagnostics that may improve outcomes in conditions such as sepsis and ventilator-associated pneumonia (VAP) while simultaneously reducing unnecessary antibiotic use.

Dr Aran Singanayagam is a Senior Clinical Research Fellow at Imperial College and Honorary Consultant in Respiratory Medicine at the Royal Brompton and Harefield NHS Trust. He qualified from the University of Edinburgh Medical School in 2005. Dr Singanayagam's research programme employs a combination of in vitro and in vivo disease models to understand how pulmonary host-defence is dysregulated in the context of inflammatory airway diseases. He has published extensively in this area (h-index 33) and has received international awards for his research. He sits on the Editorial Board of the European Respiratory Journal.

Dr Richa Singh is a Consultant Respiratory Physician and Honorary Senior Lecturer at the Royal London Hospital and Queen Mary University, London. Dr Singh's area of interest is COPD. She completed her PhD at Imperial College, London, under the supervision of Professor Jadwiga Wedzicha and Professor Louise Donnelly, focusing on the mechanisms and consequences of bacterial colonisation in COPD. She currently leads the severe COPD service and is involved in developing the integrated COPD service within Tower Hamlets and improving access to clinical research trials for patients in both primary and secondary care. Dr Singh is an active member of both the British Thoracic Society and the European Respiratory Society.

Professor Alan Smyth is Professor of Child Health at the University of Nottingham and Honorary Consultant in Paediatric Respiratory Medicine at Nottingham University Hospitals NHS Trust. His major research interests include the treatment of infection in cystic fibrosis – improving effectiveness and reducing long term toxicity. He has also highlighted the problem of delayed publication of clinical trial results. His current work includes a James Lind Alliance Priority Setting Partnership, to promote patient priorities for clinical research in cystic fibrosis. Professor Smyth is Co-ordinating Editor of the Cochrane Cystic Fibrosis and Genetic Disorders Group and Joint Editor in Chief of Thorax. When not working, he is a keen cyclist and pilot.

Dr Karl Staples is an Associate Professor in Translational Medicine at the University of Southampton Faculty of Medicine. His research focuses on host-pathogen interactions in chronic inflammatory airways diseases, such as asthma and chronic obstructive pulmonary disease (COPD), and the contribution of these interactions to exacerbations of these respiratory conditions. To study these interactions, he has developed novel ex vivo models of bacterial and viral infection using human lung cells and tissue. Dr Staples is the Meetings Secretary of the British Association for Lung Research.

Professor Michael Steiner is Professor of Respiratory Medicine at University of Leicester, Honorary Consultant Respiratory Physician at University Hospitals of Leicester, and Honorary Clinical Professor at Loughborough University. His sub-speciality clinical interests include management of advanced COPD, lung volume reduction therapies, sleep and home non-invasive ventilation. His research interests focus on chronic disease management and quality improvement in COPD with particular expertise in exercise performance, physical training, pulmonary rehabilitation, nutrition and skeletal muscle dysfunction. He was clinical lead for the Pulmonary Rehabilitation component of the National COPD Audit Programme 2013-18. He is the current Chair of the BTS Quality Improvement Committee.

Dr Luigi Taranto-Montemurro is an Italian physician-researcher who received his MD degree at Brescia University (Italy) in 2006. After medical school, he obtained specialty training in respiratory and sleep medicine. In 2010 and 2011, he worked as a researcher at Toronto University focusing on the cardiovascular consequences of obstructive sleep apnoea. From January 2015 onward, he became part of Dr Andrew Wellman's research laboratory at Brigham and Women's Hospital and Harvard Medical School in Boston. His work at Harvard is focused on upper airway muscle activity during sleep and on research for a pharmacological treatment for OSA.

SPEAKERS' BIOGRAPHICAL DETAILS

Professor Robert Tarran received his BSc (Hons) from the University of Leeds and his PhD in Physiology from Newcastle University. He completed post-doctoral research at the University of North Carolina at Chapel Hill and the University of California at Berkley. Professor Tarran is currently a faculty member of the Department of Cell Biology and Physiology at UNC-Chapel Hill, and is a member of UNC's Lineberger Cancer Center and Marsico Lung Institute. His research interests have centered on the role of ion channels in chronic lung diseases including CF, COPD and asthma. Over the last five years, he has been studying the effects of e-cigarettes on the lung.

Dr Amanda Tatler is tenured Senior Research Fellow within the Division of Respiratory Medicine at the University of Nottingham. Her research is focused upon understanding the mechanisms driving tissue remodelling in respiratory diseases. She has undertaken periods of post-doctoral training at the University of Nottingham, University of California San Francisco and Harvard Medical School. She has a keen interest in novel ex vivo tissue models of disease and her current work aims to develop a "breathing" precision cut lung slice model. Additionally, Amanda's group are investigating novel molecular mechanisms contributing to both the development of asthmatic airway remodelling and the progression of pulmonary fibrosis. Dr Tatler sits on the Scientific Committee of the British Lung Foundation and is Secretary of the British Association for Lung Research, having served on their committee since 2012.

Dr Rachel Thomson, MBBS, Grad Dip (Clin Epi), PhD, FRACP, Associate Professor, is a Thoracic Physician and Lead of the Bronchiectasis and Mycobacterial Diseases Research Group at the Gallipoli Medical Research Institute, University of Queensland. She conducts specialised mycobacterial clinics at Greenslopes Private, The Prince Charles and Princess Alexandra Hospitals. She has an international reputation for her research into lung disease due to nontuberculous Mycobacteria, currently focussing on immunological and environmental aspects of susceptibility to NTM infection, characteristics of the lung microbiome in NTM, and improving treatment outcomes.

Dr Rebecca Thursfield is a Consultant in Paediatric Respiratory Medicine at Alder Hey Children's NHS Trust. Following undergraduate training in Liverpool, she trained in respiratory paediatrics in London and completed an MD(Res) in the inflammation of airways of children with cystic fibrosis at the Royal Brompton Hospital, London. Dr Thursfield's particular interests include cystic fibrosis, bronchiolitis obliterans and respiratory complications of children with trache-oesophageal fistula. She has developed a respiratory physiology service and jointly leads this service. She also has a particular interest in clinical research.

Dr Simon Tiberi is a Consultant Physician and Honorary Senior Lecturer in Infectious Diseases at Barts Health NHS Trust and Queen Mary University of London. He works in three hospitals in East London working in infection and tuberculosis clinics. Dr Tiberi is a Clinical Advisor to the British Thoracic Society Multidrug Resistant Tuberculosis Clinical Advisory Service. He is also TB Secretary for the European Respiratory Society and Vice Chair of the Global TB Network Consilium.
Dr Tiberi's research interests focus on mycobacteria and respiratory infections. He is currently involved in a number of clinical trials, translational and health service research programmes. Dr Tiberi has published over 90 papers and several book chapters. He is Course Director of the Queen Mary University of London TB Certificate Programme.

Dr Selina Tsim is a Macmillan Consultant Respiratory Physician at the Queen Elizabeth University Hospital in Glasgow. She has a specialist interest in pleural disease, mesothelioma and lung cancer. Dr Tsim was awarded a PhD at the University of Glasgow in 2018 for her thesis examining imaging and blood biomarkers in mesothelioma.

Dr Chris Turnbull is a Clinical Lecturer and Respiratory Registrar at the University of Oxford and the Royal Berkshire Hospital. He undertook his DPhil and sub-speciality training in sleep medicine under the supervision of Professor Stradling and Dr Nickol. His main research interest is in understanding the physiological mechanisms of cardiovascular and metabolic disease in OSA.

Dr Don Urquhart is Consultant and Honorary Senior Lecturer in Paediatric Respiratory and Sleep Medicine in Edinburgh. Dr Urquhart has a long-standing clinical and research interest in exercise. He has completed clinical trials and investigator-led studies of exercise in patient groups including children with cystic fibrosis and spinal surgery patients.

Dr Mark Velangi is a Consultant Paediatric Haematologist in Birmingham Children's Hospital. He graduated from Edinburgh University in 1991 and

subsequently trained in haematology in Newcastle and Birmingham. He is the Clinical Lead for the West Midlands Children's Haemoglobinopathy Network and the Joint Paediatric Lead for the Haemoglobinopathy National Quality Review Programme. He has a particular interest in acute complications of sickle cell disease.

Dr Colin Wallis is a Consultant in Paediatric Respiratory Medicine at Great Ormond Street Hospital for Children (GOSH). He received his undergraduate training at the University of Cape Town and, after completing an MD degree, joined the paediatric registrar rotation at the Red Cross Children's Hospital in Cape Town. After additional jobs in the UK, and further experience in Canada, he joined the respiratory team at GOSH in 1993.
Dr Wallis has a specific interest in the care and management of children with chronic lung disease, cystic fibrosis, and the child on long term ventilation. He is the respiratory representative on the GOSH national tracheal service. He has led the achondroplasia service at GOSH for the last 25 years.
Dr Wallis is a senior examiner for the RCPCH and Associate Editor for the ADC. He has published over 125 articles in peer-reviewed journals and is the author of several chapters in leading paediatric respiratory texts.

Dr Sarah Walmsley is a Wellcome Senior Clinical Fellow and Professor of Respiratory Medicine at the University of Edinburgh. Her research interests focus on how oxygen sensing and metabolic regulation influence neutrophilic inflammation with consequence for inflammatory lung disease.

Professor Athol Wells graduated at Otago University in 1979, trained in New Zealand, and eventually moved to the UK permanently in 1999 and regrets not having done this 10 years earlier. He was given professorial status in 2005 and has focused in clinical research in ILD for the last 20 years (including diagnosis, prognostic evaluation and functional-morphologic relationships). He has recently been honoured by an ERS life-time award but does not see this as an indication that he should retire in the near future! He is very active in guideline groups and has nearly 500 peer-reviewed articles and editorials/review articles.

Dr Sophie West is a Respiratory Consultant at Newcastle upon Tyne NHS Foundation Trust and leads the Newcastle Regional Sleep Service. Her research interests are in OSA and the impact of CPAP on co-morbid conditions, such as insulin resistance, type 2 diabetes and diabetic retinopathy. Dr West is on the NICE Sleep Disordered Breathing Clinical Guidelines Committee. With the OSA Partnership Group, she has a keen interest in ensuring accurate driving advice to people with OSA.

Dr Jo Whitehouse became a Respiratory Consultant at Birmingham Heartlands Hospital in 2004 and practices general respiratory medicine and cystic fibrosis. In 2005, she started multidisciplinary clinics for non-CF bronchiectasis and took over joint clinics for immunodeficiency patients with respiratory symptoms. She has been CF Centre Director since 2011 and lead on CF non-CF bronchiectasis for the Trust.

Professor Tom Wilkinson is Professor of Respiratory Medicine at the University of Southampton, Faculty of Medicine and Honorary Consultant at University Hospitals Southampton. He trained at the University of Cambridge and Barts and the London School of Medicine and completed his PhD at UCL studying disease mechanisms driving infective exacerbations of COPD. He is lead of the Southampton COPD research group, and respiratory theme lead for the NIHR Wessex CLAHRC.
Professor Wilkinson's research seeks to improve understanding of the mechanisms which drive susceptibility to respiratory infections and exacerbations in patients with chronic lung disease, and to develop new vaccines and therapies to impact on these. He has served as co-chair of the British Thoracic Society Home Oxygen Guidelines Standards of Care Committee, is associate editor for the journal Thorax, a member of the BTS COPD Specialist Advisory Group and co-founder of the health technology company myMHealth. Professor Wilkinson has published over 80 peer reviewed papers and reviews on airways disease, exacerbations and airway immunology. His work has been recognised by National and International Awards including the Maurizio Vignola Award for Innovation in Respiratory Medicine in Europe by the ERS.

Dr Hannah Woodcock is an NIHR Academic Clinical Lecturer and Respiratory SpR at UCL. She recently completed a PhD under the supervision of Professor Rachel Chambers on idiopathic pulmonary fibrosis. Her research focussed on understanding the molecular mechanisms and signalling pathways involved in driving fibrosis, with a particular emphasis on the PI3K/mTOR signalling axis.

EXHIBITORS' INFORMATION

Action for Pulmonary Fibrosis — Stand: Q

Action for Pulmonary Fibrosis is a national charity that was set up in 2013 by patients, family members and medical specialists. Our vision is to find a cure for pulmonary fibrosis so that everyone affected by the disease has a better future. We provide support to patients and their families, raise awareness, campaign and educate to improve access to the highest standard of care for everyone affected. We are committed to finding a cure through funding research.
Please visit our website for more information.

Tel: 01543 442 152
Email: info@actionpulmonaryfibrosis.org
Website: www.actionpulmonaryfibrosis.org

Aquilant — Stand 36

Aquilant is proud to be the UK's sole distributor of Fujifilm endoscopy products in the UK.
The latest 7000 series processor utilises innovative 4-LED multi light technology, and the bronchoscope range features Super CCD and anti-blur technology along with close focus and advanced observation modes Blue Light Imaging (BLI) and Linked Colour Imaging (LCI). Fujifilm's category leading forward viewing EBUS endoscopes, Synapse 3D navigation platform and miniprobe ultrasound system also complement the range, providing clinicians with unsurpassed endoscopic visualisation for detection and characterisation.
Our vision is to be recognised as commercially innovative, patient focussed and ultimately, as your partner of choice.
Membership of the Healthcare 21 Group provides the solid foundation required for us to continue investing in the long-term development of the business.

Tel: 01256 365 456
Email: contactus@aquilantservices.com
Website: www.aquilant.net

Association for Respiratory Technology and Physiology (ARTP) — Stand: F

The Association for Respiratory Technology and Physiology (ARTP), through standards of training and quality assurance, are the professional guardians of physiological measurement issues in respiratory medicine in the UK. With over 35 years of experience in the design and delivery of lung function services, ARTP provides the only national, professionally recognised, qualifications in respiratory function testing and spirometry in the UK.
ARTP also recommends standards for the design and delivery of lung function services through position papers from ARTP Working Groups on the structure, function and content of lung function facilities in the UK.
An important function of the ARTP is the provision of opportunities for Continuing Professional Development. The ARTP organises meetings and courses on many respiratory topics.

Tel: 01543 442 141
Email: admin@artp.org.uk
Website: www.artp.org.uk

Association of Chartered Physiotherapists in Respiratory Care (ACPRC) — Stand: G

ACPRC is a national body of physiotherapists interested in all aspects of respiratory care, with over 1000 members. The ACPRC aims to promote health and best practice in respiratory physiotherapy for the benefit of all.

Email: secretary@acprc.org.uk
Website: www.acprc.org.uk
Twitter: @theacprc

Association of Respiratory Nurse Specialists (ARNS) — Stand: I

ARNS was created in 1997 by respiratory nurses, for respiratory nurses, and this ethos is still very true today. ARNS remains the only nursing-led membership organisation within the UK respiratory specialty field. Today, our organisation benefits from the participation of more than 1,500 members across the UK.
ARNS collaborates with other respiratory care organisations, as well as government and NHS initiatives in order to influence policy and developments for respiratory services, such as the NICE and BTS Guidelines.

Phone: 07740 117 902
Email: info@arns.co.uk
Website: www.arns.co.uk
Twitter: @ARNS_UK
You can also find us on Facebook

AstraZeneca — Stand: 2

AstraZeneca is a global, science-led biopharmaceutical company that focuses on the discovery, development and commercialisation of prescription medicines, primarily for the treatment of diseases in three therapy areas - Oncology, Cardiovascular, Renal & Metabolism and Respiratory.

Tel: 020 3749 5000
Email: ukhpcommunications@astrazeneca.com
Website: www.astrazeneca.co.uk

Avanos — Stand: 26

Avanos is a medical device company focused on delivering clinically superior breakthrough solutions that will help patients get back to the things that matter.

Headquartered in Alpharetta, Georgia, Avanos is committed to creating the next generation of innovative healthcare solutions which will address our most important healthcare needs, such as reducing the use of opioids while helping patients move from surgery to recovery.

Avanos develops, manufactures, and markets its recognised brands in more than 90 countries.

For more information, please contact your Avanos Customer Service Team.

Tel: 0800 917 65 85 (From UK & IE)
Email: customerservice.uk.ie@avanos.com
Tel: +32 2 700 68 51 (From other countries)
Email: customerservice.export@avanos.com
Website: www.avanos.co.uk

BD — Stand: 23

The PleurX drainage system allows patients to drain fluid at home and at their own schedule; managing their fluid build-up before becoming uncomfortable. Therefore, the PleurX drainage system will help your patients avoid repeat visits to the doctor or hospital for drainage.

The PleurX drainage system has over 83 clinical studies demonstrating its superior safety and patient comfort. It is now supported with a patient pathway care programme – delivering unrivaled education, patient information and discharge support to ensure care with dignity.

Tel: 01293 527 888
Email: PleurX@bd.com
Website: www.bd.com/uk

BMJ — Stand: C

BMJ is a healthcare knowledge provider and a leader in respiratory content. Together with the British Thoracic Society, we publish *Thorax*, a leading international journal of respiratory medicine with an impact factor of 9.640; and its open access companion, *BMJ Open Respiratory Research*, which covers all aspects of respiratory, critical care and sleep medicine. Both journals offer high quality peer review and rapid editorial times, ensuring your work reaches the widest audience. Visit our stand to learn more about how to submit your research and access essential respiratory content.

Websites: https://thorax.bmj.com
https://bmjopenrespres.bmj.com

Bristol-Myers Squibb/Pfizer Alliance — Stand: 3

In 2007, Pfizer and Bristol-Myers Squibb entered into a worldwide collaboration to develop and commercialise apixaban, an oral anticoagulant discovered by Bristol-Myers Squibb. This global alliance combines Bristol-Myers Squibb's long-standing strengths in cardiovascular drug development and commercialisation with Pfizer's global scale and expertise in this field.

Bristol-Myers Squibb

Bristol-Myers Squibb is a global biopharmaceutical company whose mission is to discover, develop and deliver innovative medicines that help patients prevail over serious diseases. For more information, please visit http://www.bms.co.uk

Pfizer Ltd: Working together for a healthier world™

At Pfizer, we apply science and our global resources to improve health and well-being at every stage of life. We strive to set the standard for quality, safety and value in the discovery, development and manufacturing of medicines. Our diversified global health care portfolio includes medicines and vaccines, as well as many of the world's best-known consumer healthcare products. Every day, Pfizer colleagues work to advance wellness, prevention, treatments and cures that challenge the most feared diseases of our time. Consistent with our responsibility as one of the world's premier innovative biopharmaceutical companies, we also collaborate with health care providers, governments and local communities to support and expand access to reliable, affordable health care around the world. For more than 150 years, Pfizer has worked to make a difference for all who rely on us. In the UK, Pfizer has its business headquarters in Surrey and is a major supplier of medicines to the NHS. To learn more about our commitments, please visit us at www.pfizer.co.uk

Websites: www.bms.co.uk
www.pfizer.co.uk

British Association for Lung Research (BALR) — Stand: J

The British Association for Lung Research (BALR) is a community for all types of respiratory scientists, from basic to clinical. We aim to provide a platform to exchange ideas, create collaborations, and further pulmonary research. We have been active for over thirty years, and are proud to support respiratory researchers in the UK and abroad.

Email: admin@balr.co.uk
Website: www.balr.co.uk

EXHIBITORS' INFORMATION

British Lung Foundation — Stand: R

One in five of us has problems with our breathing. Millions more are at risk. We're the only UK charity looking after the nation's lungs. We offer hope, help and a voice. Our research finds new ways to prevent, treat and cure lung disease. Our support gives people who struggle to breathe the skills, knowledge and confidence to take control of their lives. And together, we're campaigning for clean air and better services. One day, everyone will breathe clean air with healthy lungs. Only your support can make that happen.

Tel: 03000 030 555
Email: hello@blf.org.uk
Website: www.blf.org.uk

British Thoracic Oncology Group (BTOG) — Stand: M

The British Thoracic Oncology Group (BTOG) is the multi-disciplinary group for healthcare professionals involved with thoracic malignancies throughout the UK and Ireland. The vision of BTOG is to ensure equitable access to optimal care for patients with all thoracic malignancies in the UK and Ireland. The mission of BTOG is to support and educate healthcare professionals, creating a professional community to exchange ideas, information and innovation and to foster the development of research. The overall aim is to represent the needs of patients and improve their outcomes.

BTOG 2020 – 29th to 31st Jan 2020 – Dublin

Tel: 0116 296 5239
Email: info@btog.org
Website: www.btog.org

Broncus Medical/Uptake Medical — Stand: 16

Broncus® Medical, based in San Jose, California, is a healthcare technology company focused on virtual bronchoscopic navigation. Archimedes® – Total lung access system integrates CT data, bronchoscopy, proprietary software and fused fluoroscopy to provide three dimensional, real-time guided TBNA and trans parenchymal nodule access (BTPNA). Uptake Medical®, a Broncus Company, aims to improve the lives of patients suffering from pulmonary disease with bronchoscopic thermal vapor ablation (BTVA®)

Email: sdey@uptakemedical.com (UK Sales Manager)
Website: www.broncus.com

BTG part of Boston Scientific Corporation — Stand: 15

Boston Scientific transforms lives through innovative medical solutions that improve the health of patients around the world. As a global medical technology leader for 40 years, we advance science for life by providing a broad range of high performance solutions that address unmet patient needs and reduce the cost of healthcare. Boston Scientific Corporation has completed its acquisition of BTG. Together, we are positioned to bring you a comprehensive offering of technologies, clinical science and medical education to advance the treatment of cancer, venous and arterial disease.

Tel: 01276 902 020
Email: BTGvascularEMEA@btg-im.com
Website: www.bostonscientific.com

Chiesi Limited — Stand: 4

Chiesi Limited is the UK affiliate of Chiesi Farmaceutici SpA. It is headquartered in Manchester and employs over 250 employees. Chiesi Farmaceutici is an international research-focussed healthcare group based in Parma, Italy, with over 80 years of experience in the pharmaceutical industry. The group employs nearly 5,000 people and has affiliates in 26 countries. Chiesi researches, develops and markets innovative drugs in the respiratory therapeutics, specialist medicine and rare disease areas. Its R&D organisation is also headquartered in Parma, Italy, and integrated with six other key R&D groups in France, the USA, the UK, Sweden and Denmark to advance Chiesi's pre-clinical, clinical and registration programmes.

Tel: 0161 488 5555
Email: Info@chiesi.uk.com
Website: www.chiesi.uk.com

Circassia — Stand: 29

Circassia is a specialty pharmaceutical company focused on respiratory disease. Our market-leading NIOX® products are used by specialists throughout the UK and around the world to aid asthma diagnosis and management. Allergic airway inflammation is the major underlying cause of asthma. By measuring the FeNO (the fractional exhaled nitric oxide) with NIOX®, clinicians can evaluate allergic airway inflammation in patients with underlying asthma. As a result, NIOX® is used to improve asthma management by assisting in diagnosis, determining responsiveness to inhaled corticosteroids, tailoring inhaled steroid use, monitoring treatment compliance and reducing exacerbations. For more information, please visit www.niox.com or get in touch at info@circassia.com.

Tel: 01865 405 560
Email: info@circassia.com
Website: www.niox.com
Twitter: @CircassiaUK
LinkedIn: linkedin.com/company/circassia-uk

European Respiratory Society — Stand: S

ERS is an international organisation that brings together physicians, healthcare professionals, scientists and other experts working in respiratory medicine. We are one of the leading medical organisations in the respiratory field, with a growing membership representing over 160 countries.

Our mission is to promote lung health in order to alleviate suffering from disease and drive standards for respiratory medicine globally. Science, education and advocacy are at the core of everything we do.

Tel: +41 21 213 01 01 (ERS Headquarters, Switzerland)
Tel: +44 114 267 28 60 (ERS Publications, ELF and Communications Office, UK)
Tel: +32 2 238 53 60 (ERS Advocacy Office, Belgium)
Website: www.ersnet.org

Exhalation Technology Ltd — Stand: 8

At Exhalation Technology, we are revolutionising respiratory care by providing clinicians the tools to help transform the process of diagnosing, treating and monitoring respiratory conditions.

Inflammacheck® provides clinicians access to information such as underlying causes.

Inflammacheck® strengthens their decision-making process – and supports better outcomes for patients.

Tel: 07447 934 977
Email: krupa.patel@exhalationtechnology.com
Website: www.exhalationtechnology.com

Fisher & Paykel Healthcare — Stand: 32

Fisher & Paykel Healthcare is a leading designer, manufacturer and marketer of products and systems for use in respiratory care, acute care, surgery and the treatment of obstructive sleep apnoea.

With over 40 years of experience, we fully understand the life-changing impact that can result from delivering inspired and world-leading healthcare solutions.

As an innovator, we relentlessly search for new ideas that change outcomes, improve experiences and give healthcare professionals new possibilities to enhance their daily work. As an enabler, we bring compassion, care and empathy to our work. We are always curious and leading edge, thinking differently about the problems that stand between patients and the lives they want. In the interests of patient care, we go where others wouldn't or haven't. We bring the answers to life in products that redefine expectations.

Tel: 01628 626 136
Email: customerservice@fphcare.co.uk
Website: www.fphcare.com

Gilead Sciences — Stand: 7

Gilead Sciences, Inc is a research-based biopharmaceutical company that discovers, develops and commercializes innovative medicines in areas of unmet medical need. The company strives to transform and simplify care for people with life-threatening illnesses around the world. Gilead has operations in more than 35 countries worldwide, with headquarters in Foster City, California.

Tel: 0203 681 4500
Website: www.gilead.com

Glenmark — Stand: 35

Glenmark brings 40+ years of pharmaceuticals knowledge and experience and has more than 12,000 employees. Operations cover 80+ countries across the world. Glenmark are an innovations-based company ranked in the top 75 ranked pharma and biotech companies of the world. The pipeline has a strong respiratory focus with multiple devices/brands planned. Glenmark Pharmaceuticals Europe Ltd head office is based in the UK. They have established 10+ years of providing pharmaceuticals to the NHS primary and secondary care.

Tel: 07866 420 411 (Olivia Marsh)
Email: Olivia.marsh@glenmarkpharma.com
Website: www.glenmarkpharma.com/

GSK — Stand: 1

GSK is a science-led global healthcare company with a mission to help people do more, feel better and live longer. For more than 50 years, GSK has been a leader in respiratory, helping patients with respiratory disease better manage their condition. Working in collaboration with the scientific community, we remain at the cutting-edge of scientific research into innovative medicines with the aim of helping to treat patients' symptoms and reduce the risk of their disease.

For further information please visit our website.

Website: www.gsk.com

Hitachi Medical Systems | PENTAX Medical for Endobronchial Ultrasound Technology — Stand: 5

Hitachi Medical Systems profile the new EB19-J10U endobronchial ultrasound scope at BTS 2019. Outstanding ultrasound image quality with an enlarged working channel contribute to an accurate and easier needle aspiration. The unmatched ergonomic design combined with a sharpened HD endoscopic view ensure the highest performance and diagnostic safety for mediastinal staging and clinical diagnosis.

EXHIBITORS' INFORMATION

Tel: 0844 800 4294
Email: welcome.uk@hitachi-medical-systems.com
Website: www.hitachi-medical-systems.co.uk

Insmed — Stand: 40

Insmed is dedicated to improving the lives of patients battling serious and rare diseases. Our mission is to develop novel, transformational therapies that make a real difference to patients.

Email: medicalinformation@insmed.com
Website: www.insmed.com

National Asthma and COPD Audit Programme (NACAP) — Stand: D

The National Asthma and COPD Audit Programme (NACAP) aims to improve the quality of care, services and clinical outcomes for patients with asthma (adults; children and young people) and COPD. Spanning the patient care pathway, the programme includes a primary care audit (Wales only), continuous secondary care audits of admissions to hospital for acute exacerbations of COPD and asthma attacks, as well as a continuous audit of the provision and delivery of pulmonary rehabilitation. Quality improvement is integrated into all audits via events and resources to support service development.

Tel: 0203 075 1526
Email: nacap@rcplondon.ac.uk
Website: www.rcplondon.ac.uk/nacap
Twitter: @NACAPaudit

National Lung Cancer Audit (NLCA) — Stand: E

The most comprehensive audit of lung cancer in the world, the NLCA is commissioned by the Healthcare Quality Improvement Partnership. The NLCA uses combined registry data, such as cancer outcomes and services dataset, pathology reports and death certificates from the National Cancer Registration and Analysis Service, which are then analysed by the University of Nottingham. Publications include: an *Annual Report* for England and Wales; the *Lung Cancer Clinical Outcomes Publication* for England; a *Key Finding for Patients and Carers* for England and Wales, and; this year we are producing the *2019 Organisational Audit Report* and the *Spotlight Report on Molecular Testing in Advanced Lung Cancer.*

Tel: 0203 075 1739
Email: NLCA@rcplondon.ac.uk
Website: www.nlcaudit.co.uk/
Twitter: @RCP_NLCA

NHS England and NHS Improvement's National Respiratory Programme and NHS RightCare — Stand B

The National Respiratory Programme along with partners across the NHS, professional bodies and patient organisations are implementing the ambitions set out in the NHS Long Term Plan. The Respiratory Programme are also supporting the RightCare National Priority Initiative on Respiratory Disease. RightCare provides evidence-based resources for local systems to improve the health of their populations, reduce unwarranted variation across their care pathways and contribute to a sustainable NHS. Visit our stand to meet members of the team and find out more about our work.

Email: england.clinicalpolicy@nhs.net (Respiratory Team)
rightcare@nhs.net
Website: www.england.nhs.uk/ourwork/cinical-policy/respiratory-disease
www.england.nhs.uk/rightcare/workstreams/respiratory
Twitter: @NHSRightCare

Novartis Pharmaceuticals UK Limited — Stands: 24 & 25

Novartis Pharmaceuticals UK Limited provides a range of innovative healthcare solutions that address the evolving needs of patients and societies. Headquartered in Basel, Switzerland, Novartis in the UK is proud to be the largest initiator of clinical trials and offers a diversified portfolio to best meet the needs of patients, from oncology to cardiology and respiratory. With its heritage firmly established with Novartis, severe asthma continues to be a key area of focus. For more information, please visit our website.

Website: www.novartis.co.uk

Olympus — Stands 13 & 14

Olympus supports healthcare professionals focusing on early detection of diseases and minimally invasive procedures through the delivery of the diagnostic and therapeutic technologies needed to treat their patients. Supporting progress within the respiratory field, Olympus has led the way since 1968 with its advanced innovations initially with the first commercial, fibre-optic flexible bronchoscope, through to the first video bronchoscope. The concept of EBUS-TBNA, invented and pioneered by Olympus, has revolutionised the staging process and shortened the lung cancer patient pathway. Now in its 100th year, Olympus is committed to making

people's lives healthier, safer and more fulfilling around the world.

Tel: 01702 616 333
Email: medical@olympus.co.uk
Website: www.olympus.co.uk/medical

Orion Pharma (UK) Ltd — Stand 17

Orion Pharma (UK) Ltd is a subsidiary of Orion Corporation, a pharmaceutical company based in Finland. Orion carries out extensive research with a goal of introducing new treatments into global markets. Core therapy areas in Orion's product and research strategy are Respiratory, Critical Care, CNS, Women's Health and Oncology.

Website: www.orionpharma.co.uk

PARI Medical Ltd — Stand: 42

PARI Medical Ltd is part of the global network of PARI companies.

Founded in 1906, PARI is a family owned company with a comprehensive portfolio of innovative respiratory products.

This year PARI Medical Ltd is celebrating 25 Years in the UK.

PARI's mission is to improve the lives of those affected by respiratory diseases and those who provide care to them.

Tel: 01932 341 122
Email: infouk@pari.eu
Website: www.pari.com

Primary Care Respiratory Society (PCRS) — Stand: H

The Primary Care Respiratory Society (PCRS) is a UK-wide professional society dedicated to promoting knowledge and sharing information for respiratory-interested health professionals, campaigning to influence policy and set standards in respiratory medicine and disseminating primary care research into respiratory conditions to support policy and education activities.

Tel: 01675 477 600
Email: info@pcrs-uk.org
Website: www.pcrs-uk.org

Primary Ciliary Dyskinesia Family Support Group — Stand: O

The PCD Family Support Group is a charity that:-

- Provides support to patients
- Raises awareness of PCD
- Promotes research to aid the diagnosis and treatment of patients
- Supports the NHS to ensure patients have access to diagnostic services and on-going care

For further information please contact us:-

Help Line: 0300 111 0122
Email: chair@pcdsupport.org.uk
Website: www.pcdsupport.org.uk

Pulmonx — Stand: 11

Pulmonx technologies improve the lives of patients suffering from emphysema. Used together, the StratX and Chartis assessment systems and the Zephyr Endobronchial Valve have been proven to improve pulmonary function, quality of life and exercise capacity in emphysema patients, regardless of heterogeneity, or disease distribution.

Tel: +41 32 475 2070
Email: info@pulmonx.com
Website: www.pulmonx.com

The Respiratory Show 2020 — Stand: 37

14/15 October 2020, NEC Birmingham

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BTS/ BALR/ BLF Early Career Investigator Awards Symposium

T1 META-ANALYSIS OF IDIOPATHIC PULMONARY FIBROSIS GENOME-WIDE ANALYSES IDENTIFIES THREE NOVEL GENETIC SIGNALS ASSOCIATED WITH DISEASE SUSCEPTIBILITY

[1]RJ Allen, [2]B Guillen-Guio, [3]JM Oldham, [4]SF Ma, [5]A Dressen, [1]ML Paynton, [1]LM Kraven, [6]M Obeidat, [6]X Li, [7,8]R Braybrooke, [9,10]TE Fingerlin, [8,11]IP Hall, [8,11]I Sayers, [1,12]MD Tobin, [13,14]TM Maher, [9,15,16]DA Schwartz, [5]BL Yaspan, [13,14]PL Molyneaux, [2,17,18,19]C Flores, [4]I Noth, [8,11]RG Jenkins, [1,12]LV Wain. *[1]Department of Health Sciences, University of Leicester, UK; [2]Research Unit, Hospital Universitario N.S. de Candelaria, Universidad de La Laguna, Spain; [3]Department of Internal Medicine, University of California Davis, USA; [4]Division of Pulmonary and Critical Care Medicine, University of Virginia, USA; [5]Genentech, San Francisco, USA; [6]The University of British Columbia Centre for Heart Lung Innovation, St Paul's Hospital, Vancouver, Canada; [7]Division of Epidemiology and Public Health, University of Nottingham, Nottingham, UK; [8]NIHR, Nottingham University Hospitals, Nottingham, UK; [9]Center for Genes, Environment and Health, National Jewish Health, Denver, USA; [10]Department of Biostatistics and Informatics, University of Colorado, Denver, USA; [11]Division of Respiratory Medicine, University of Nottingham, Nottingham, UK; [12]NIHR, Leicester Respiratory Biomedical Research Centre, Leicester, UK; [13]NIHR Respiratory Biomedical Research Unit, Royal Brompton Hospital, London, UK; [14]National Heart and Lung Institute, Imperial College, London, UK; [15]Department of Medicine, University of Colorado, Denver, USA; [16]Department of Immunology, University of Colorado, Denver, USA; [17]CIBER de Enfermedades Respiratorias, Instituto de Salud Carlos III, Spain; [18]Instituto Tecnológico y de Energías Renovables (ITER), Canarias, Spain; [19]Instituto de Tecnologías Biomédicas (ITB), Universidad de La Laguna, Spain*

10.1136/thorax-2019-BTSabstracts2019.1

Introduction Idiopathic pulmonary fibrosis (IPF) is a devastating incurable lung disease. There have been three previous genome-wide association studies (GWAS) of IPF susceptibility. By combining these studies, we were able to perform the largest, densest and most powerful GWAS of IPF to date.

Methods We used a two-stage approach. Stage 1 consisted of a genome-wide meta-analysis of IPF across the three previous studies. European cases and controls in each of the studies was imputed using the Haplotype Reference Consortium (HRC) reference panel. We ran genome-wide analyses adjusting for 10 principal components (to adjust for fine-scale ancestry) in each study separately and meta-analysed the results. Variants with $p<5 \times 10^{-8}$ in the stage 1 analysis were further analysed in two independent case-control collections (stage 2) and were defined as significantly associated with IPF risk if they were significant after multiple testing adjustments. Statistical fine-mapping and functional follow-up using three eQTL databases was used to identify putative causal genes. Finally, we used a polygenic risk score approach to determine the contribution to IPF disease risk of genetic variants that have not been reported as associated with IPF risk. For that, variants that were located near known IPF risk signals were excluded from the score and the number of variants included was varied.

Results GWAS were performed on 10,790,934 genetic variants in 2,668 IPF cases and 8,591 controls (stage 1) with replication in 1,467 IPF cases and 11,874 controls (stage 2). We identified three novel signals associated with IPF susceptibility. These three novel signals were associated with decreased expression of *DEPTOR* (in lung tissue), *KIF15* and *MAD1L1* (in non-lung tissue). We replicated 11 of the previously reported 17 IPF risk variants. The most significant risk score was found to include over 800,000 independent variants that were non-significant in our GWAS and explained about 2% of the phenotypic variation.

Conclusion The novel signals support the importance of mTOR signalling and suggest a possible role of spindle-assembly genes in IPF susceptibility. Risk score analyses suggest there are potentially hundreds of genetic variants associated with IPF susceptibility that have not yet been identified by GWAS.

T2 EFFECT OF INCIDENT HEART FAILURE ON SHORT- AND LONG-TERM MORTALITY OF COPD PATIENTS

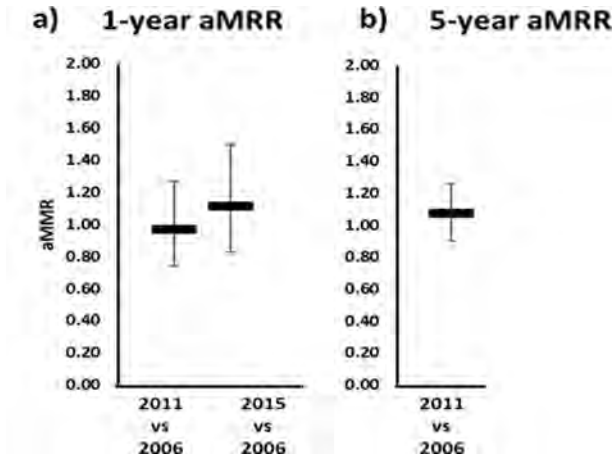
EL Axson, V Sundaram, CI Bloom, A Bottle, MR Cowie, JK Quint. *Imperial College London, London, UK*

10.1136/thorax-2019-BTSabstracts2019.2

Introduction and objectives Chronic obstructive pulmonary disease (COPD) patients are at a greater risk of developing heart failure (HF), yet HF diagnosis is delayed in COPD patients due to their shared signs and symptoms. HF patients in the general population have seen improved 1-year and 5-year survival post-HF diagnosis[1]; however, it is well known that cardiovascular comorbidities are systemically under-treated in the COPD population and that COPD patients are diagnosed with HF later than the general population.[2] It may be that COPD patients with incident HF (COPD-iHF) have not seen similar survival gains as the general population.

Methods COPD-iHF patients were identified from the Clinical Practice Research Datalink (CPRD). Age- and sex-adjusted mortality rate ratios (aMRR) for 1-year, 5-year, and 10-year mortality were calculated for COPD-iHF in 2006, 2011, and 2015 compared temporally and to COPD patients without incident HF (COPD-no HF).

Results We identified 181,705 COPD patients without HF at the start of follow-up. COPD-iHF experienced three times greater 1-year mortality (2006: aHR 3.31, 95%CI: 2.70, 4.06) and two times greater 5-year (2006: aHR 2.35, 95%CI: 2.08, 2.66) and 10-year mortality (2006: aHR 1.95, 95%CI: 1.75, 2.17) than COPD-no HF patients and this did not change based on year of HF



Abstract T2 Figure 1 Age and sex adjusted mortality rate ratios (aMRR) comparing the 1-year and 5-year mortality of COPD patients with incident HF in 2011 and 2015 to the mortality of COPD patients with incident HF in 2006

diagnosis. 1-year and 5-year mortality did not improve over time comparing COPD-iHF in 2011 (1-year aHR 0.97, 95%CI: 0.74, 1.27; 5-year aHR 1.07, 95%CI: 0.90, 1.26) and 2015 (1-year aHR 1.11, 95%CI: 0.83, 1.50) to COPD-iHF in 2006 (figure 1).

Conclusions COPD-iHF patients have not seen the same survival gains over the past decade as the general population with incident HF. This may reflect continued under-treatment of cardiovascular conditions and the delayed diagnosis of HF within the COPD population. The absence of or delayed access to survival modifying cardiovascular medications in the COPD population with HF may account for the lack of survival gains in this population. Bespoke guidelines for the diagnosis and management of HF in the COPD population are needed to improve survival of patients.

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T3 ITACONATE DRIVES THE RESOLUTION OF PULMONARY FIBROSIS

[1]PP Ogger, [1]P Ghai, [1]RJ Hewitt, [1]PL Molyneaux, [2]TM Maher, [1]CM Lloyd, [1]AJ Byrne. *[1]National Heart and Lung Institute, Imperial College London, London, UK*; *[2]Royal Brompton Hospital, London, UK*

10.1136/thorax-2019-BTSabstracts2019.3

Introduction and objectives Idiopathic pulmonary fibrosis (IPF) is a devastating disease with limited therapeutic options. Airway macrophages (AMs) are key components of airway defence and are implicated in the dysregulated wound healing underlying IPF. Itaconate is an endogenous metabolite with antimicrobial and anti-inflammatory potential. Synthesis of itaconate is catalysed by immune-response gene 1 (Irg1) and Irg1/itaconate are increased in macrophages upon stimulation with LPS[1]. We hypothesised that the expression of Irg1/itaconate in AMs is involved in the pathogenesis/resolution of pulmonary fibrosis and manipulation of this pathway could ameliorate disease.

Methods To assess the distribution and expression pattern of *Irg1* in healthy/IPF lung, we employed gene expression analysis in AMs, bronchial epithelial cells and lung fibroblasts from IPF patients or controls. To mechanistically interrogate the role of Irg1 in the bleomycin model of pulmonary fibrosis we utilised mice expressing, or lacking *Irg1*, in addition to therapeutic dosing of exogenous itaconate. Finally, to determine the role of secreted itaconate on the stromal compartment in IPF, primary lung fibroblasts were cultured with itaconate in vitro and proliferation/wound healing was assessed.

Results *Irg1* was expressed in AMs, but not epithelial cells or fibroblasts from healthy controls/IPF patients; interestingly, IPF AMs showed reduced expression of *Irg1* compared to controls. In the bleomycin model, $Irg1^{-/-}$ mice had decreased survival, worsened lung function, and increased collagen deposition at the resolution time point (42d post bleomycin) compared to WT mice. Monocyte-recruited AMs (Mo-AMs) showed higher expression of *Irg1* compared to tissue-resident AMs (Tr-AMs). Tr-AMs significantly upregulated the expression of fibrosis-related genes in $Irg1^{-/-}$ compared to WT, while the functional phenotype of monocyte-recruited AMs was not affected by $Irg1^{-/-}$. Treatment with itaconate during the fibrotic phase of the bleomycin model improved lung function and decreased gene expression of type IV collagen and fibronectin. *In vitro* culture of primary human lung fibroblasts with itaconate decreased proliferation and wound healing capacity.

Conclusions Taken together these data indicate that *Irg1*-expressing Mo-AMs are essential for the resolution of lung fibrosis and that targeting this pathway may be a viable therapeutic strategy in IPF.

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T4 CALCIUM-SENSING RECEPTOR ANTAGONISTS (CALCILYTICS) AS A NOVEL THERAPEUTIC FOR ALARMIN-DRIVEN INFLAMMATORY LUNG DISEASE

[1]B Mansfield, [1]P Huang, [1]R Bruce, [2]T-R Ho, [3]X Du, [3]Q Huang, [3]W Wang, [4]ST Lugg, [5]W Ford, [5]E Kidd, [2]C Corrigan, [2]JPT Ward, [2]C Hawrylowicz, [4]D Thickett, [6]KE Lewis, [7]L Mur, [1]PJ Kemp, [3]Y Sun, [1]D Riccardi. *[1]School of Biosciences, Cardiff University, Cardiff, UK*; *[2]Asthma UK Centre for Allergic Mechanisms in Asthma, School of Immunology and Microbial Sciences, King's College London, London, UK*; *[3]Department of Immunology, School of Basic Medical Sciences, Capital Medical University, Beijing, China*; *[4]Institute of Inflammation and Ageing, College of Medical and Dental Sciences, University of Birmingham, Birmingham, UK*; *[5]School of Pharmacy and Pharmaceutical Sciences, Cardiff University, Cardiff, UK*; *[6]School of Medicine, Swansea University, Swansea, UK*; *[7]Institute of Biological, Environmental and Rural Sciences (IBERS), Aberystwyth University, Aberystwyth, UK*

10.1136/thorax-2019-BTSabstracts2019.4

Introduction Exposure to urban particulate matter (UPM) exacerbates the development of asthma and COPD. UPM exposure triggers the release of 'alarmins' by the airway epithelium, which causes an inflammatory response such as acceleration of the activation and maturation of dendritic cells (DC). Previously, we have demonstrated that, in surrogate models of allergic asthma, certain environmental stimuli activate the airway calcium-sensing receptor (CaSR), which drives bronchial hyperresponsiveness, inflammation and remodelling. We have also shown that CaSR antagonists, calcilytics, can abrogate these changes. Whether UPM exerts its effects acting at the CaSR is unknown.

Aims To test the ability of calcilytics to:

1. Prevent the effects of UPM in recombinant systems expressing the CaSR and in DC;
2. Suppress airways hyperresponsiveness, inflammation and remodelling in a murine model of alarmin–driven (IL–33) asthma.

Methods $[Ca^{2+}]_i$ responses to UPM were investigated in HEK293 cells stably transfected with human CaSR (HEK-CaSR) or empty vector (HEK-0), ± calcilytic NPS2143. FACS and cytometric bead array were used to evaluate maturation (%CD83) and cytokine release by human monocyte-derived DC following 24h exposure to UPM ± calcilytics. IL-33 was delivered intranasally to naïve mice once daily for 6 consecutive days followed by the calcilytic NPSP795 or vehicle control twice daily from day 2. On day 7, airways resistance was measured (Flexivent) under terminal anaesthesia, after which bronchoalveolar lavage fluid (BALF) analysis was performed, and lungs collected for histomorphology and for measurements of cytokine release.

Results UPM increased $[Ca^{2+}]_i$ in the HEK-CaSR but not the HEK-0 cells, an effect inhibited by calcilytics. Calcilytics attenuated UPM-induced maturation, and release of the cytokines IL-10 and IL-23p40, but not IL-6 by DC. *In vivo,* inhaled calcilytics significantly reduced **(1)** bronchial hyperresponsiveness; **(2)** BALF inflammatory cell infiltration and lung concentrations of IL-5, IL-13 and IL-6; **(3)** airways collagen deposition.

Conclusions UPM activates the CaSR and induces maturation and activation of DC, an effect inhibited by calcilytics. Furthermore, calcilytics show benefit in alarmin-driven airways inflammation and hyperresponsiveness in an animal asthma surrogate, suggesting that they will be effective against exacerbating stimuli such as UPM.

T5 PREGNANCY ZONE PROTEIN IS RELEASED INTO NEUTROPHIL EXTRACELLULAR TRAPS IN SEVERE BRONCHIECTASIS

S Finch, A Shoemark, AJ Dicker, HR Keir, A Smith, TC Fardon, D Cassidy, JTJ Huang, JD Chalmers. *University of Dundee, Dundee, UK*

10.1136/thorax-2019-BTSabstracts2019.5

Introduction Pregnancy zone protein (PZP) is a broad spectrum immunosuppressive protein originally discovered in the serum during pregnancy and believed to prevent foetal rejection. We unexpectedly identified PZP as highly expressed in sputum from patients with bronchiectasis and chronic *Pseudomonas aeruginosa* infection. In this study we aimed to characterise PZP in the bronchiectasis airway including its relationship with disease severity.

Methods Patients were recruited from a specialist bronchiectasis clinic. PZP was measured in sputum and serum using ELISA. The sputum microbiome was characterised using 16s rRNA sequencing. A combination of Immunofluorescence, ELISA, electron microscopy and an in-vivo *Staphylococcus aureus* infection model were used to study dynamics of PZP release in the lung.

Results Liquid chromatography/mass spectrometry in 20 patients identified 80 proteins that were differentially expressed between *P.aeruginosa* infected vs uninfected individuals, including PZP which was higher in *P. aeruginosa* infected patients. Results were validated in a cohort of 124 bronchiectasis patients where PZP was associated with severity of disease using the bronchiectasis severity index – median sputum PZP 163 μg/ml (IQR 64.61-854.1) compared to mild (58.58μg/ml (IQR 25.29-163.8), or moderate disease (52.64 (IQR 24.09-97.34), ($p<0.001$). Sputum PZP was higher in patients who were culture positive for *P. aeruginosa* and was correlated to *Pseudomonas* operational taxonomic units in the microbiome. PZP was related to bacterial load and could be reduced with antibiotic therapy in a substudy of 20 patients during acute exacerbation. PZP was released from peripheral blood neutrophils stimulated with PMA, fMLP and bacteria in a dose dependent manner and was released into BAL during acute neutrophilic inflammation using a murine *S. aureus* infection model. Electron Microscopy imaging of neutrophils demonstrated that PZP is present in the cytoplasm and nuclei of neutrophils and fluorescence microscopy also demonstrated PZP associated with neutrophil extracellular traps (NETs) in-vitro, and PZP correlated with neutrophil extracellular traps in-vivo.

Conclusion PZP is a novel neutrophil protein released during neutrophil extracellular trap formation and is a biomarker of bronchiectasis severity.

T6 IDENTIFICATION OF ROLIP AS A MITOCHONDRIAL REGULATOR OF METABOLISM AND THE HYPOXIA RESPONSE PATHWAY

[1]PSJ Bailey, [1]BM Ortmann, [2]AS Costa, [2]C Frezza, [1]JA Nathan. *[1]Cambridge Institute for Medical Research, Department of Medicine, University of Cambridge, Cambridge, UK; [2]MRC Cancer Unit, University of Cambridge, Cambridge, UK*

10.1136/thorax-2019-BTSabstracts2019.6

Introduction Inflamed tissues or solid tumours provide challenging microenvironments for cell survival, whereby localised hypoxia and nutrient scarcity can alter immune responses or drive tumour growth. Cells endure this oxygen deprivation by the induction of Hypoxia Inducible transcription Factors (HIFs), which drive an adaptive gene response to promote survival. Drugs targeting the HIF pathway are being trialled for chronic anaemia, modifying immune responses and preventing tumour growth, highlighting HIFs' relevance to respiratory disease. However, HIFs not only respond to oxygen abundance, but can also be activated by metabolic changes in response to nutrient availability.

Central to understanding metabolic activation of HIFs is the recognition that the oxygen sensors within the HIF pathway, the prolyl hydroxylases (PHDs), also require the Krebs cycle metabolite and essential nutrient 2-oxoglutarate (2-OG/a-ketoglutarate) as substrate for their catalytic activity. Therefore, understanding how cells control 2-OG levels is important.

Key determinants of 2-OG metabolism are (1) the 2-oxoglutarate dehydrogenase complex (OGDHc), a rate limiting enzyme within the Krebs cycle, and (2) modification of the OGDHc by lipoylation, a fatty acid cofactor required for enzymatic function. Genetic disruption of the OGDHc or its lipoylation leads to HIF stabilisation, and patients with hereditary mutations in the OGDHc develop tumour syndromes, typical of HIF activation. However, how the OGDHc is regulated is not well understood.

Methods and results Using unbiased genetic screens in human cells to find genes involved in HIF metabolic activation, we identify ABHD11 (we term Regulator of Lipoylation (ROLIP)), as an uncharacterised mitochondrial protein that, on depletion, leads to metabolic stabilisation of HIFs. Using cell biology, metabolomics and in vitro enzymatic assays, we show that ROLIP is required for Krebs cycle function and ODGHc activity. ROLIP associates with the OGDHc, but ROLIP depletion does not alter total levels of the enzyme. Instead, ROLIP preserves OGDHc function by protecting the enzyme from oxidative damage and maintaining lipoylation.

Summary and importance These studies identify ROLIP as a novel enzyme required for maintaining oxidative phosphorylation, and highlight a new oxygen and metabolic sensing mechanism for controlling HIFs that may be therapeutically tractable.

Smoking cessation strategies for lung health

S1 FIVE YEAR OUTCOMES IN A COHORT OF SMOKERS ADMITTED WITH RESPIRATORY DISEASE AND TREATED WITH VARENICLINE ON A RESPIRATORY WARD

D Hobden, S Kennedy, LJ Restrick. *Department of Respiratory Medicine, Whittington Health NHS Trust, London, UK*

10.1136/thorax-2019-BTSabstracts2019.7

Background Tobacco dependence is a significant cause of morbidity and mortality in patients with respiratory disease for which there is evidence-based treatment. This includes behaviour change support (BCS), nicotine replacement therapy (NRT) and varenicline. We have previously reported a 41% 6-month quit rate for a cohort of smokers admitted with respiratory disease treated with varenicline.[1]

Aim The aim of this study was to evaluate 5-year outcomes for a cohort of respiratory ward inpatients started on varenicline, with BCS and NRT, during hospital admission.

Methods We retrospectively reviewed the electronic records (Hospital/General Practice access) for 44 respiratory inpatients[1] prescribed varenicline August 2012 to January 2014 for demographics, diagnoses, spirometry, smoking history, admissions and death. Patients not seen recently had telephone follow-up; death certificates were reviewed for hospital deaths. Primary outcomes were death, current smoking status (clinician/patient reported) and admissions/bed-days since index admission.

Results Data was available for 39/44 patients (89%); table 1 shows patient characteristics and outcomes. Eighteen (46%) patients died within 5 years of index admission with mean age at death 67 years; 16/18 (89%) patients who died had COPD and 78% (14/18) remained tobacco dependent. Cause of death for 3/4 (75%) patients, where certificate available, was a smoking-related cause. Six of 21 (29%) patients alive at 5 years were ex-smokers. Over 5 years from index admission ex-smokers had a lower but non-significant number of admissions and bed-days compared to smokers; mean admissions 2.0 v 3.1 and bed-days 16 v 25.

Abstract S1 Table 1 Patients characteristics and 5-year outcomes for respiratory inpatients treated with varenicline (with behaviour change support and nicotine replacement therapy) during index admission August 2012–January 2014

	Died n=18	Alive Current smoker n=15	Alive Ex-smoker n=6
Age mean (range) years	67 (42–82)	59 (29–80)	71 (49–88)
COPD n (%)	16 (89%)	7 (47%)	5 (83%)
Asthma n (%)	2 (11%)	11 (73%)	3 (50%)
Asthma and COPD n (%)	2 (11%)	6 (40%)	2 (33%)
FEV1 mean (SD) L	0.94 (0.55) n=15	1.63 (0.80) n=13	1.27 (0.47) n=6
FVC mean (SD) L	1.99 (1.68) n=3	2.51 (1.05) n=10	2.35 (0.43) n=5
Charlson comorbidity index mean (range)	5.1 (2–10)	3.3 (0–7)	5 (2–8)
Pack-years at index admission median (range)	63 (20–140)	35 (8–100)	72 (20–120)
Cannabis/smoked drugs at index admission n (%)	2 (11%)	3 (20%)	0 (0%)
Further admissions over 5 years or until death mean (range) n	2.8 (0–11)	3.1 (0–13)	2.0 (0–6)
Bed-days over 5 years or until death mean (range) n	41 (0–234)	25 (0–116)	16 (0–42)

Conclusions This group of patients who were tobacco dependent and admitted with respiratory disease had a very high 5-year mortality at almost 50% and mean age of death was only 67 years. Quit rate at 5 years in those still alive was 29%; down from 41% at 6-months.[1] Over 5 years continuing smokers had an average of three further admissions and 25 days in hospital. Yet nationally fewer than one in two inpatients are offered treatment for tobacco dependence. This study highlights the importance of clinical teams treating tobacco dependence as a relapsing-remitting long-term condition at every contact point.

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S2 DOCTOR'S PERCEPTIONS OF EFFICACY, SAFETY AND USE OF E-CIGARETTES IN THE UNITED KINGDOM

JC Gates, E Heiden, M Amos, T Brown, H Rupani, A Hicks, AJ Chauhan. *Portsmouth Hospitals NHS Trust, Portsmouth, UK*

10.1136/thorax-2019-BTSabstracts2019.8

Background Since the introduction of electronic cigarettes (e-cigarettes) there has been a rapid rise in their popularity and use. Public Health England encourage their use as part of a smoking cessation strategy in contradiction with many worldwide institutions. On a day to day basis, front line healthcare professionals are being asked to advise their patients about e-cigarettes; therefore their beliefs and opinions are being relied upon.

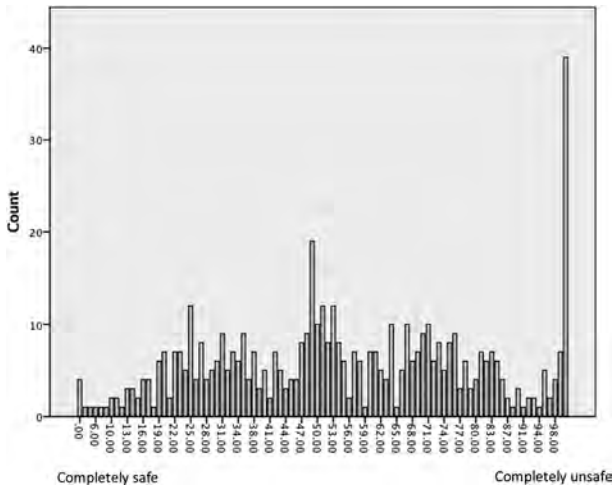
Aims To explore the opinions and practices of UK doctors regarding e-cigarettes, including their safety, and examine for any difference in advice given to patients.

Methods A cross-sectional anonymous survey was developed by Respiratory Physicians in QAH, Portsmouth and distributed nationally to a sample of doctors from all specialities and grades over a 6 week period from April 2019.

Results A total of 571 participants responded and we analysed the data of 524. 47 were excluded either because of incomplete answers or if not from doctors working in the UK. Responders included qualified GPs (14%), consultants (30%), registrars, GP registrars or staff grade doctors (39%), core trainees (9%) and foundation trainees (8%). The largest speciality group of respondents were GPs (22%), followed by non-respiratory medical specialities (20%) and Respiratory specialists (19%). 12% had used an e-cigarette and 1.5% were current smokers. 60% wanted more training in this area.

There was a wide spread in opinions regarding the perceived safety of e-cigarettes (figure 1) with an average 55.8 ±26 and range of 0–100. Personal smoking habits significantly influenced safety perceptions.

A thematic analysis revealed four key themes: uncertainty due to a lack of evidence, pragmatism due to the known risks of traditional smoking, ambivalence due to a lack of awareness and a considerable concern negating their use.



Abstract S2 Figure 1

Conclusions There is a wide variation in beliefs and practice of UK doctors, despite policies intended to encourage e-cigarette use. Patients are receiving conflicting advice regarding their use which is likely to continue until further educational resources are available, and doctors can be confident in the safety and long term evidence for e-cigarettes.

S3 EXPOSURE TO ELECTRONIC CIGARETTE VAPOUR INDUCES FUNCTIONAL CHANGES IN NEUTROPHILS WHICH ARE MORE EXAGGERATED BY 4TH GENERATION DEVICES

A Jasper, E Sapey, DR Thickett, A Scott. *University of Birmingham, Birmingham, UK*

10.1136/thorax-2019-BTSabstracts2019.9

Background Despite uncertainties in their long term impact on lung health, the use of electronic-cigarettes (EC) has increased rapidly in recent years. In spite of the essential role of the neutrophil in the innate immune system, little is known about the effects of EC exposure on these cells. Our previous studies have uncovered cytotoxic and pro-inflammatory effects of EC on alveolar macrophages; this work aims to determine the effects on neutrophil (PMN) viability and function.
Methods PMNs were isolated from the venous blood of healthy young volunteers. Using a novel EC vapour (ECV) exposure system, PMN were exposed to 40puffs EC vapour, generated from Kanger 2nd generation (2G) and 4th generation (4G) devices, using flavourless e-cigarette liquid. Apoptosis and necrosis was assessed by flow cytometry (Annexin V assay with propidium iodide (PI) staining). Phagocytosis was assessed by pHrodo assay (*E.coli* and *S.Aureus*). Chemotaxis to CXCL8 was assessed using an Insall chamber and video microscope. Nicotine content was assessed by GCFID.
Results There were no significant differences in the viability of neutrophils immediately after exposure to 40 puffs ECV or after 4 hours. 24 hours post ECV exposure PMN cell death was elevated following 4GECV exposure (UTC; 20.4% apoptotic, 2GECV; 20.1% apoptotic, 4GECV; 57.3% apoptotic, n=3, not significant (ns)). Necrosis was also elevated in these samples (UTC; 6.49% necrotic, 4GECV; 17.8% necrotic, n=3, ns). Chemokinesis/chemotaxis to CXCL8 were significantly impaired after ECV exposure compared to UTC (2GECV; 70.7% reduction (chemotaxis), 51.6% reduction (chemokinesis) n=10, $p<0.01$). This effect was further exaggerated after 4GECV exposure (108.0% reduction (chemotaxis), 70.0% reduction (chemokinesis), n=9, $p<0.0001$). Phagocytosis was significantly decreased by 4GECV exposure compared to UTC (*E.Coli* 33.3% reduction, *S.Aureus* 71.5% reduction, n=6, $p<0.05$). Nicotine content analysis showed 4G devices delivered 2–4 times nicotine compared to 2G devices.
Conclusion ECV exposure did not impact neutrophil viability at time 0 nor at 4hours, however PMNs showed delayed, exaggerated neutrophil apoptosis at 24hours. ECV exposure also impaired function, inhibiting both chemotaxis and phagocytosis immediately following exposure, more powerful 4G devices having greater functional implications. This neutrophil phenotype has previously been seen in patients with sepsis.

S4 DIAGNOSING AND TREATING TOBACCO DEPENDENCE IN HOSPITAL INPATIENTS; IDENTIFYING HEALTH PROFESSIONALS NEEDS AND HOW MIGHT WE ADDRESS THEM?

[1]D Attar-Zadeh, [2]A Vaghela, [1]M Vithlani, [2]LJ Restrick. *[1]Breathe Smoking Cessation Team, Solutions for Health, Camden and Islington Local Authority, London, UK; [2]Respiratory Team, Whittington Health, London, UK*

10.1136/thorax-2019-BTSabstracts2019.10

Introduction Tobacco Dependence (TD) is a long-term condition with evidence-based clinically effective treatment; skilled behaviour change conversations in combination with prescribed medication (nicotine replacement therapy (NRT)/varenicline). Historically diagnosing and treating TD has not been included in health care professional (HCP) training.
Objectives The aim of this study was to assess hospital-based HCPs needs in an inner city Acute Trust in diagnosing/treating TD in inpatients and evaluate whether tailored training can address these needs.
Methods TD diagnosis/treatment training was designed for trainee doctors, pharmacists and the respiratory MDT (including consultants, nurse specialists and physiotherapists) based on national guidance.

An annual cycle of 1–2 hour training was delivered by three clinicians trained and experienced in behaviour change (motivational interviewing (MI)) and TD prescribing. HCP training needs and impact of training were evaluated using scaled 0–10 'importance' and 'confidence' questions based on MI principles. Changes following training were evaluated using paired t-tests.
Results 168 HCPs attended one of eight 1–2 hr TD diagnosis/treatment training sessions between Sept 2017 and March 2019.

Importance of HCPs being able to diagnose/treat TD

HCPs (n=72) across professions identified it as important to: ask patients about smoking mean (range) 8.1/10 (4–10); advise patients how best to stop smoking 8.1/10 (4–10); and that patients in hospital should be prescribed NRT 8.0/10 (4–10).

Need to increase HCP confidence in diagnosing/treating TD

Before training HCPs confidence in diagnosing TD was mean 7.9/10 (n=101); mean confidence in discussing TD treatment was 5.7/10 (n=116) and mean confidence in prescribing TD medication was 5.1 (n=56).

Impact of training in increasing HCP confidence in diagnosing/treating TD

Abstract S4 Table 1 Impact of training on Health Care Professionals (HCP) self-assessment of confidence in diagnosing, discussing and prescribing treatment for tobacco dependence in a hospital setting

In patients you see…	Pre-training confidence* mean (range)	Post-training confidence* mean (range)	HCP n	p value
How confident* are you in diagnosing tobacco dependence?	7.9 (0–10)	8.8 (2–10)	101	<0.0001
How confident* are you in discussing how to treat tobacco dependence?	5.7 (0–10)	8.4 (2–10)	116	<0.0001
How confident* are you in prescribing treatment for tobacco dependence?	5.1 (0–10)	8.2 (4–10)	56	<0.0001

*Where '0' is not at all confident and '10' is totally confident

Confidence in diagnosing TD, discussing TD treatment and in prescribing TD medication all increased very significantly with 1–2 hours of clinician-led training $p<0.0001$. See table 1 for full results.

Conclusions This study shows that HCPs want to be able to diagnose and treat tobacco dependence but without training are not confident to do this. One-off training, delivered by clinician-peers, who are experienced and trained in diagnosing and treating tobacco dependence, and in motivational interviewing, is one way to effectively increase HCP confidence in diagnosing, discussing and treating tobacco dependence.

Pulmonary rehabilitation: better: more!

S5 CHANGING THE SHAPE OF REHABILITATION: BREATHLESSNESS REHABILITATION

[1]E Chaplin, [1]O Rervitt, [1]S Ward, [1]A Watt, [1]N Gardiner, [1]L Houchen-Wolloff, [1]C Bourne, [1,2]S Singh. *[1]Centre for Exercise and Rehabilitation Science, Pulmonary Rehabilitation Department, Glenfield Hospital, University Hospitals of Leicester NHS Trust, Leicester, UK; [2]School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, UK*

10.1136/thorax-2019-BTSabstracts2019.11

Introduction We have previously reported the successful Integration of patients with Chronic Heart Failure (CHF) into a traditional Pulmonary Rehabilitation programme (PR).[1] However there is an opportunity to reconfigure both cardiac rehabilitation (CR) and PR to deliver a symptom based programme - breathlessness rehabilitation (BR) for patients with a primary symptom of breathlessness irrespective of the index diagnosis, or co-morbid disease.[2] [3] We have reconfigured our services to combine the expertise of the CR and PR teams to provide comprehensive expertise for participants.

Methods Patients attended a redesigned twice weekly, group-based, tailored exercise and education programme for six weeks, delivered by CR and PR staff. The classes included both aerobic and resistance exercises and an overarching generic education programme alongside disease specific components. Generic clinical outcome measures were performed pre and post BR. Home programmes were reviewed at each session to facilitate goal setting and influence progress in exercise behaviours beyond the supervised programme.

Abstract S5 Table 1 Outcomes for BR

	Pre Mean (SD)	Post Mean (SD)	Change Mean 95% Confidence Interval
ISWT (m)	225.60 (134.27)	273.00 (151.28)	47.40 (35.25 to 59.54) *
ESWT (secs)	209.71 (142.75)	520.39 (414.12)	310.68 (249.43 to 371.92) *
QMVC (Kg)	21.78 (10.07)	25.50 (10.09)	3.71 (2.26 to 5.16) *
HADS-A	7.24 (4.31)	5.69 (4.02)	-1.55 (-2.07 to -1.03) *
HADS -D	6.55 (3.53)	5.29 (3.52)	-1.26 (-1.74 to -.77) *

Abbreviations: ISWT, Incremental shuttle walk test; m, metres; ESWT, Endurance shuttle walk test; sec, seconds; QMVC, Quadriceps maximal Voluntary Contraction; Kg, kilograms; HADS –A, hospital anxiety and depression score – anxiety; HADS –D, hospital anxiety and depression score – depression
*p≤0.0001

Results N=206 (n=127 respiratory, n=79 CHF) were assessed and enrolled into BR (114 male, mean (SD) age 69.82 (11.54) years, BMI 28.88 (7.30), median MRC 3, NYHA 2. 153 patients completed the programme and outcomes are outlined in table 1. Statistically significant improvements were seen in both the exercise capacity and quadriceps strength, alongside a reduction in the Hospital Anxiety and Depression score.

Conclusions Overall the data indicate that BR is effective at improving generic outcomes for patients with breathlessness. Given the significance of co-morbid disease it is an approach that warrants further consideration.

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S6 THE UTILITY OF ECCENTRIC CYCLING FOR PEOPLE WITH COPD: ACUTE CARDIORESPIRATORY AND METABOLIC RESPONSES

[1]TJC Ward, [1]MR Lindley, [1]RA Ferguson, [2]RA Evans, [3]D Constantin, [2]SJ Singh, [3]CE Bolton, [3]P Greenhaff, [2]MC Steiner. *[1]Loughborough University, Loughborough, UK; [2]Leicester Biomedical Research Centre-Respiratory, Leicester, UK; [3]NIHR Nottingham Biomedical Research Centre Musculoskeletal theme and Centre for Musculoskeletal Ageing (CMAR), Nottingham, UK*

10.1136/thorax-2019-BTSabstracts2019.12

Background Eccentric cycling (ECC) may be an attractive exercise modality in COPD due to lower cardiorespiratory demand and perception of effort compared to conventional concentric cycling (CON) at equivalent mechanical workloads. However, it is unknown whether ECC can be performed by individuals with COPD at an intensity able to induce metabolic adaptation.

Methods 13 individuals with COPD (mean ± SD age 64 ± 9 years, FEV_1%pred 45 ± 19%, BMI 24 ± 4 $kg.m^{-2}$, $\dot{V}O_{2peak}$15 ± 3 $ml.kg^{-1}.min^{-1}$) and 9 age matched controls (FEV_1%pred 102 ± 13%, BMI 28 ± 5 $kg.m^{-2}$, $\dot{V}O_{2peak}$23 ± 5 $ml.kg^{-1}.min^{-1}$), performed up to six 4-minute bouts of ECC and CON at matched mechanical loads of increasing intensity. In addition, 12 individuals with COPD underwent quadriceps muscle biopsies (vastus lateralis) before and immediately after

Abstract S6 Table 1 Muscle metabolites before and after 20 minutes concentric and eccentric cycling at 65% peak power in individuals with COPD. Mean ± SD or (95% CI). *p<0.05 pre to post

	CON			ECC		
	Pre	Post	Change	Pre	Post	Change
Lactate (mmol.kg^{-1} dry matter)	4.7 ± 2.1	42.6 ± 29.6	37.9 (13.3; 62.5)*	7.2 ± 4.5	6.0 ± 3.7	-1.2 (-5.4;3.0)
Phosphocreatine (mmol.kg^{-1} dry matter)	69.8 ± 16.5	52.9 ± 22.1	-16.9 (-31.1;-2.7)*	62.7 ± 21.8	67.0 ± 7.5	4.2 (-12.5;20.9)
Creatine (mmol.kg^{-1} dry matter)	46.4 ± 13.3	74.3 ± 29.9	27.9 (3.9;51.9)*	55.2 ± 11.1	58.7 ± 10.0	3.5 (-12.6;19.6)

20 minutes of ECC and CON at 65% peak power. Modalities were compared using linear mixed models.

Results The gradient of the slope of $\dot{V}O_2$ (ml.min^{-1})/Power (Watts) during ECC was 2.8-fold and 3.3-fold lower than CON for COPD and control participants, respectively. At matched mechanical loads, minute ventilation, heart rate, systolic blood pressure, RER (all $p<0.001$), capillary [lactate], perceived breathlessness and leg fatigue ($p<0.05$) were lower during ECC than CON in both groups. Muscle lactate content increased ($p=0.01$), and muscle phosphocreatine decreased ($p=0.03$) during CON in COPD, which was not evident during ECC (see table 1). ECC was well received by individuals with COPD with 76% preferring it to CON.

Conclusion Cardiopulmonary and blood lactate responses during submaximal ECC were less compared to CON at equivalent mechanical workloads in health and COPD, and this was confirmed at a muscle level in COPD. Submaximal ECC was well tolerated and allowed greater mechanical work at lower ventilatory cost. However, in people with COPD, the lower metabolic cost of ECC is unlikely to stimulate cardiovascular and metabolic adaptation to a training intervention to the same extent as CON.

S7 DOES COMPLETION OF A PULMONARY REHABILITATION PROGRAMME IMPROVE PATIENT ACTIVATION SCORES?

DS Barber, S Pilsworth, F Frost, D Wat, S Sibley. *Liverpool Heart and Chest Hospital NHS Foundation Trust, Liverpool, UK*

10.1136/thorax-2019-BTSabstracts2019.13

Introduction Patient Activation Measure (PAM) is a validated patient reported-measure that measures patients' knowledge, skill, and confidence to manage their own health and care (Hibbard J.H. et al. Health Serv Res. 2005 Dec; 40:1918–30). Patients with low activation scores are often frequent users of elective & emergency medical services.

Aim To explore changes in activation via PAM scores for patients who completed a course of Pulmonary Rehabilitation (PR) against those who failed to complete.

Methods 201 patients from the Knowsley Community Respiratory Service participated in PR between April 2016 and December 2018 and completed PAM questionnaires before and after the programme.

Results There were 103 males (76 completed), 98 females (78 completed) with a median age of 69 (44–93), median FEV1% predicted of 65 (22–117), median BMI of 28 (17–47) and 52 were smokers (25% of completers versus 28% of non-completers). 154 patients completed the program with a median (95% CI) PAM change of +5.53 (3.5 to 7.5), versus 47 who did not complete with a change in PAM of -2.1 (-5.7 to 2.1) points, difference between the groups 6.7 (2.5 to 10.7) $p<0.001$. Median baseline PAM scores were identical between the groups (51.0 vs 51.0) $p=0.76$. Additionally, a higher proportion of PR completers improved by at least 1 PAM level, 67/154 (43.5%) versus 11/47 (23.4%) non-completers $X^2p=0.01$.

Conclusion Successful completion of a course of PR is associated with a significant positive improvement in PAM score. Baseline PAM doesn't appear to be an indicator of future completion of PR. This reaffirms that PR plays a role in improving self-management in COPD and completion of the programme should be highly encouraged.

S8 PULMONARY REHABILITATION – TIME FOR CHANGE?

S Pilsworth. *Liverpool Heart and Chest Hospital, Liverpool, UK*

10.1136/thorax-2019-BTSabstracts2019.14

Introduction The importance of pulmonary rehabilitation (PR) is well known for the management of chronic respiratory disease and is a core component of disease management. The important of increasing uptake and availability of PR is made clear within the NHS long term plan. Despite this push little is known about patient's perspective or PR and how to engage people further to participate despite its proven benefit in health related quality of life.

Method To evaluate patient perceptive and opinion of PR 4 group interviews were conducted in different PR groups in the North West of England. Patients were asked to discuss their thoughts on PR, including preconceptions of the programme, importance of PR and how to engage better with people with chronic respiratory disease. Interviews were recorded and themes were highlighted.

Results 21 patients enrolled in an 8 week PR programme were interviewed for a total of 130 minutes. 10 males and 11 females were interviewed, 18 patients had a diagnosis of COPD, 2 were diagnosed with bronchiectasis and 1 was diagnosed with asthma. Thematic analysis showed patients perceived the importance of physical activity and saw gains in attending PR. Patients felt the positive impact of PR was not well delivered and that people offering a referral to PR did not know about the course. They felt PR was frequently offered too late in their disease process. There was much debate about the appropriateness of the term 'exercise' and 'rehabilitation' as they had negative connotations.

Conclusion Preliminary finding suggest that patients feel PR is offered too late in there disease pathway and health professionals (HCP) need to be offering PR at every clinical point of care. HCP lack of knowledge regarding PR was discussed by many patients, suggesting the need for HCP to improve their own knowledge and understanding. Another key area of debate was the terminology used to describe PR,

'rehabilitation' and 'exercise' were felt to bring negative thoughts to mind, and did little to sell the positive impact PR can have on their lives. A more positive name would have helped to support people to attend.

S9 THE ROLE OF AMBULATORY OXYGEN IN IMPROVING THE EFFECTIVENESS OF PULMONARY REHABILITATION FOR PATIENT WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE – SINGLE BLINDED RANDOMISED TRIAL

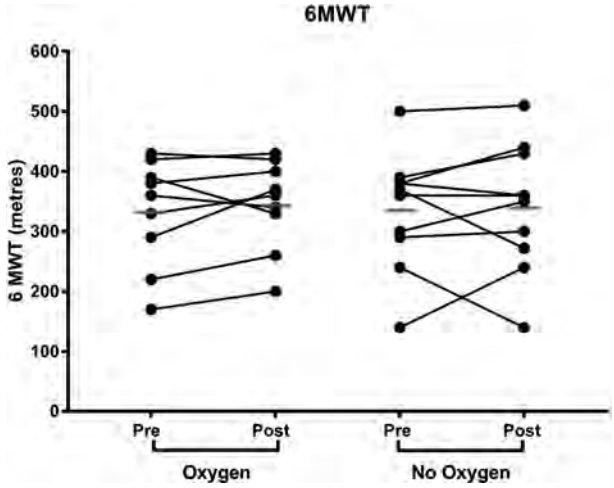
[1]V Padmanaban, [1]C Collins, [1]A Lound, [1]C Lee, [2]P Mallia, [1]SL Elkin. *[1]Imperial College Healthcare NHS Trust, London, UK; [2]National Heart and Lung Institute, Imperial College, London, UK*

10.1136/thorax-2019-BTSabstracts2019.15

Background Pulmonary rehabilitation (PR) is recognized as a core component of the management of patients with COPD.[1] Although the benefits of PR in COPD are well established, there remain a number of unanswered questions regarding how to maximise performance during PR, including the use of ambulatory oxygen. Studies investigating the effects of oxygen use during PR have had conflicting results.[2] Therefore, we aimed to investigate the effect of ambulatory oxygen on PR outcomes in COPD patients

Methods Patients with COPD referred to PR and have exercise desaturation (spo2<90%) during 6-minute walk distance (6MWD) test, and improve using ambulatory oxygen as per the British Thoracic Society Oxygen criteria, were randomised to receive either oxygen at the flow rate determined at the initial assessment to a maximum flow rate of 6lpm, or room air. Current oxygen users were excluded. 6MWD and chronic Respiratory questionnaire (CRQ) were measured pre and post completion of PR programme. The therapist who carried out the outcomes measure was blinded to the randomisation and was not involved in the delivery of PR

Results 20 patients (female-8) were recruited between April 2016- 2017, one patient withdrew after consent. There was no significant difference in the 6MWD and CRQ between the oxygen (n=9) and no oxygen group (n=10). In the oxygen group 56%, declined oxygen and 11% had no oxygen desaturation following PR. In the non-oxygen group, 40% declined oxygen and 20% had no exercise desaturation following PR.



Abstract S9 Figure 1

Conclusion Use of ambulatory oxygen during PR, did not improve the 6MWD following completion of PR in COPD patients. Higher proportion of people in the oxygen group declined oxygen after completion of PR; this was mainly due to no perceived benefit with improving functional activity reported by patients. Also 16% of patients did not desaturate after completion of PR. This raises the question it may be better to assess patients for ambulatory oxygen following completion of PR.

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Pleural disease: not so benign

S10 WHOLE GENOME ANALYSIS OF FAMILIAL PNEUMOTHORAX BY THE 100,000 GENOMES PROJECT

[1]HL Grimes, [2]D Brown, [3]S Holden, [3]J Babar, [3]S Karia, [3]J Herre, [3]M Knolle, [1]E Maher, [1]Genomics England Research Consortium, [1]SJ Marciniak. *[1]University of Cambridge, Cambridge, UK; [2]Genomics England Research Consortium, London, UK; [3]Addenbrookes Hospital, Cambridge, UK*

10.1136/thorax-2019-BTSabstracts2019.16

Background Spontaneous pneumothorax can be the presenting feature of several genetic disorders including Birt-Hogg-Dubé, Marfan, and vascular Ehlers-Danlos syndromes. Diagnosing these conditions enables personalised management that can prolong life for the probands and their relatives. At least 10% of individuals suffering an apparently primary spontaneous pneumothorax have an affected first or second-degree relative, and so should more accurately be labelled as having familial pneumothorax. Currently, assessment in our specialist pneumothorax clinic arrives at a diagnosis in only 20% of cases of familial pneumothorax. It is unclear if this reflects the failure to diagnose known syndromes or the existence of, as yet, undiscovered causes. The 100,000 Genomes Project recruited patients with a range of cancers or rare diseases, including familial pneumothorax.

Method Thirty-two individuals with familial pneumothorax but no obvious syndromic cause were recruited. Whole genome sequencing was performed and potentially pathogenic variants were identified. Comparison was made with public databases, including Gnomad, and with a control cohort of recruits to the 100,000 Genomes Project with unrelated conditions. PanelApp, a crowdsourcing tool, was used to classify known pneumothorax-genes as 'tier 1' (clinically validated); plausible pneumothorax-genes as 'tier 2' (case report evidence), and all other genes as 'tier 3'. Phenotypic information, from recruitment questionnaires, and past medical history, from NHS Hospital Episode Statistics, were also scrutinised.

Results Despite efforts to exclude known pneumothorax syndromes, one recruited individual had a mutation in *FLCN*, a tier 1 gene causative of Birt-Hogg-Dubé syndrome. This suggests that most patients with known pneumothorax syndromes can be diagnosed by clinico-radiological assessment, though analysis for copy number and structural variants is ongoing. Our analysis identified few rare alleles to be shared by the remaining individuals. Far more often, a small group of

common loss-of-function alleles was enriched in non-syndromic familial pneumothorax. Further work is ongoing to determine the genetic basis for those patients without a genetic diagnosis to date.

Conclusion Using whole genome sequencing we have demonstrated that clinico-radiological assessment identifies most individuals with currently known pneumothorax syndromes. Further work is ongoing to determine the genetic basis for those patients without a genetic diagnosis to date.

S11 UTILITY OF COMPUTED TOMOGRAPHY (CT) TO PREDICT NEED FOR EARLY SURGERY AND RECURRENCE AFTER FIRST EPISODE OF PRIMARY SPONTANEOUS PNEUMOTHORAX (PSP)

[1]A Azam, [2]M Abdelmoteleb, [2]N Qayyum, [1]A Zahid, [1]Q Abdullah, [1]M Haris, [1]MB Ganaie. [1]*Department of Respiratory Medicine, University Hospitals of North Midlands, Stoke On Trent, UK*; [2]*Department of Radiology, University Hospitals of North Midlands, Stoke On Trent, UK*

10.1136/thorax-2019-BTSabstracts2019.17

Introduction and objectives CT scanning is not presently advocated by British Thoracic Society (BTS) guidelines after first episode of primary spontaneous pneumothorax (PSP). There is emerging evidence that emphysema like changes and CT based Dystrophy Severity Score (DSS) can predict need for early surgical intervention and recurrence after first episode of PSP. We aimed to assess the role of CT based DSS during first episode of PSP in predicting need for early surgery and recurrence.

Methods Retrospective analysis of consecutive PSP episodes at first presentation (n=197) admitted to our institution from 01/01/2012 – 31/12/2017. Patients were categorized as low grade (score 0–3) or high grade (score 4–6) based on DSS on CT scan assessed by a thoracic radiologist who was blinded to eventual patient outcomes. DSS was calculated based on the type, number and distribution of blebs and bullae (adapted from World J Surg. 2016;40(5):1112–20).

Results 45 PSP patients had CT at first presentation. Median age was 31 years, 82% male and 73% smoker.8 patients had low grade DSS; all were managed non-surgically and none had recurrence over 12 months.37 patients had high grade DSS. 25 high grade DSS patients (67.5%) were managed by surgical intervention and 3 had contralateral recurrence over 12 months. 12 high grade DSS patients (32.5%) were managed non-surgically; 2 patients had ipsilateral recurrence over 12 months.

Conclusions CT based DSS seems to predict need for early surgery and recurrence after first episode of PSP. CT can be used to risk stratify patients after first episode of PSP and identify patients at high risk of failure of conventional treatment and early recurrence. Further prospective randomized studies are required to validate these findings.

Abstract S11 Table 1 Comparison of low grade with high grade DSS for predicting early surgical intervention and rate of recurrence after first episode of PSP

	Low grade DSS (n=8)	High grade DSS (n=37)	P value
Median age, years (IQR)	35 (23.5 – 46.7)	31 (24 – 34.5)	0.51
Male, n (%)	8 (100%)	29 (78%)	0.32
Right sided, n (%)	3 (37.5%)	17 (46%)	0.72
Current/Ex-smoker, n (%)	5 (62.5%)	28 (75.7%)	0.66
Median LOS, days (IQR)	5 (3.2 – 8.5)	8 (4 – 12)	0.52
Surgical intervention, n (%)	0	25 (68%)	0.0006
Recurrence at 1 year, n (%)	0	5 (13.5%)	0.57

S12 THE CHANGES IN INCIDENCE AND MANAGEMENT OF PLEURAL EMPYEMA IN ENGLAND OVER THE LAST DECADE

DT Arnold, FW Hamilton, TT Morris, R Payne, NA Maskell. *University of Bristol, Bristol, UK*

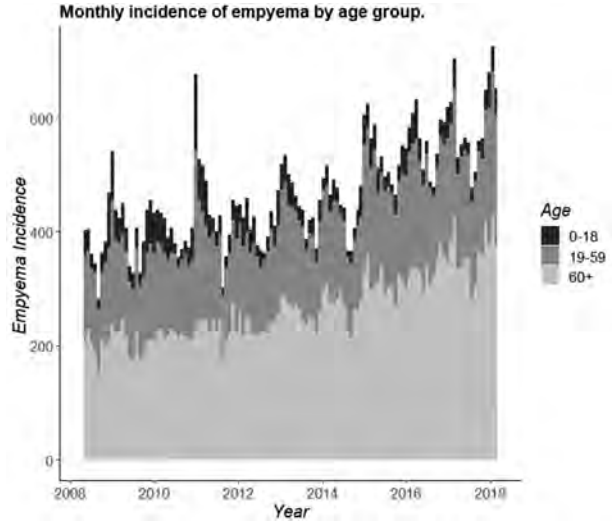
10.1136/thorax-2019-BTSabstracts2019.18

Introduction Pleural empyema represents a significant healthcare burden due to extended hospital admissions and/or requirement for surgical intervention. Epidemiological studies from Europe and North America have shown a steady increase in incidence, especially in the elderly.[1] [2] No epidemiological studies have been performed in England. This study aimed to assess changes in incidence and management of pleural empyema over the last 10 years.

Methods Hospital Episode Statistics data was used to identify every patient admitted to an English hospital with pleural empyema (code J86), as well as all previously validated codes for viral influenza and pneumonia.

Descriptive statistics were used to represent the change in empyema incidence, management and mortality. Linear regression analysis was used to compare the incidence of empyema with other respiratory infections.

Results Between April 2008 and April 2018 there were 53,161 patients admitted with empyema. There was male predominance (67% vs 33%). The incidence of empyema has significantly increased from 4916 in 2008 to 7011 in 2017, see figure. There was seasonal variation with rates in the winter



Abstract S12 Figure 1

months increasing by a quarter. The median hospital length of stay in adults was 17 days (IQR 8 to 32). The proportion requiring surgery has remained stable (15.2%), but the proportion of open surgery has fallen. Mortality rates remain approximately 12–14% throughout the study period. Incidence correlates closely with rates of viral influenza (r=0.60) and was highest in the children and young adults during the 2010/2011 influenza season.

Conclusion This is the first population level assessment of empyema incidence in this country. Rates of empyema admissions have steadily increased with a seasonal variation that may be related to influenza incidence. Results of linkage of the HES data to Public Health England influenza statistics will be presented at the conference.

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S13 THE MICROBIOLOGY OF PLEURAL INFECTION, AN APPROACH BASED ON 16S RRNA GENE NEXT GENERATION SEQUENCING

[1]NI Kanellakis, [1]E Bedawi, [1]JP Corcoran, [2]S Gerry, [1]R Hallifax, [1]R Mercer, [1]V George, [1]A Dudina, [1]JM Wrightson, [1]R Asciak, [3]R Miller, [1]M Dobson, [4]N Ilott, [5]NA Maskell, [1]I Psallidas, [1]NM Rahman. *[1]Oxford Centre for Respiratory Medicine, Churchill Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford, UK; [2]Centre for Statistics in Medicine, University of Oxford, Oxford, UK; [3]Infection and Population Health Institute for Global Health, University College London, London, UK; [4]Oxford Centre for Microbiological Studies, Kennedy Institute of Rheumatology, University of Oxford, Oxford, UK; [5]Academic Respiratory Unit, University of Bristol, Bristol, UK*

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Background Pleural infection (PI) is a common and complicated disease, bearing a heavy healthcare burden worldwide. Definitive pathogen identification based on current methods occurs in only 40% of cases, mainly due to prior antibiotic administration and special bacterial nutritional culture requirements. To this end PI microbiology knowledge remains incomplete. Novel deep sequencing techniques could increase the rate of reliable pathogen identification and shed light on the complex polymicrobial patterns of PI.

Aim To investigate and further characterise the microbial nature of PI using next generation sequencing (NGS).

Methods Pleural fluid samples from the 'Pleural Infection Longitudinal Outcome Study' (PILOT, ISRCTN50236700, n=243) underwent bacterial DNA extraction followed by 16S rRNA NGS using Illumina MiSeq. Data were analysed with DADA2 and Phyloseq R packages.

Results Bacterial DNA from pleural fluid samples was successfully extracted and sequenced. NGS detected 391 diverse pathogens up to the genus level and analysis showed that PI is a polymicrobial disease. 131 (54%) samples had one pathogen with relative abundance over 50% and 89 (36%) samples had at least 3 pathogens with relative abundance over 10%. *Streptococcus Pneumoniae* was detected in 40 (16%) and *Staphylococcus Aureus* in 20 (8%) samples.

Discussion It is feasible to extract and sequence bacterial DNA from pleural fluid samples from patients with PI. 16S rRNA NGS is a robust method for investigating the total bacteriology of pleural fluid samples.

Funding National Institute for Health Research (NIHR) Oxford Biomedical Research Centre (BRC).

S14 THE ROLE OF SOLUBLE UROKINASE PLASMINOGEN ACTIVATING RECEPTOR (SUPAR) IN PARAPNEUMONIC EFFUSIONS

[1]DT Arnold, [1]FW Hamilton, [1]KT Elvers, [1,2]N Zahan-Evans, [1]NA Maskell. *[1]University of Bristol, Bristol, UK; [2]North Bristol NHS Trust, Bristol, UK*

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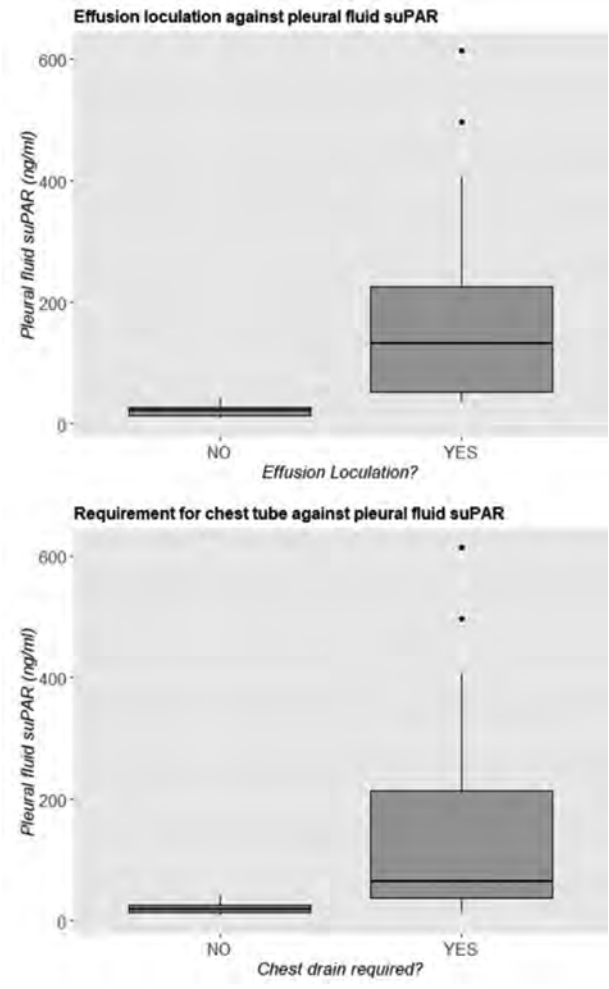
Introduction For decades the management of parapneumonic effusions has relied on pleural fluid pH measurement. However, the eventual requirement for fibrinolytics or surgery is more often dictated by the development of loculations. soluble urokinase Plasminogen Activating Receptor (suPAR) is a novel biomarker released by pleural mesothelial cells in response to infection as part of the fibrinolysis cascade. This study



Abstract S14 Figure 1

assessed levels of suPAR in the pleural fluid (PF) and serum of patients with parapneumonic effusions.

Methods We analysed stored serum and PF from a prospectively collected cohort of patients with effusions due to infection. Cases with frank pus on thoracentesis were excluded. Baseline pleural ultrasounds were performed to assess loculations, with routine bloods and pleural fluid analysis. Clinical outcomes and final diagnoses were confirmed at 12 months by two respiratory consultants. suPAR levels were analysed in duplicate using the suPARnostic® double monoclonal antibody sandwich ELISA assay. Binomial logistic regression was used to compare clinical outcomes to biochemical markers. Mann Whitney test was used to compare suPAR levels between groups.

Results Between 2008 and 2016 there were 93 patients with parapneumonic effusions recruited (49 non-loculated and 44 loculated effusions). Median PF suPAR was 88ng/ml (9–614ng/ml). PF suPAR was significantly higher in loculated effusions (median 162ng/ml versus 22ng/ml, $p<0.001$) see figure 1. Serum suPAR did not correlate with PF suPAR nor clinical outcomes.

The sensitivity and specificity of PF suPAR >35ng/ml to predict loculations was 100% and 91% respectively. 94% of patients (45/48) with a pf suPAR over 35ng/ml were managed with a chest tube. Using stepwise logistic regression (in a model that included PF pH) PF suPAR was an independent predictor of need for fibrinolytics and surgery ($p<0.001$).

Conclusion The development of loculations is an important differentiator in the management of parapneumonic effusions. suPAR is a novel biomarker and is part of the fibrinolysis cascade. This is the first study to assess the potential role of suPAR in parapneumonic effusions. PF suPAR was superior to PF pH and serum CRP at predicting loculations as well as requirement for fibrinolytics or surgery. Its true utility needs assessing in a larger prospective study.

Biomarkers and treatments in cystic fibrosis

S15 AN OBSERVATIONAL STUDY OF IVACAFTOR IN PATIENTS WITH CYSTIC FIBROSIS (CF) AND SELECTED NON-G551D GATING MUTATIONS: OUTCOMES FROM THE SECOND INTERIM ANALYSIS OF THE VOCAL STUDY

[1]NJ Simmonds, [2]C Castellani, [3]C Colombo, [4]K van der Ent, [5]L Jha, [5]C DeSouza, [5]T Thorat, [6]N Kinnman. *[1]Adult Cystic Fibrosis Centre, Royal Brompton Hospital and Imperial College London, London, UK; [2]Cystic Fibrosis Centre, IRCCS Istituto Giannina Gaslini, Genoa, Italy; [3]Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy; [4]Department of Pediatric Respiratory Diseases, University Medical Center Utrecht, Utrecht, Netherlands; [5]Vertex Pharmaceuticals Incorporated, Boston, USA; [6]Vertex Pharmaceuticals (Europe) Limited, London, UK*

10.1136/thorax-2019-BTSabstracts2019.21

Introduction and objectives The efficacy and safety of ivacaftor in patients with CF and non-*G551D* gating mutations were demonstrated in the Phase 3 randomised KONNECTION trial (NCT01614470). VOCAL (NCT02445053) is an ongoing Phase 4 observational study evaluating real-world effectiveness of ivacaftor in this population (including *G178R, S549N/R, G551S, G1244E, S1251N, S1255P,* and *G1349D* mutations). This prespecified second interim analysis describes outcomes over 24 months; 4 years of prospective data collection is planned.

Methods VOCAL includes patients aged ≥6 years with CF from selected sites in the UK, Italy, and the Netherlands. A mixed model for repeated measures of percent predicted FEV_1 ($ppFEV_1$) and nutritional status was used to analyse on-treatment changes from baseline (start of ivacaftor) in 6-month intervals. A negative binomial model was used to compare 12-month on-treatment rates of pulmonary exacerbations (PEx) with the 12-month rate prior to treatment start. No adjustments for multiple comparisons were performed.

Results By the data cutoff, 68/73 patients (93%) completed 24 months of treatment. Twenty-five (34%) were male. Mean baseline age was 26.9 (SD, 13.5) years. Mean baseline $ppFEV_1$ was 64.82% (SD, 23.61%); least squares (LS) mean (SE; 95% CI) improvement from baseline was 10.78 (1.28; 8.24–13.33) percentage points at 6 months and was sustained through 24 months. In patients aged ≥20 years (n=49), mean baseline body mass index (BMI) was 22.95 kg/m^2 (SD, 3.81); LS mean (SE; 95% CI) change from baseline was 0.81 (0.14; 0.52–1.10) at 6 months and increased to 1.25 (0.21; 0.82–1.68) at 24 months. In patients aged <20 years (n=24), mean baseline BMI *z* score was -0.41 (SD, 0.90); LS mean (SE; 95% CI) change from baseline was 0.54 (0.11; 0.31–0.77) at 6 months and was sustained through 24 months. Ivacaftor was associated with a >50% reduction in the annual rate of PEx requiring hospitalisations and PEx requiring intravenous antibiotics through 24 months compared with the 12-month pretreatment period. No new safety signals were identified.

Conclusions These real-world data demonstrate the positive impact of ivacaftor treatment on $ppFEV_1$, nutritional parameters, and PEx in patients with non-*G551D* gating mutations.

S16 THE INFLUENCE OF THE CFTR MODULATOR IVACAFTOR ON ASPERGILLOSIS IN CYSTIC FIBROSIS

[1]NC Fritsch, [2]HD Green, [2]AM Jones, [2]PJ Barry. *[1]University of Manchester, Manchester, UK; [2]Manchester Adult Cystic Fibrosis Centre, Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.22

Introduction Cystic fibrosis (CF) is a life limiting genetic condition which occurs due to mutations in the cystic fibrosis transmembrane conductance regulator gene (CFTR). Absence of functional CFTR protein leads to progressive respiratory disease characterized by bronchiectasis and chronic infections. CF lung disease predisposes patients to infection and sensitivity to the fungal pathogen Aspergillus fumigatus. Novel CFTR modulating therapies have recently been associated with potential disease modification in CF. It is unclear whether these therapies will have an influence on susceptibility to Aspergillus related disease in CF.

Methods We conducted a retrospective cohort study examining patients who commenced the CFTR modulator ivacaftor. Over a period of 5 years we monitored the isolation ofAspergillus in sputum samples and patients' serological response to Aspergillus fumigatus.

Results In 40 patients, ivacaftor therapy resulted in a significant decrease in sweat chloride (from 112 [102.75 – 119.25] to 45 [37 – 61], $p<0.001$), and an increase in FEV1 from 53.2% to 63.1% predicted. One patient was treated both with CFTR modulators and itraconazole for

ABPA. There was a significant decrease in the number of sputum samples patients provided in the year preivacaftor initiation compared to 5 years post from a median of 7 [4 – 12.75] per year to 1 [0 – 4], p<0.001. There was no difference in the rate of Aspergillus isolation in sputum. There was an early decrease (at 6 months) in total IgE levels from 35.55 [15.9 – 202.5] to 26.7 [9.5 – 108.25] (p=0.02) but these were not sustained over longer periods. There were no significant changes in Aspergillus specific IgE or IgG over the study time.

Conclusion Effective CFTR modulation in patients with CF does not appear to alter susceptibility or reaction to Aspergillus fumigatus in clinical settings. These findings suggest that Aspergillus will remain a significant pathogen in a new era of CF when most patients will receive CFTR modulator therapy. This will potentially result in clinical challenges due to difficult drug-drug interactions between –azole medications and CFTR modulators.

S17 IVACAFTOR TREATMENT IN PATIENTS 6 TO <12 MONTHS OLD WITH CYSTIC FIBROSIS WITH A CFTR GATING MUTATION: RESULTS OF A 2-PART, SINGLE-ARM, PHASE 3 STUDY

[1]JC Davies, [2]LT Wang, [2]P Panorchan, [2]D Campbell, [2]S Tian, [2]M Higgins, [2]O Egbuna, [2]C McKee, [3]M Rosenfeld. *[1]Imperial College London and Royal Brompton Hospital, London, UK; [2]Vertex Pharmaceuticals Incorporated, Boston, USA; [3]Seattle Children's Hospital, University of Washington School of Medicine, Seattle, USA*

10.1136/thorax-2019-BTSabstracts2019.23

Objectives ARRIVAL (NCT02725567) is a single-arm, Phase 3 study of the pharmacokinetics (PK) and safety of ivacaftor (IVA) in patients aged <24 months with cystic fibrosis (CF) with ≥1 *CFTR* gating mutation. We present results of the completed 6- to <12-month cohorts. The study is ongoing for patients aged <6 months.

Methods Patients received IVA (5 to <7 kg, 25 mg; 7 to <14 kg, 50 mg) every 12 hours for 4 days in part A (A) and 24 weeks in part B (B). Primary endpoints were PK (A) and safety (A, B), including serum lipase and amylase. Secondary/exploratory endpoints (B) included PK and changes in sweat chloride (SwCl), growth, serum immunoreactive trypsinogen (IRT) and faecal elastase (FE-1).

Results A and B enrolled 6 and 11 patients; mean age (standard deviation [SD]) was 7.7 (1.9) and 9.0 (1.3) months, respectively. PK from 4 days of IVA dosing in A informed dosing in B, in which exposure was consistent with that observed in adult patients. IVA was generally safe and well tolerated in both parts. In A, one patient had adverse events (AEs) (constipation, vomiting and sleep disorder) considered to be related to study drug. There were no deaths, serious AEs (SAEs) or AEs leading to study drug interruption or discontinuation. In B, one patient had increased alanine aminotransferase (>3 to ≤5 × upper limit of normal) that normalised with continued dosing; three patients reported SAEs (none were deemed related to IVA). Improvements were seen in multiple efficacy endpoints (table 1).

Conclusion These results suggest that IVA can be dosed safely in patients aged 6 to <12 months; substantial improvements in SwCl indicate improved CFTR function. Increases in FE-1 and reductions in lipase and IRT suggest there is a window of opportunity in early life for improving pancreatic function. These findings are consistent with those in children aged 12 to <24 months treated with IVA and support treating the underlying cause of CF in infants with IVA.

Sponsor Vertex Pharmaceuticals Incorporated.

S18 THE SPUTUM PROTEOME AND ITS RELATIONSHIP TO CYSTIC FIBROSIS LUNG DISEASE: USING GLOBAL PROTEOMICS TO DEVELOP CLINICALLY USEFUL BIOMARKERS

[1]RW Lord, [1]RE Maher, [1]V Harman, [1]B Bianco, [2]PJ Whorwell, [3]PS McNamara, [4]JA Smith, [5]RJ Beynon, [1]AM Jones. *[1]Manchester Adult Cystic Fibrosis Centre, Manchester, UK; [2]Department of Gastroenterology, Wythenshawe Hospital, Manchester, UK; [3]Department of Respiratory Medicine, Alder Hey Hospital, Liverpool, UK; [4]Respiratory and Allergy Clinical Research Facility, Wythenshawe Hospital, Manchester, UK; [5]Centre for Proteomic Research, University of Liverpool, Liverpool, UK*

10.1136/thorax-2019-BTSabstracts2019.24

Introduction There is potential for protein biomarkers to assist with clinical decision making in cystic fibrosis (CF) patients, such as when to commence and cease antibiotic therapy. Several small proteomic studies in CF populations have identified large numbers of proteins within respiratory samples, with some correlating with measures of lung function. Here initial data is presented from a larger cohort, with a comprehensive evaluation of protein abundance relative to baseline and longitudinal lung function.

Methods Spontaneous sputum samples were collected from CF subjects (n=37) and induced from healthy volunteers (HV) (n=33). Bottom-up shotgun proteomic analysis of samples was undertaken using liquid chromatography-mass spectrometry. Spirometry was noted at baseline, and for the previous 12 months. For comparison of relative protein abundance between cohorts, principal component analysis (PCA) and correlative statistics were undertaken.

Results Principal component analysis (PCA) highlighted significant differences between the CF and HV sputum proteome, with large increases in inflammatory proteins, predominantly neutrophil granulocyte proteins. There were significant differences in the sputum proteome between CF patients with normal/mild (FEV1% predicted ≥ 70%, n=4) and severe lung disease (FEV1% predicted ≥ 70%, n=5). The top ten most

Abstract S17 Table 1 Mean absolute change from baseline at week 24

Parameter (normal range)	SwCl, mmol/L (<30)	FE-1,[a] µg/g (>200)	IRT, ng/mL	Lipase, U/L	Amylase, U/L
Baseline, mean (SD)	101.5 (9.8); n=11	119.6 (199.1); n=10	1120.6 (238.2); n=9	331.4 (286.5); n=11	76.1 (39.8); n=11
Week 24, mean (SD)	43.1 (19.8); n=6	291.3 (170.5); n=9	753.2 (363.6); n=9	90.5 (63.8); n=11	54.2 (29.0); n=11
Mean (SD) absolute change[b]	−58.6 (16.5); n=6	159.3 (154.4); n=9	−406.2 (363.3); n=7	−240.9 (284.2); n=11	−21.9 (36.1); n=11

[a]Of 9 patients with FE-1 values at both visits, 5 (55.6%) had FE-1 ≤200 µg/g at baseline and >200 µg/g at week 24; [b]Calculated from the group with data available at both time points

influential proteins from this PCA were further examined. Within the entire CF cohort (n=37), seven of these ten proteins significantly correlated ($p<0.05$) with baseline lung function, with triosephosphate isomerase showing the greatest correlation ($r_s=-.594$, $p<0.001$). When comparing those with the greatest (n=5) and least (n=5) FEV1% decline, the PCA showed no separation and only one protein, proteasome activator complex subunit 1, showed a significant difference.

Discussion These data confirm findings from previous smaller studies that differences in the sputum proteome relate to baseline severity of lung disease. However, it does not appear to relate to longitudinal changes in lung function over 12 months. A biomarker might be only able to inform over shorter time periods, potentially because the proteome is in a state of flux. Further work is required to evaluate if longitudinal assessment of the proteome allow prediction of FEV1% decline, or if proteome changes are predictive of a pulmonary exacerbation.

S19 PEAK NASAL INSPIRATORY FLOW AND NASAL CYTOKINES ARE USEFUL BIOMARKERS OF NASAL INFLAMMATION IN CYSTIC FIBROSIS GENE THERAPY

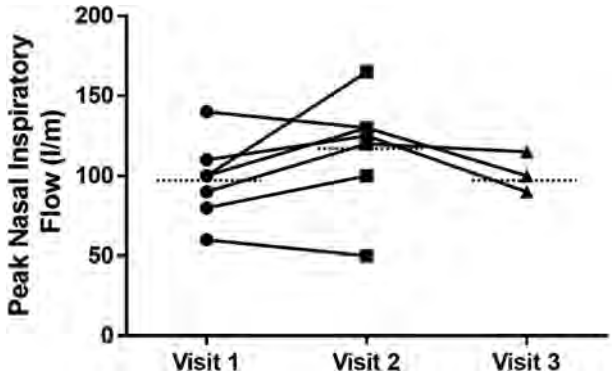
AD Saleh, SR Durham, MH Shamji, U Griesenbach, EWFW Alton. *National Heart and Lung Institute, Imperial College, London, UK*

10.1136/thorax-2019-BTSabstracts2019.25

Introduction The UK Cystic Fibrosis Gene Therapy Consortium has developed a programme of gene therapy for cystic fibrosis (CF). Studies include administration in the nasal respiratory epithelium to confirm molecular efficacy and safety in advance of lung trials. The aim of this study is to validate the measurement of peak nasal inspiratory flow (PNIF) and cytokines in nasal secretions from stable CF subjects and controls, for use as safety outcome measures to detect immune inflammatory responses.

Methods Study participants were asked to perform a short maximal sniff manoeuvre using an In-Check device (Clement Clarke) and the best of 2 proficient attempts was used. PNIF was measured in 19 subjects with stable CF and 23 healthy controls. Smokers and subjects with significant nasal pathology or steroid use were excluded. Repeat visits were performed in 7 patients with CF to assess intra-subject variability. Nasal secretions were obtained from 12 CF subjects and 6 healthy controls within the cohort using open cell polyurethane sponges. Cytokines correlating with innate (IL-1β, IL-8, TNFα, IFNα and CXCL11) and adaptive (IL-4, IL-6, IL-10, RANTES and IFNγ) viral immune responses were analysed using a MagPix bead assay.

Results PNIF was not significantly different in between healthy subjects and those with CF and there was no significant difference between male and female subjects overall. PNIF was stable between visits 1 and 2 in CF (%CV 16.6). IL-1β, IL-8, IL-6, IFNγ, TNFα, CXCL11 and RANTES were detectable in most samples. Nasal IFNγ was higher in nasal secretions from subjects with CF (5.8 (0–10.75) pg/ul) compared with healthy controls (0 (0–0), p=0.002) whereas differences were non-significant for other cytokines. In CF subjects, median cytokine level did not vary significantly between visit 1 and 2 for any cytokine. However, mean coefficient of variation for all cytokines was 63%.



Abstract S19 Figure 1 Peak nasal inspiratory flow result for repeat measurements in subjects with cystic fibrosis. No significant differences in group medians between visits(dotted lines)

Conclusions We show for the first time that peak inspiratory nasal flow and detection of cytokines can be rapidly undertaken and are well-tolerated measurements in CF. Group medians for PNIF and all nasal cytokines were stable on repeat visits. These biomarker assays are suitable for safety outcome measures reporting nasal inflammation at clinical trial.

S20 INHALED AZTREONAM LYSINE RECOVERS LUNG FUNCTION AND IMPROVES QUALITY OF LIFE IN ACUTE PULMONARY EXACERBATIONS OF CYSTIC FIBROSIS

[1]F Frost, [2]J Fothergill, [2]C Winstanley, [1]D Nazareth, [1]MJ Walshaw. *[1]Liverpool Heart and Chest Hospital NHS Foundation Trust, Liverpool, UK; [2]Institute of Infection and Global Health, University of Liverpool, Liverpool, UK*

10.1136/thorax-2019-BTSabstracts2019.26

Background Pulmonary exacerbations cause significant morbidity in people with cystic fibrosis, but treatment with extended courses of intravenous antibiotics may also result in systemic side-effects, adverse reactions and co-morbid complications. Treatment through the inhaled route, where the lungs are targeted directly with less systemic exposure may be more appropriate. The AZTEC-CF study investigated the efficacy of inhaled aztreonam lysine (AZLI) in the treatment of acute pulmonary exacerbations.

Methods AZTEC-CF was an open-label randomised crossover study designed and conducted at a regional adult cystic fibrosis centre in the UK (*ClinicalTrials.gov:* NCT02894684). Inclusion criteria included age > 16 years, *P. aeruginosa* infection and no prior use of AZLI. Exclusion criteria included *Burkholderia cepacia* complex infection and solid-organ transplant. During two consecutive exacerbations requiring hospitalisation for intravenous antibiotics, subjects received 14 days AZLI plus intravenous colistimethate (AZLI+IV) or standard dual intravenous antibiotics (IV+IV). Primary outcome was recovery of% predicted FEV1 (ppFEV1) at 14 days. Key secondary outcomes included health-related quality of life outcomes, sputum bacterial load, systemic inflammatory markers, aztreonam resistance and safety outcomes.

Results Sixteen adults with CF were consented and randomised, and by March 2019 (censorship date) 28/32 (87.5%) exacerbations were completed. At 14 days, improvement in $ppFEV_1$ was greater for AZLI +IV compared to IV+IV (mean +13.5% versus +8.3%; paired differences [95% CI] +4.6%

[2.1 to 7.2], p=0.002). The minimum clinically important difference in CFQ-R Respiratory Domain was achieved more frequently in exacerbations treated with AZLI+IV (83.3% vs. 43.8%, p=0.03). No significant differences were found between treatments for changes in sputum bacterial load, systemic inflammation or adverse events. Aztreonam-resistant *P. aeruginosa* load was significantly increased (+0.9 Log_{10} CFU/ml, p=0.01) after the IV+IV treatment but not AZLI+IV (-0.15 Log_{10} CFU/ml, p=0.65) despite no use of aztreonam in the IV+IV treatment.

Conclusion AZLI is effective, safe and well tolerated in the treatment of acute pulmonary exacerbations of CF. Superior improvements in lung function and quality of life suggest AZLI may represent a new treatment approach for acute pulmonary exacerbations and further work is required to understand how its use in the acute setting can be optimised.

An update in screening for lung cancer

S21 DEVELOPING NHS ENGLAND'S NATIONAL TARGETED LUNG HEALTH CHECK PILOT

[1]RW Lee, [2]A Nair, [3]C Stacey, [3]D Fitzgerald, [2]S Quaife, [4]P Sasieni, [2]S Janes, [5]D Baldwin. *[1]Royal Marsden Hospital and Institute of Cancer Research NIHR Biomedical Research Centre, London, UK; [2]University College London Hospitals, London, UK; [3]NHS England National Cancer Team, London, UK; [4]Kings College London, London, UK; [5]Nottingham University Hospitals NHS Trust, Nottingham, UK*

10.1136/thorax-2019-BTSabstracts2019.27

Introduction The NLST and NELSON studies demonstrated lung cancer mortality reduction from low-dose CT (LDCT) lung cancer screening. Local implementation pilots of 'Lung Health Checks' indicate feasibility in the NHS. NHS England will now fund 10 aligned projects for a national Lung Health Check pilot as a major centre-piece of the early diagnosis agenda of the NHS Long Term Plan. We report on methodological approaches to deliver this project and progress towards deployment.

Methods Sites selected from Clinical Commissioning Groups in 10 Cancer Alliances had highest incidence and mortality from lung cancer, excluding those where screening pilots or research projects were already underway. Approximately 600,000 individuals will be invited with an expected 200,000 scans over the next four years, including baseline and 24 month incident round scanning. To support quality and governance, NHS England published a National Protocol (January 2019), are developing a Quality Assurance Framework, minimum dataset, Incidental Findings Protocol and Research Standard (assisted by CRUK). NHSE are supported by the CT Screening Advisory Committee, a sub-group of the Clinical Expert Group for Lung Cancer, NHSE. Cancer Alliances are being assisted in developing detailed delivery plans by the National Cancer Programme team.

Results Detailed delivery plans have been provided by all regions. 47 radiologists will attend a national education program with clearly defined metrics for a national quality assurance training standard including volumetry and computer-aided detection. Standard participant materials are in production and QA evaluator appointed. Data on infrastructure readiness, progress against delivery milestones and final supporting documents relating to quality and governance will be presented.

Conclusions The Lung Health Check program will be a major national flagship for respiratory medicine and a key component of the Long Term Plan aspirations to achieve early stage diagnosis in 75% of cancer cases. The program will inform the international literature on implementation of potentially revolutionary lung cancer screening but careful adherence to QA and demonstration of efficacy through appropriate evaluation is critical. Potential barriers include participant uptake; workforce capacity and data flow/information governance. The Standard Protocol is already being used by several European countries as a template for local protocol development.

On behalf of the CT Screening Advisory Group, Clinical Expert Group for Lung Cancer and NHS England National Cancer Team.

S22 THE LIVERPOOL HEALTHY LUNG PROJECT – RAISING THE IMPORTANCE OF LUNG HEALTH

[1]MJ Ledson, [2]M Ahmed, [3]R Arvanitis, [3]M Timoney, [3]E Gaynor, [4]J Field. *[1]Liverpool Heart and Chest Hospital, Liverpool, UK; [2]Aintree University Hospital, Liverpool, UK; [3]Liverpool CCG, Liverpool, UK; [4]Liverpool University, Liverpool, UK*

10.1136/thorax-2019-BTSabstracts2019.28

Liverpool has high levels of deprivation and one of the highest rates of respiratory morbidity in England with double the incidence of lung cancer, most prevalent in the lower socioeconomic groups. To tackle this health inequality, in February 2016 in partnership with Liverpool CCG, Liverpool University, and primary care and public health colleagues, we embarked on the 4-year Liverpool Healthy Lung Project.

Based on primary care records, individuals aged 58–75 with COPD, a history of smoking or asbestos exposure were invited to a face-to-face lung health check conducted by an experienced respiratory nurse. At this interview positive lifestyle messages were promoted and their 5-year personal lung cancer risk calculated (www.MyLungRisk.org) using the LLPv2 risk model. Those without a diagnosis of COPD underwent spirometry, and those who triggered the 5% threshold lung cancer risk threshold were offered a low dose thoracic CT scan. We now report our results to April 2019, when 11436 of 28590 (40%) patients invited to the lung health check had attended.

Of these, 6632 (58%) underwent spirometry and 10% were diagnosed with COPD. A further 3812 (34%) underwent the CT scan and of these 126 (3.3%) were suspicious of malignancy. Lung cancer was ultimately diagnosed in 76 (2%) and 61 of these (80%) were offered radical treatment. Of the remaining 50 patients, 11 underwent an invasive test and there was 1 benign resection. 343 patients (9%) needed repeat scans for lung nodules.

These early results show that this innovative project is already improving access to respiratory healthcare in a deprived area of Liverpool, has identified new COPD patients, and over time should improve outcomes for lung cancer in this disadvantaged population.

S23 OPTIMUM DIAGNOSTIC PATHWAY AND PATHOLOGIC CONFIRMATION RATE OF EARLY STAGE LUNG CANCER: RESULTS FROM VIOLET

[1]E Lim, [2]S Begum, [2]T Batchelor, [3]R Krishnadas, [4]M Shackcloth, [5]J Dunning, [5]I Paul, [2]V Anikin, [2]N McGonigle, [6]B Naidu, [6]H Fallouh, [7]E Belcher, [7]D Stavroulias, [8]M Loubani, [8]S Qadri, [9]V Zamvar, [10]H Mckeon, [10]R Harris, [11]JM Blazeby, [2]AG Nicholson, [10]CA Rogers.
[1]National Heart and Lung Institute, Imperial College, London, UK; [2]The Royal Brompton and Harefield NHS Foundation Trust, London, UK; [3]University Hospitals Bristol NHS Foundation Trust, Bristol, UK; [4]Liverpool Heart and Chest Hospital, Liverpool, UK; [5]The James Cook University Hospital, Middlesbrough, UK; [6]Birmingham Heartlands Hospital, Birmingham, UK; [7]Oxford University Hospitals NHS Foundation Trust, Oxford, UK; [8]Hull University Teaching Hospitals NHS Trust, Hull, UK; [9]Royal Infirmary of Edinburgh, Edinburgh, UK; [10]Clinical Trials and Evaluation Unit, Bristol Trials Centre, Bristol Medical School, University of Bristol, Bristol, UK; [11]Population Health Sciences, Bristol Medical School, University of Bristol, Bristol, UK

10.1136/thorax-2019-BTSabstracts2019.29

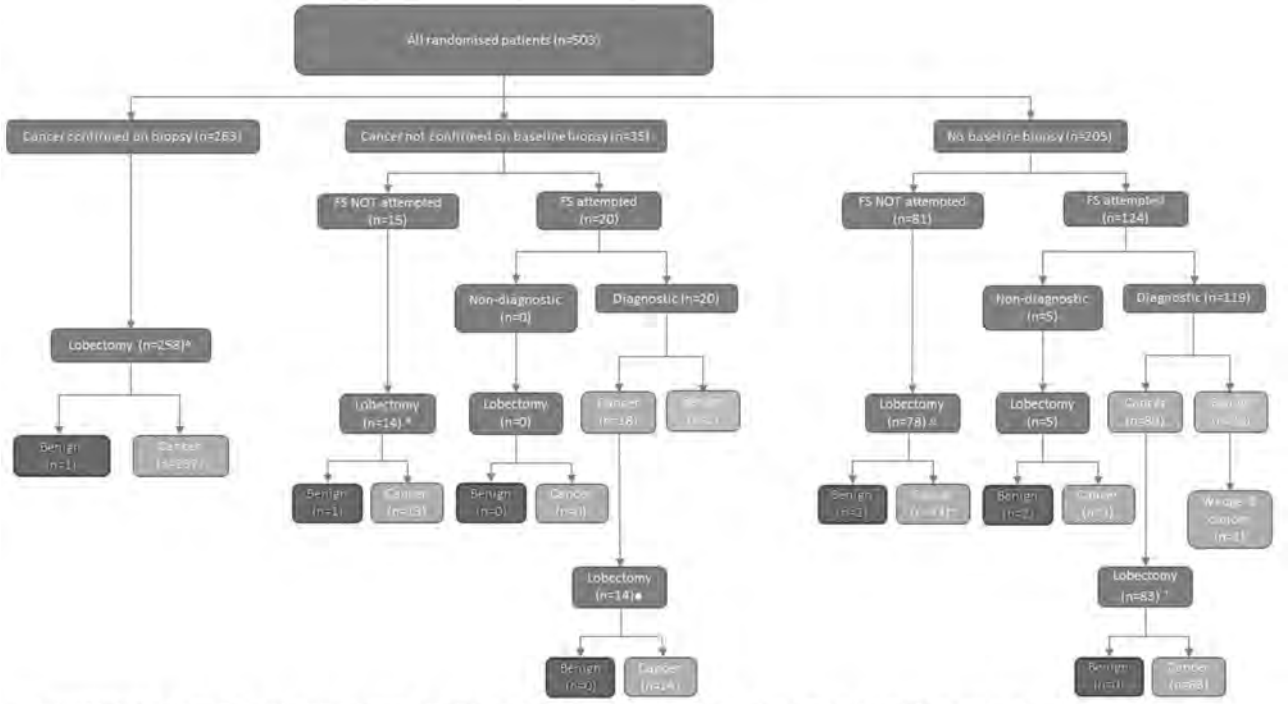
As pathological confirmation of lung cancer influences treatment selection for suspected early stage lung cancer, high pre-treatment tissue confirmation rates (90%) have been recommended by the National Lung Cancer Audit 2018. However, this practice prior to radical management of patients with early stage lung cancer has never been studied. Using prospective collection of pre-defined biopsy data within multi-disciplinary teams in UK centres, we sought to define the management and outcomes of incomplete pre-treatment tissue confirmation of primary lung cancer in patients undergoing surgery in a multi-centre clinical trial.

Methods VIOLET is an UK National Institute of Healthcare Research (NIHR) Health Technology Assessment (HTA) funded clinical trial (Ref: 13/04/03) comparing video-assisted thoracic surgery (VATS) versus open surgery for known or suspected lung cancer. Diagnostic patient pathways were identified and documented for participants with and without pre-surgical tissue confirmation of primary lung cancer. Methods of tissue confirmation (where undertaken) were documented, with resected pathology report as reference compared against the outcome of inappropriate lobectomy (benign disease or secondary lung cancer).

Results From July 2015 to February 2019 a total of 2,109 patients were screened, of whom 503 patients were eligible and consented to participate in VIOLET. In total 263 (52%) of patients had a pre-operative pathologic confirmed diagnosis of primary lung cancer. Of the remaining 240 (48%) patients, the majority 205 (85%) did not have a pre-operative biopsy attempted and 35 patients (15%) received a pre-operative non-diagnostic biopsy.

Of the 240 patients who entered the operating theatre without pathological confirmation of primary lung cancer, biopsy and frozen section analysis was undertaken in 144 (60%) patients. In the remaining 96 (40%) a lobectomy was undertaken without tissue confirmation (19% of the cohort of 503 trial participants). The overall lobectomy rate for benign disease was 6/503 (1.2%).

Conclusions Our results suggest low levels of inappropriate resection can be achieved with a pre-surgical tissue confirmation rates of approximately 50% through a combination of intra-operative confirmatory biopsy and correct risk estimation of lung cancer. The practice would need to be monitored to ensure acceptable levels are consistently achieved across multi-disciplinary teams caring for patients with suspected primary lung cancer.



Abstract S23 Figure 1

S24 ASSESSMENT OF HISTOPATHOLOGICAL AND RESECTION MARGIN DATA IN POST-OPERATIVE NON-SMALL CELL LUNG CANCER PATIENTS

H Gleeson, J Edwards, H George, L Socci, S Tenconi, JN Rao, DN Hopkinson. *Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK*

10.1136/thorax-2019-BTSabstracts2019.30

Background Surgery remains the mainstay treatment modality in patients with Non-Small Cell Lung Cancer (NSCLC), however the benefits of surgery when resectability becomes borderline is contentious. Resection status (R-Status) reflects how effective the surgery is, which consequently impacts prognosis and potentially, further treatment.

Methods Patients who underwent curative resection for NSCLC during 07/04/2005 to 30/03/2017 were eligible for this study, forming a cohort of 1,804 patients, once exclusion criteria were applied. Electronic medical records and histopathology data was retrospectively reviewed which formed the database. The IASLC proposed R-Status criteria was evaluated and consisted of: Number of N2 stations explored; Systematic or Lobe- Specific Lymph Node Dissection: Status of the highest station; Extracapsular Extension; and Bronchial Carcinoma In-Situ. Patients were then re-assigned R-Status based on these criteria and the revised categories of R0, R(Un), R1 and R2 were analysed to establish their prognostic and survival impact.

Results Initially, there were 1642 R0, 155 R1 and 5 R2 cases. After reassignment according to the IASLC proposed definition, there were 673 R0, 959 R(un), 167 R1 and 5 R2. Less than Systematic or Lobe-Specific Lymph Node dissection was the primary reason for reassignment to R(Un) in 90.3% of cases. There was significant evidence of an association between proposed R-Status and T-Category, ($p<0.001$) There was also a significant evidence of association within the pN- Category and R-Status, ($p<0.01$). In Node positive cases (pN+), there was a 24- month difference in survival between R0 and R(Un) Cases. (HR=1.34, p=0.050).

Conclusion These data confirm that R descriptors have prognostic relevance and the proposed uncertain resection stratifies between R0 and R1. The 26-month difference in survival between R0 and R(Un) in node positive cases, demonstrates the importance of these proposals and the need for further prospective data collection to validate these findings. Therefore, R(un) status should be considered for inclusion in the RCPath Minimum Dataset and the National Lung Cancer Audit as a quality outcome measure.

S25 IMPROVED LUNG CANCER SURVIVAL FOLLOWING LOW DOSE COMPUTED TOMOGRAPHY (LDCT) SCREENING IN ASBESTOS-EXPOSED INDIVIDUALS

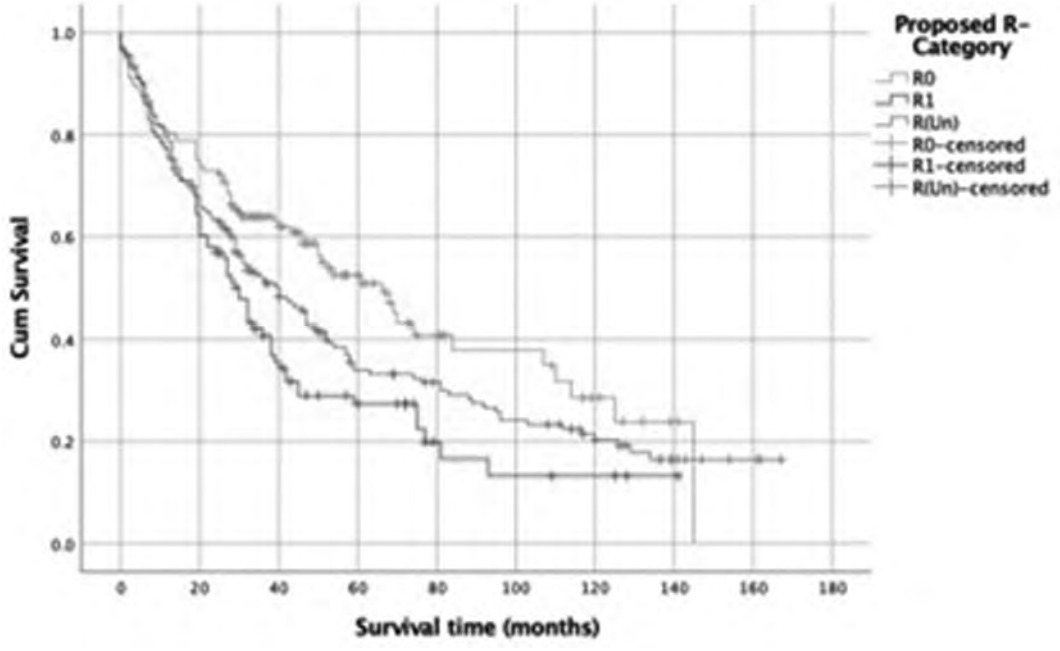
[1]EJA Harris, [2]P Franklin, [2]A Reid, [2]N Olsen, [3]NH de Klerk, [2]AW Musk, [4]FJH Brims. *[1]Sir Charles Gairdner Hospital, Perth, Australia; [2]School of Global and Population Health, University of Western Australia, Perth, Australia; [3]Telethon Kids Institute, Perth, Australia; [4]Curtin University Medical School, Perth, Australia*

10.1136/thorax-2019-BTSabstracts2019.31

Introduction Asbestos exposure is recognised to raise the risk of lung cancer (with additive synergism combined with a tobacco smoking history). A significant asbestos-exposure history is not adequately considered in any current US lung cancer screening guidelines.

The Western Australian (WA) Asbestos Review Program (ARP) has screened nearly five-thousand asbestos-exposed individuals for asbestos-related diseases since 1990, using annual chest x-ray (CXR), and latterly LDCT following the publication of the high-profile 'National Lung Screen Trial' in 2011. The hypothesis that LDCT screening improves lung cancer survival in this population was examined.

Subjects and methods Participants with significant asbestos exposure, (≥ 3 months full-time occupational exposure or pleural plaque on chest imaging), had attended at least one ARP appointment and were diagnosed with lung cancer between 2007 and 2017. The diagnosis was confirmed



Abstract S24 Figure 1 Survival Functions for R -Category (N+ Cases, No N0)

Abstract S25 Table 1 Demographic characteristics of the three asbestos-exposed groups with lung cancer

	Out of screening Group 1	CXR screening Group 2	CT screening Group 3
Lung cancers, n=	30	17	18
Median age at diagnosis (IQR)	71.9 (64.5–78.9)	74.7 (72.2–78.4)	77.7 (70.5–81.8)
Sex=Male, n=(%)	27 (90.0)	16 (94.1)	15 (83.3)
Alive at Censor, n=(%)	8 (26.7)	5 (29.4)	14 (77.8)
Histology			
Adenocarcinoma	9	8	12
Squamous Cell	4	3	4
Adenosquamous	2	0	0
Large Cell	0	1	0
NSCLC (unspecified)	5	2	0
Small Cell	3	1	0
Neuroendocrine (inc. carcinoid)	1	1	1
Unclassified	6	1	0
Unknown	0	0	1

through data linkage from the WA state cancer registry (performed mid-2015) or diagnosis through LDCT screening.

Participants were classified into three groups:

1. Not under active follow-up - between 1/1/2007 and 01/01/2012 (no imaging or appointments within prior 15 months of diagnosis)

2. CXR screening - between 1/1/2007 and 1/1/2012 (CXR within the prior 15 months)

3. LDCT screening - between 1/9/2012 and 1/9/2017 (LDCT scan within prior 15 months)

Survival time from diagnosis was calculated. The date of censor for groups 1 and 2 was 1/1/2012 and for group 3 was 1/9/2017 allowing a 5-year period to be considered for all three groups. Cox proportional-hazards model was used to investigate all-cause mortality by group.

Results Table 1 shows group demographics and cancers detected. Compared to the reference group (Group 1), after adjustment for age and sex, an 82% mortality risk reduction was demonstrated in the LDCT screening group (HR 0.18, 95% CI 0.06–0.54, p=0.002). No significant difference in risk was shown between the CXR screening and reference group (HR 0.70, 95% CI 0.34–1.44, p=0.36).

Conclusion Improved lung cancer survival was demonstrated in those diagnosed by LDCT screening. Extending consideration of LDCT screening to those with an appropriate asbestos-exposure history may improve mortality from lung cancer, however, the correct population for cost-effective screening has yet to be well defined.

S26 RESULTS OF THE NATIONAL MESOTHELIOMA ORGANISATIONAL AUDIT

[1]A Shantikatara, [2]S Harden, [3]L Darlison, [2]PA Beckett. *[1]University Hospitals of Derby and Burton, Derby, UK; [2]Royal College of Physicians, London, UK; [3]Mesothelioma UK, Leicester, UK*

10.1136/thorax-2019-BTSabstracts2019.32

Introduction The National Lung Cancer Audit (NLCA) has previously demonstrated variation in provision of local services which relate to patient outcomes. As part of the National Mesothelioma Audit (funded by Mesothelioma UK), we have carried out an organisational audit across the UK to investigate access to services and organisation of multidisciplinary teams for malignant pleural mesothelioma (MPM) patients.

Methods Lung cancer clinical leads across the United Kingdom were invited to complete an online survey. Email reminders were sent at intervals over a 6-week period, and the specialist nursing network was used to further encourage participation. Results were analysed in Microsoft Excel.

Result Overall there were 125 responses, equivalent to a 75% response rate (England 105, Wales 9, Scotland 7, N. Ireland

Abstract S26 Table 1

	Local access	Regional access	No access
Image guided pleural biopsy	95%	4%	1%
Local anaesthetic thoracoscopy	56%	32%	12%
Video-assisted thoracoscopy	34%	66%	0%
Chemotherapy	87%	13%	0%
Radiotherapy	64%	30%	5%
Palliative surgery	17%	37%	45%
Indwelling pleural catheter	86%	12%	1%
Clinical trials	33%	61%	6%

4). 46% of respondents stated that they see their MPM patients in the lung cancer clinic with only 13% having a specific pleural clinic.

Access to investigation and treatment is shown in table 1.

78% reported routinely staging patients according to IASLC TNM v8 and 94% reported routinely recording the pathological subtype of mesothelioma. 21% of organisations perform a PET-CT scan, and 17% use biomarkers as part of the diagnostic assessment, although the survey did not distinguish between routine and exceptional use. A tissue biopsy is carried if pleural cytology suggests MPM routinely in 61%, sometimes in 34% and rarely in 5%.

95% of organisations routinely discuss MPM cases in the local lung cancer MDT. Whilst only 22% had a local MPM specialist MDT, 49% routinely discuss MPM patients in a regional specialist MDT. 19 of these regional specialist MDTs were identified through the survey (England 17, Wales 1, Scotland 1). 84% responded that the lung CNS acted as a key worker on MPM patients with only 14% having a mesothelioma specific CNS.

Conclusion Access to key investigations are treatment are generally good. It is interesting that PET-CT and biomarkers are used so frequently despite not being recommended in BTS guidelines. 78% staging and 94% subtyping are considerably better (54% and 57% respectively) directly measured in the last NMA audit, perhaps reflecting genuine improvements in practice, or alternatively over-optimistic assessment of local practice. A second phase of this audit will look in detail at the self-declared specialist MDTs.

What's new? Clinical trials in lung disease

S27 A PLACEBO-CONTROLLED, DOUBLE-BLIND, RANDOMISED, CROSSOVER STUDY TO ASSESS THE EFFICACY, SAFETY AND TOLERABILITY OF TRPV4 INHIBITOR GSK2798745 IN PARTICIPANTS WITH CHRONIC COUGH

[1]VJ Ludbrook, [1]KE Hanrott, [1]J Marks-Konczalik, [2]JL Kreindler, [1]NP Bird, [1]D Hewens, [1]M Beerahee, [2]DJ Behm, [3]A Morice, [4]L McGarvey, [5]SM Parker, [6]SS Birring, [7]J Smith. *[1]Glaxosmithkline, Stevenage, UK; [2]Glaxosmithkline, Upper Providence, USA; [3]Hull York Medical School, Hull, UK; [4]Queens University Belfast, Belfast, UK; [5]North Tyneside General Hospital, North Shields, UK; [6]Kings College London, London, UK; [7]University of Manchester, Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.33

Introduction and objectives Airway sensory nerves involved in the cough reflex may be mediated by adenosine triphosphate (ATP) agonism of P2X purinoceptor 3 (P2X3) receptors. Transient receptor potential vanilloid 4 (TRPV4) activation causes ATP release from airway macrophages and epithelial cells and it is hypothesised that a TRPV4-ATP-P2X3 axis contributes to chronic cough. The aim of this study was to evaluate, using an adaptive design, whether blockade of TRPV4 channels, using the selective TRPV4 channel blocker GSK2798745, is effective in reducing cough.

Methods A placebo-controlled, double blind, randomised, two-period crossover study was designed with interim analyses for futility and to allow possible sample size adjustment during the study. Refractory chronic cough patients were recruited from four specialist clinics. Participants received either GSK2798745 or matching placebo once daily for 7 days with a 14–21 day wash out between treatments. Dose of GSK2798745 orally administered was predicted to give ~65–72% TRPV4 inhibition over 24-hour period. Blood samples were collected for pharmacokinetic assessment. 24-hour cough count (VitaloJAK) was recorded before and after each treatment period. The primary endpoint was total cough counts during day-time hours following 7 days of dosing.

Results Interim analysis was performed after 12 participants had completed both treatment periods and showed a 32% increase in cough counts on Day 7 for GSK2798745 compared to placebo. The negative criteria for the study were met and the study was subsequently stopped. At this point 17 participants had been enrolled (Mean 61yrs; 88% female), and 15 completed the study. Final study results for posterior median cough counts are shown in table 1.

Conclusion There was no evidence of an anti-tussive effect of GSK2798745, despite cough frequency being highly reproducible within patients and expected drug exposure. Leicester Cough Questionnaire and severity and urge to cough VAS were consistent with this lack of change in cough counts. The design of the study allowed the decision on lack of efficacy to be made with minimal participant exposure to the molecule.

S28 BENEFITS OBSERVED WITH PATIENT-REPORTED OUTCOMES IN A PHASE 2B CLINICAL TRIAL OF GEFAPIXANT, A P2X3 RECEPTOR ANTAGONIST, IN CHRONIC COUGH

[1]SS Birring, [2]LP McGarvey, [3]JA Smith, [4]AH Morice, [5]MR Sher, [6]J Schelfhout, [6]A Mehta, [6]DR Muccino. *[1]King's College Hospital, London, UK; [2]Queens University, Belfast, UK; [3]University of Manchester, Manchester, UK; [4]Hull York Medical School, Cottingham, UK; [5]Center for Cough, Largo, USA; [6]Merck and Co., Inc., Kenilworth, USA*

10.1136/thorax-2019-BTSabstracts2019.34

Background The negative impact of chronic cough on patients' daily lives is multi-faceted; therefore, the evaluation of chronic

Abstract S27 Table 1

Endpoint	Treatment	Posterior Median (SD)	Ratio of Posterior Median (90% Credible Intervals)	% Increase from placebo
10 hour (daytime) cough count	GSK2798745 (n=15)	241.1 (35.4)	1.336 (0.965, 1.847)	34%
	Placebo (n=17)	180.6 (24.8)		
24 hour cough count	GSK2798745 (n=15)	450.7 (50.8)	1.090 (0.848, 1.402)	9%
	Placebo (n=17)	413.4 (43.6)		

Abstract S28 Table 1 Patient-reported outcomes at week 12

	Placebo N=61	Gefapixant 7·5 mg N=59	Gefapixant 20 mg N=59	Gefapixant 50 mg N=57
Cough Severity VAS (mm)* -	-16·7 (-22·7, -10·7)	-21·1 (-27·2, -15·1)	-23·1 (-29·1, -17·0)	-27·9 (-34·1, -21·6) †
CSD Total Score *	-1·2 (-1·6, -0·7)	-1·5 (-2·0, -1·1)	-1·7 (-2·2, -1·3)	-1·9 (-2·4, -1·4) †
CSD Subscales **				
Frequency Subscale	-1.3 (1.75)	-1.8 (1.75)	-1.9 (2.12)	-2.0 (1.70)
Intensity Subscale	-1.2 (1.73)	-1.6 (1.74)	-1.9 (2.21)	-2.1 (1.86) †
Disruption Subscale	-0.8 (1.43)	-1.0 (1.32)	-1.4 (2.05)	-1.6 (1.24) ‡
Total LCQ Score *	2·1 (1·3, 3·0)	3·3 (2·4, 4·2)	3·2 (2·3, 4·0)	4·0 (3·1, 4·9) †
LCQ Domains **				
Social Domain	0.8 (1.41)	1.1 (1.43) †	1.2 (1.45)	1.6 (1.71) †
Psychological Domain	0.8 (1.38)	1.4 (1.35) †	1.2 (1.40)	1.5 (1.53) †
Physical Domain	0.5 (0.99)	0.7 (0.97)	0.8 (1.07)	1.2 (1.15) ‡
PGIC – N (%) Very Much or Much Improved	17 (28.3%)	31 (53.4%) †	29 (49.2%) †	37 (64.9%) ‡

Full Analysis Set population

*LS Mean (95% CI) Change from Baseline at Week 12; **Mean (SD) Change from Baseline at Week 12; †p<0·05 vs. placebo; ‡p<0·001 vs. placebo

VAS, CSD and LCQ based on mixed model repeated measures analysis; PGIC p-value based on Cochran Mantel Haenszel Test

cough treatment requires an approach including both objective and subjective measures. We assessed patient-reported outcomes (PROs) in a phase 2b clinical trial of gefapixant in patients with refractory or unexplained chronic cough (RCC or UCC).

Methods This Phase 2b, 12-week, randomized controlled trial included subjects with severe RCC or UCC (duration >1 year; baseline VAS≥40 mm). Treatments included placebo or gefapixant (7.5, 20, or 50 mg BID) in a 1:1:1:1 ratio. Awake Objective Cough Frequency at 12 weeks was the primary endpoint; PROs included as secondary endpoints were: Cough Severity Visual Analog Scale (VAS), Patient Global Impression of Change (PGIC), Cough Severity Diary (CSD), and the Leicester Cough Questionnaire (LCQ). VAS is a patient rating of cough severity on a 0–100 mm visual analog scale (no cough to worst cough severity). PGIC is a patient rating of improvement (from very much, much, or minimally improved to no change or minimally, much, and very much worse). CSD was scored daily and summarized weekly and is comprised of 7 items (0–10 [best-worst] scale) including subscales capturing subjects' impression of frequency, disruption, and intensity. LCQ is a 19-item questionnaire (0–7 [worst-best] scale) including domains quantifying patients' impression of physical, psychological and social effects of cough.

Results 253 subjects were randomized with subjects on gefapixant 50 mg demonstrating significant reduction (p<0.01) of Awake Cough Frequency at 12 weeks vs. placebo (*Smith et al, Am J Respir Crit Care Med 2017: 195:A7608)*. Week 12 results for PROs are presented in the table 1. Gefapixant 50 mg demonstrated significantly greater improvement vs. placebo for each PRO with all doses demonstrating significantly greater improvement for PGIC.

Conclusions Improvements in PROs in this trial are consistent with data on objective cough frequency reductions and indicate benefits related to quality of life, particularly with regard to disruption and psychological impact from cough.

S29 THE IMPACT OF GOLD STAGE ON THE EFFECTIVENESS OF TIOTROPIUM/OLODATEROL IN PREVENTING COPD EXACERBATIONS IN THE DYNAGITO TRIAL

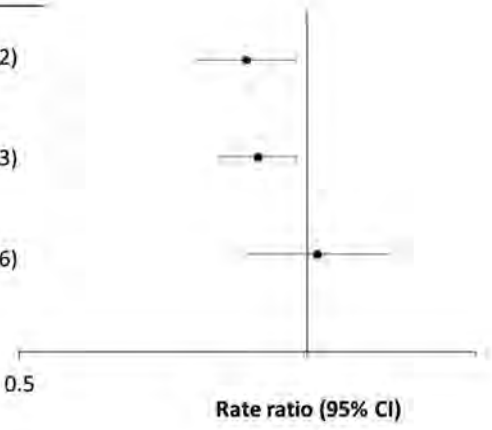
[1]J Wedzicha, [2]PMA Calverley, [3]AR Anzueto, [4]A de la Hoz, [5]F Voß, [6]KF Rabe, [7]C Jenkins. *[1]Respiratory Division, National Heart and Lung Institute, Imperial College London, London, UK; [2]Clinical Science Centre, Institute of Ageing and Chronic Disease, University of Liverpool, Liverpool, UK; [3]Department of Pulmonary Medicine and Critical Care, University of Texas Health Sciences Center and South Texas Veterans Health Care System, San Antonio, USA; [4]Boehringer Ingelheim International GmbH, Ingelheim am Rhein, Germany; [5]Boehringer Ingelheim International Pharma GmbH and Co. KG, Ingelheim am Rhein, Germany; [6]LungClinic Grosshansdorf, Grosshansdorf, Germany; [7]The George Institute for Global Health, Concord Clinical School, The University of Sydney, Sydney, Australia*

10.1136/thorax-2019-BTSabstracts2019.35

Rationale The DYNAGITO trial investigated the effect of bronchodilation on exacerbation rate in patients with COPD. The observed rates were 0.90 per patient-year with tiotropium/olodaterol (T/O) and 0.97 per patient-year with tiotropium alone (Tio) (rate ratio 0.93; 99% confidence interval 0.85–1.02; P=0.0498). We investigated whether the effect on exacerbation rate was the same across patients with varying degrees of baseline airflow limitation.

Methods DYNAGITO was a 52-week, double-blind trial in which patients with COPD were randomized (1:1) to receive T/O 5/5µg or Tio 5µg once daily, delivered via Respimat® (NCT02296138). Patients continued to take inhaled corticosteroids (ICS) if receiving them at baseline. Inclusion criteria included post-bronchodilator FEV_1 <60% predicted at baseline and at least one moderate or severe exacerbation in the previous 12 months. In this post hoc analysis, we grouped patients by baseline Global Initiative for Chronic Obstructive Lung Disease (GOLD) stages 2–4; there was a small number of patients classed as GOLD 1 (n=47), so we did not include this group. We used a negative binomial model adjusted for a number of covariates to calculate adjusted incidence rates and rate ratios.

GOLD stage	n	Adjusted exacerbation rate		Rate ratio (95% CI)
		Tio	T/O	
2	2,784	0.75	0.65	0.864 (0.767–0.972)
3	4,039	0.90	0.80	0.888 (0.810–0.973)
4	992	1.12	1.15	1.024 (0.862–1.216)



Based on negative binomial model adjusted for logarithm of treatment exposure as offset, treatment, ICS use at baseline, region, GOLD stage, smoking status, and treatment by GOLD stage interaction as fixed effects, and baseline CAT and number of exacerbations treated with antibiotics or steroids in previous year as covariates.

CAT, COPD Assessment Test; CI, confidence interval; ICS, inhaled corticosteroids; GOLD, Global Initiative for Chronic Obstructive Lung Disease; T/O, tiotropium/olodaterol; Tio, tiotropium.

Abstract S29 Figure 1 Exacerbation rate by GOLD stage 2–4 at baseline

Results Overall, there were 2,784 patients classed as GOLD 2, 4,039 GOLD 3 and 992 GOLD 4. Baseline COPD treatment differed by GOLD stage. More patients were receiving a long-acting muscarinic antagonist (LAMA) only or LAMA/long-acting β_2-agonist (LABA) in GOLD 2 (12.6% and 13.4%) than GOLD 3 (7.5% and 12.0%) or 4 (5.6% and 8.4%), while fewer patients were receiving LAMA/LABA/ICS in GOLD 2 (32.6%) than in GOLD 3 (42.8%) or 4 (47.7%). T/O reduced the exacerbation rate compared with Tio in GOLD 2 and 3 patients, but not in GOLD 4 patients (figure 1).

Conclusion The results demonstrate that improving bronchodilation with T/O reduced the exacerbation rate compared with Tio in patients with GOLD 2 and 3 COPD. The lack of effect of bronchodilators in the most severely limited patients has been reported previously (Wedzicha et al. N Engl J Med 2016;374:2222–34) and may reflect the complex contributors to airflow obstruction in very severe COPD.

S30 THE FEASIBILITY OF INVESTIGATING METHYLPHENIDATE FOR THE TREATMENT OF SARCOIDOSIS-ASSOCIATED FATIGUE (THE FAST-MP STUDY) – A DOUBLE-BLIND, PARALLEL-ARM RANDOMISED CONTROLLED-TRIAL

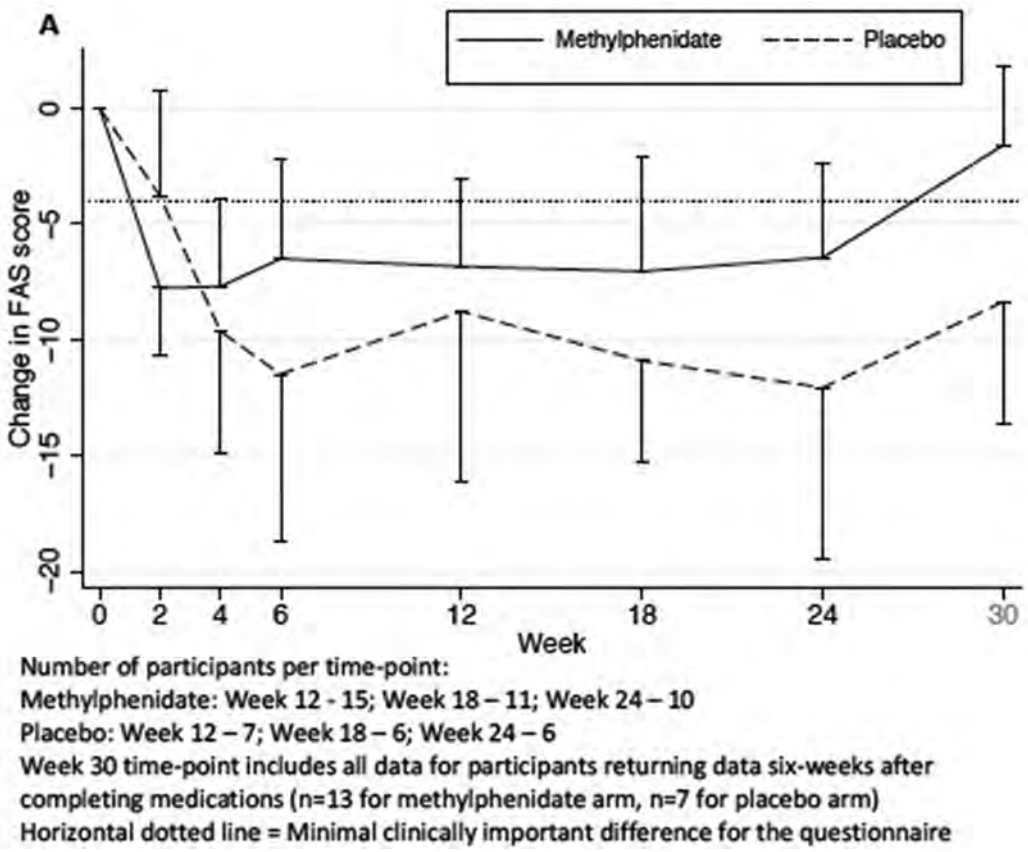
CP Atkins, AP Jones, AM Wilson. [1]*James Paget University Hospital, Great Yarmouth, UK*; [2]*University of East Anglia, Norwich, UK*

10.1136/thorax-2019-BTSabstracts2019.36

Aim We aimed to investigate the feasibility and optimum design of a study to determine the clinical efficacy of symptomatic treatment of sarcoidosis-associated fatigue using methylphenidate.

Methods Patients with pulmonary sarcoidosis and significant fatigue were recruited from the respiratory clinic at a single hospital, into a parallel-arm, double-blind, placebo-controlled randomised-controlled trial, with referrals from other participant identification centres in the region. Fatigue was quantified using the Fatigue Assessment Scale (FAS) questionnaire. Eligible participants were randomised in a 3:2 ratio in favour of methylphenidate through an online system using block randomisation controlled for baseline fatigue severity. Methylphenidate was commenced at 10 mg (1 capsule) twice daily, increased to 20 mg (2 capsules) twice daily if appropriate after 2 weeks. Participants attended up to seven visits over a period of up to 24 weeks, with follow-up questionnaires six weeks after completing medications. Participants allocated to placebo received identical placebo capsules and attended the same visit schedule.

Results A total of 385 patients were screened; 56 (14.5%) were eligible and 23 (5.9%) consented to participate, of which 22 received their allocated intervention. No withdrawals occurred although one participant receiving methylphenidate discontinued the intervention due to an adverse event. Adverse events observed were similar between groups. No difference in fatigue scores between groups was seen at any point (figure 1), although the mean fatigue score in each group improved from baseline. In the placebo group, improvements in non-fatigue clinical measures (anxiety, respiratory symptoms, perceived health and overall quality of life) were seen compared with the methylphenidate group.



Abstract S30 Figure 1

Conclusions The data from the FaST-MP study supports the feasibility of performing a trial powered to determine the clinical efficacy of methylphenidate for sarcoidosis-associated fatigue, although only a small proportion of patients with sarcoidosis and chronic fatigue would be eligible for such an intervention. The number of visits and amount of contact with the research team may have meant that the placebo arm did not represent 'usual care', possibly explaining the improvement in fatigue seen in the placebo group compared with baseline scores and the lack of difference between groups.

Trial Registration– Clinicaltrials.gov NCT02643732

S31 DUPILUMAB REDUCES SEVERE EXACERBATIONS ACROSS BASELINE DISEASE CHARACTERISTICS IN PATIENTS WITH ELEVATED BASELINE TYPE 2 BIOMARKERS: THE LIBERTY ASTHMA QUEST STUDY

[1]WW Busse, [2]X Muñoz, [3]TB Casale, [4]P Paggiaro, [5]M Castro, [6]Y Tohda, [7]MS Rice, [8]Y Deniz, [9]P Rowe, [8]N Amin, [9]A Teper. *[1]University of Wisconsin School of Medicine and Public Health, Madison, USA; [2]Hospital Vall d'Hebron, Barcelona, Spain; [3]University of South Florida, Tampa, USA; [4]University of Pisa, Pisa, Italy; [5]Washington University School of Medicine, St. Louis, USA; [6]Kindai University, Osaka, Japan; [7]Sanofi, Cambridge, USA; [8]Regeneron Pharmaceuticals, Inc., Tarrytown, USA; [9]Sanofi, Bridgewater, USA*

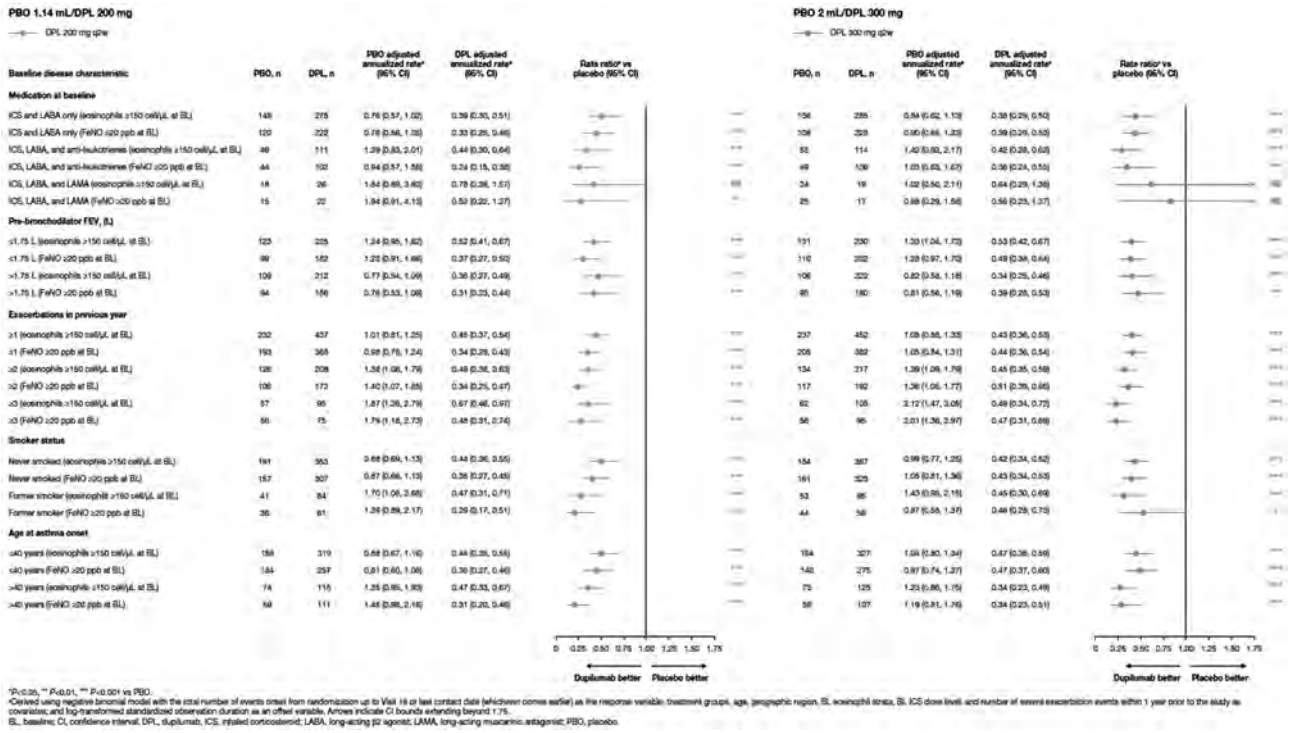
10.1136/thorax-2019-BTSabstracts2019.37

Introduction Dupilumab, a fully human VelocImmune®-derived monoclonal antibody, blocks the shared receptor component for interleukin (IL)-4/IL-13, key drivers of type 2 inflammation in multiple diseases. In the phase 3 LIBERTY ASTHMA QUEST study (NCT02414854), add-on dupilumab 200 mg/300 mg every 2 weeks (q2w) vs placebo reduced severe exacerbations and improved pre-bronchodilator forced expiratory volume in 1 second (FEV_1) in patients with uncontrolled, moderate-to-severe asthma. Treatment effects were greater in patients with elevated type 2 biomarkers at baseline. This post hoc analysis assessed dupilumab effect on severe asthma exacerbation rates by baseline disease characteristics in patients with baseline blood eosinophils ≥150 cells/μL or fractional exhaled nitric oxide (FeNO) ≥20 ppb.

Methods Annualized severe exacerbation rates during the 52-week treatment period were assessed using negative binomial regression models.

Results Dupilumab 200 mg/300 mg q2w vs placebo reduced the annualized rate of severe exacerbations during the 52-week treatment period in all subgroups of patients defined by controller medications at randomization, pre-bronchodilator FEV_1 (≤1.75 L/>1.75 L), number of severe asthma exacerbations (≥1, ≥2, ≥3) in the previous year, smoking history (never smoked/former smoker), and age at asthma onset (≤40 years/>40 years) (**figure 1**). The effect of dupilumab was significant in all subgroups except for 2 subgroups with relatively fewer patients. Overall, the most frequent dupilumab 200 mg/300 mg vs matched placebo adverse event was injection-site reaction (15%/18% vs 5%/10%).

Conclusions Dupilumab significantly reduced severe exacerbations across most baseline disease characteristics in patients



Abstract S31 Figure 1 Annualized rate of severe asthma exacerbations during the 52-week treatment period by baseline disease characteristics in patients with uncontrolled, moderate-to-severe asthma and elevated type 2 biomarkers at baseline (blood eosinophils A50 cells/pL or FeNO 2≥150 cells/μL or FeNO≥20 ppb)

with uncontrolled, moderate-to-severe asthma with evidence of type 2 inflammation at baseline. Dupilumab was generally well tolerated.

Acute asthma: lessons from the frontline

S32 ASSOCIATIONS BETWEEN ASTHMA SEVERITY, INITIAL MANAGEMENT AND SPECIALIST REVIEW ON LENGTH OF STAY AND MORTALITY OUTCOMES

[1]A Adamson, [1]S Robinson, [2]CM Roberts, [1]JK Quint, [3]J Calvert. *[1]Imperial College London, London, UK; [2]University College London Partners, London, UK; [3]North Bristol NHS Trust, Bristol, UK*

10.1136/thorax-2019-BTSabstracts2019.38

Introduction Early treatment of asthma attack is recommended and improves outcomes. Using audit data of acute asthma admissions in secondary care, we investigated whether:

1. Patients admitted with severe and life-threatening asthma were more likely to receive systemic steroids, beta-agonists, and a peak expiratory flow (PEF) measurement, and receive these more quickly, than patients with less severe asthma
2. Patients with more severe asthma were more likely to be reviewed by a specialist
3. Initial actions impacted on length of stay (LOS) and mortality

Methods The Royal College of Physicians National Asthma and COPD Audit Programme began a continuous audit on acute asthma in secondary care in November 2018. 170 hospitals in Britain provided data on asthma admissions from November 2018-March 2019. Data were collected on patient characteristics and care received. Multi-level logistic and linear regression were used to analyse associations between asthma severity (defined using NICE guidelines), care, and outcomes.

Results 10,428 asthma admissions were inputted, of which 10,242(98.2%) were suitable for analysis. 34.6% (N=3,547), 51.4% (N=5,266), and 14.0% (N=1,429) of patients were admitted with moderate, severe, and life-threatening asthma respectively. 87.7% (N=8,986) received systemic steroids on arrival, 91.3% (N=9346) were administered beta-agonists and 72.6% (N=7,436) had their PEF measured on arrival. 76.8% (N=7,870) of patients received a specialist respiratory review.

After adjusting for age and hospital, patients with severe and life-threatening asthma were more likely to receive systemic steroids, beta agonists, and PEF measurement compared to those with moderate asthma ($p<0.001$), and were more likely to receive this sooner ($p<0.001$). Patients with more severe asthma were more likely to receive a specialist respiratory review ($p<0.001$).

After adjusting for age and asthma severity, PEF measurement on arrival was associated with reduced mortality (adj-OR=0.27, 95%CI 0.08–0.75). Receipt of systemic steroids, beta-agonists, and PEF measurement within 1 hour of arrival was associated with a -3.6% (95%CI -7.7%-+0.5%), +1.9% (-2.1%-+6.0%) and -19.2% (-23.5%- -14.7%) change in LOS respectively.

Conclusion Patients with more severe asthma were more likely to receive optimal asthma care. PEF measurement on arrival was associated with survival and patients that received PEF within one hour had a shorter LOS.

S33 RISK FACTORS FOR FREQUENT EXACERBATIONS IN A REAL-LIFE ADULT POPULATION WITH SEVERE REFRACTORY ASTHMA

[1]JF Yang, [2]J Busby, [2]LG Heaney, [3]PE Pfeffer, [3,4]DJ Jackson, [5]AH Mansur, [6]A Menzies-Gow, [7]S Siddiqui, [7]CE Brightling, [8]M Patel, [1]NC Thomson, [1]WT Lee, [1]SJ Smith, [1]R Chaudhuri. *[1]Gartnavel General Hospital, Glasgow, UK; [2]Queen's University Belfast, Belfast, UK; [3]Guy's and St Thomas' Hospitals, London, UK; [4]King's College London, London, UK; [5]Birmingham Heartlands Hospital, Birmingham, UK; [6]Royal Brompton Hospital, London, UK; [7]University Hospitals of Leicester, Leicester, UK; [8]Derriford Hospital, Plymouth, UK*

10.1136/thorax-2019-BTSabstracts2019.39

Introduction Severe exacerbations are an important cause of morbidity in asthma. Risk factors for exacerbations have been reported in selected asthma populations, but not in a large real-world severe asthma population. Maintenance oral corticosteroids (OCS) is used in severe asthma and can suppress inflammatory biomarkers associated with frequent exacerbations (FE). We identified risk factors for FE in a severe refractory asthma population and examined whether risk factors differ in those treated with and without maintenance OCS.

Methods Adults with well-characterised refractory asthma from specialised asthma centres were recruited to a UK Severe Asthma Registry (UKSAR). Demographic data, co-morbidities, clinical and inflammatory biomarkers were collected. We conducted univariate and multivariate logistic regression to identify risk factors for FE, defined as $\geq$3 exacerbations treated with high-dose systemic corticosteroids in the past year.

Results 1235 patients fulfilled ERS/ATS criteria for severe asthma on the UKSAR. In univariate analyses, patients who were ex-smokers (OR 1.6, p<0.003), had a history of gastro-oesophageal reflux disease (OR 1.48, p=0.019), had an ACQ-7 score 0.75 to 1.5 (OR 2.48, p=0.010) or >1.5 (OR 4.85, p<0.001) were more likely to have FEs. In multivariate analyses, ACQ-7 score 0.75–1.5 and >1.5 were independent risk factors for FE (OR 3.46, p=0.014 and OR 9.69, p<0.001 respectively). There was a strong association between smoking history and FE in the maintenance OCS group (OR 2.74, p=0.011), but not in the non-maintenance OCS group (OR 0.86, p=0.700). In patients not on maintenance OCS, a higher risk of FE was observed in those with blood eosinophil count >0.45 x10^9/L or exhaled nitric oxide >50ppb (OR 1.70 and OR 1.58 respectively), however this association was not statistically significant (p=0.073 and p=0.085 respectively). ACQ-7 score >1.5 remained an independent risk factor in both the maintenance OCS and non-maintenance OCS groups (OR 8.45, p=0.006 and OR 9.86, p<0.001 respectively).

Conclusions Several factors were associated with FE risk in a real-world severe asthma population. ACQ-7 score was the strongest independent risk factor. Risk factors differed for patients not on maintenance OCS, but ACQ-7 score of >1.5 was an independent risk factor for FE regardless of maintenance OCS status.

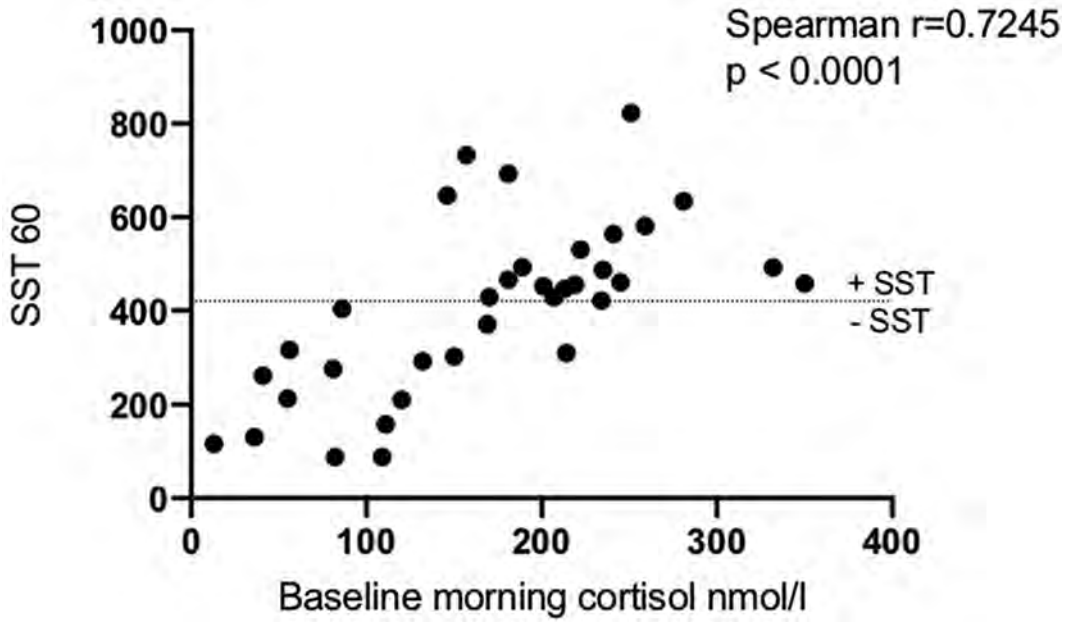
On behalf of the UK Severe Asthma Registry.

S34 THE ROLE OF BASELINE MORNING CORTISOL AS A GUIDE TO ASSESS ADRENAL FAILURE IN SEVERE STEROID DEPENDENT ASTHMA

AM Nanzer, C Roxas, L Green, L Thomson, M Fernandes, J Kavanagh, G d'Ancona, J Dhariwal, BD Kent, DJ Jackson. *Guy's Severe Asthma Centre, Guy's and St. Thomas' Hospitals, London, UK*

10.1136/thorax-2019-BTSabstracts2019.40

Introduction With the successful introduction of biologic agents for severe eosinophilic asthma (SEA), prednisolone-dependent patients are increasingly able to wean their maintenance steroids. We have previously reported on the prevalence of adrenal insufficiency (AI) in this patient cohort.[1] Strategies for how and when to test adrenal reserve vary. The morning cortisol is a simple, cheap (£2.79) test and can be done locally; the short-synacthen-test (SST) is expensive (£38), invasive, time-consuming and not risk free but it is often considered mandatory for the reliable assessment of adrenal reserve. We present our experience of considering hypothalamo-



Abstract S34 Figure 1

pituitary-adrenal (HPA)-axis testing and the use, and misuse of the SST.

Methods We conducted a retrospective review of 120 consecutive patients with SEA who started on biologic therapy between May 2017–2018. Steroid-dependent patients able to reduce their prednisolone to ≤7.5 mg/day and who had an HPA-axis assessment with a morning cortisol and/or SST were included in the analysis. Cortisol was assayed on a Roche-II, with 7.9% cross reactivity to prednisolone.

Results 72/120 patients (60%) were on maintenance prednisolone, 35/72 (49%) of these had an SST in addition to a morning cortisol.

15/35 (43%) patients failed the SST; they had a median 9am cortisol of 82nmol/l (CI: 41–120) and were taking a median daily dose of 5 mg prednisolone. Patients who passed the SST (20/35 (57%)) had a median 9am cortisol of 220 nmol/l (CI: 189–250) and were on average taking 3 mg prednisolone daily at the time of testing. 100% of patients with a morning cortisol of < 100nmol/l failed the SST and 100% of those with a morning cortisol > 250nmol/l passed the SST (figure 1). Adopting these cut-offs would have prevented 12 (34%) SST.

Conclusion In this cohort of steroid dependent asthma patients, a morning cortisol of < 100nmol/L or >250nmol/L was predictive in identifying patients with or without AI. We propose measurements of the serum morning cortisol level once the patient is on ≤5 mg prednisolone daily has utility in guiding the clinician as to which patient may need dynamic assessment of adrenal reserve and in whom it should not be done.

REFERENCE

1. Raheem, *et al*. *Thorax* 2018;**73**(Suppl 4):A174

S35 POOR INFLUENZA VACCINATION RATES IN PEOPLE WITH AIRWAYS DISEASE

JC Gates, T Brown, E Heiden, D Lodge, R Simpson, A Hicks, H Rupani, AJ Chauhan. *Portsmouth Hospitals NHS Trust, Portsmouth, UK*

10.1136/thorax-2019-BTSabstracts2019.41

Background NHS England recommend asthma and COPD patients receive the annual Influenza vaccination, yet uptake nationally remains low at 48% for those eligible[1]. We determined the vaccination status in patients with asthma and COPD admitted with influenza, and compared them to regional rates and investigated other aspects of their disease management, control and mortality.

Methods We interrogated primary and secondary care records of asthma and COPD patients admitted with microbiologically confirmed influenza infection between Nov 18-Apr19. We further investigated 90-day mortality, whether patients were known to secondary care, and in those with asthma, the exacerbation frequency, medication adherence and record of an annual review in the year prior to admission.

Results We identified 637 adults (≥16 years) with confirmed influenza; 196 (31%) had an existing diagnosis of asthma (102 pats, 16%) or COPD (94 pats, 15%) and records were available for 182/196 patients (93%). Only 37/95 (39%) patients with asthma and 40/87 (46%) with COPD had received the influenza vaccination.

Adherence to ICS, by prescription pick-up was poor in both groups with asthma, and unvaccinated patients had significantly poorer engagement (28% vs 68% with an annual review, Fishers Exact Test p=0.002). Although not statistically significant, exacerbation frequency and 90-day mortality were higher in the unvaccinated group, and the overall mortality was 5%. The vaccination rates for both asthma and COPD patients ≥ 65 yrs and asthma patients <65 yrs were significantly lower compared to age-matched regional averages (41% and 43% vs 75% [p=0.0001] and 36% vs 52% [p=0.03] respectively). The vaccination rate was no different for those under specialist care for both asthma (32% vs 29%, p=0.82) and COPD (33% vs 23%, p=0.09).

Abstract S35 Table 1

Asthma	Vaccinated=37 (39%)	Unvaccinated=58 (61%)
Annual Review	25 (68%)	16 (28%)
Under secondary care	12 (32%)	17 (29%)
Adherent to ICS	12 (32%)	13 (22%)
Exacerbations in the last 12 months	0.68 (0–6)	1.20 (0–15)
90-day mortality	0	2
Aged <65 (n=63)	23	40
Aged ≥ 65 (n=32)	14	18
COPD	**Vaccinated=40 (46%)**	**Unvaccinated=47 (54%)**
90-day mortality	3	5
Under secondary care	13 (33%)	11 (23%)
Aged < 65 (n=27)	11	16
Aged ≥ 65 (n=60)	29	31

Conclusions Asthma and COPD patients admitted with influenza had low rates of vaccination compared to the region and this was not influenced by access to specialist care. Medication adherence was poor and unvaccinated asthma patients had worse engagement and disease control.

Recommendation Opportunities to improve vaccination rates and disease control need to be explored, including vaccination at times of scheduled and unscheduled visits to both primary and secondary care.

REFERENCE

1. PHE: National Flu Immunisation Programme 2018

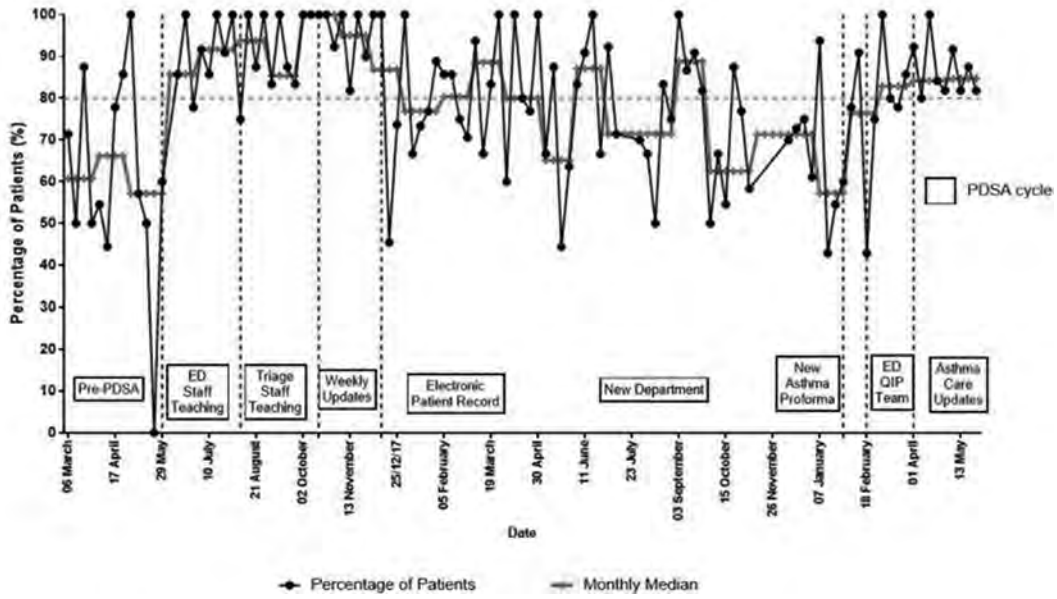
S36 IMPROVING ASTHMA CARE IN THE EMERGENCY DEPARTMENT (ED): A 2-YEAR PROSPECTIVE QUALITY IMPROVEMENT (QI) PROJECT

[1]G Long, [2]A Simpson, [1]K Stagg, [1]C Dutton, [1]H Jackson, [1]G Wood, [1]L Watson, [1]B Kane. *[1]Wythenshawe Hospital, Manchester Hospitals NHS Foundation Trust, Manchester, UK; [2]Division of Infection, Immunity and Respiratory Medicine, School of Biological Sciences, Faculty of Biology, Medicine and Health, University of Manchester, Manchester Academic Health Science Centre, Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.42

Introduction The National Report of Asthma Deaths 2014 identified that of those who died, 21% had attended the ED at least once in the previous year. The Royal College of Emergency Medicine Asthma Audit (16/17) showed asthma care is falling well below national standards with 26% of patients having a peak expiratory flow (PEF) assessed. No national data exists to characterise high-risk patients seen, treated and discharged from ED.

Objective To characterise asthma patients treated and discharged from ED, and, through a prospective QI project,



Abstract S36 Figure 1 Run chart of compliance with peak flow assessments

implement sequential interventions to increase the proportion of acute asthma patients who have a PEF within 30 minutes of arrival in ED to 80%.

Methods Over a 2-year period, we continuously collected data on demographics, pre- and post-treatment PEF, blood eosinophils and follow-up arrangements for consecutive adult patients presenting to Wythenshawe Hospital ED, coded with an asthma exacerbation. During this time, 7 QI Plan-Do-Study-Act (PDSA) cycles were carried out which focussed on staff engagement, education and use of the existing asthma pathway. Percentage of patients with PEF on arrival was plotted in a run chart.

Results 787 individual patients made 1038 visits to ED. ED staff treated and discharged 49.5% of patients. Of these, 12.9% were offered secondary care follow-up (compared with 58.7% of those admitted), 48.5% re-attended ED, 38.2% had blood eosinophils $\geq$300 cells/μL. The primary QI objective was achieved within 6 months (figure 1) through bespoke education delivered by the respiratory directorate, followed by weekly in-person reminders. However, this was not sustained due to factors such as winter pressures, staff turnover, introduction of a new electronic patient record and a move to a new ED building. Further PDSA cycles were implemented following recruitment of a central ED QI team, including introduction of a shortened asthma proforma and promotion of asthma care in daily staff huddles.

Conclusion Patients treated and discharged from ED had high levels of re-attendance, uncontrolled eosinophilia and were 4.5 times less likely to receive hospital follow-up than admitted patients. Sustained improvement in asthma assessment (such as PEF) was challenging and was supported by changes being driven by ED staff.

S37 THE EFFECT OF ASTHMA MANAGEMENT PLANS AND ANNUAL ASTHMA REVIEWS ON EXACERBATIONS

S Naqvi, R Patel, K Bhullar, JK Quint, CI Bloom. *Imperial College London, London, UK*

10.1136/thorax-2019-BTSabstracts2019.43

Introduction and aims This study aimed to evaluate the effect of two different non-pharmacological interventions (asthma management plan and annual asthma review) on asthma exacerbations, one year after the intervention. This investigation expands upon existing studies which analyse other risk factors associated with exacerbations in a UK asthma population.

Methods Clinical Practice Research Datalink and Hospital Episode Statistics data from January 2004 to January 2017 were used to identify a nationally-representative asthma population. Patients were included that had at least two years of follow-up. The presence of the two main exposures were measured in the first year: annual asthma review and asthma management plan. The risk of an exacerbation in the following year was then calculated using a multivariate logistic regression model. The following variables were included in the model: gender, age, BMI, asthma severity (BTS step), smoking history, atopy, gastro-oesophageal reflux disease (GORD), anxiety, depression and exacerbations in the year prior to study entry.

Results Of the 370,528 eligible patients, 110,467 (29.81%) received an annual asthma review, whilst only 23,140 (6.25%) were given an asthma management plan. Presence of an asthma management plan or an annual review did not increase the odds of an exacerbation (management plan: adjusted OR=1.03, 95% CI 1.00–1.07, p>0.05; annual review: adjusted OR=1.01, 95% CI 1.00–1.03, p>0.05; table 1). Of the confounders adjusted for, increasing asthma severity and history of exacerbations in the year prior to study entry had the greatest effect on the exacerbation odds, increasing by 24.99±2.56 and 7.19 ±0.15 respectively.

Conclusions One year post-study entry, presence of either intervention was found not to have any significant association with exacerbations. This study therefore suggests that these non-pharmacological interventions did not reduce the risk of exacerbations; however, it is possible that there were other confounders that were unaccounted for. Further studies investigating the type of management plan (verbal or written),

Abstract S37 Table 1

		95% Confidence Intervals	
	Odds Ratio	Lower	Upper
Interventions			
Annual review	1.008	0.988	1.029
Management plan	1.031	0.992	1.072
Gender			
Male	Reference		
Female	1.251	1.227	1.275
Age Category			
20-30	Reference		
30-40	1.139	1.103	1.177
40-50	1.452	1.408	1.498
50-60	1.867	1.810	1.925
60-70	2.246	2.179	2.316
70+	2.637	2.561	2.715
BMI category			
Healthy	Reference		
Underweight	1.075	1.034	1.117
Overweight	1.172	1.142	1.202
Obese	1.403	1.368	1.440
BTS Step			
1	Reference		
2	1.115	1.084	1.146
3	1.966	1.891	2.043
5	2.196	2.135	2.259
5	3.754	3.625	3.888
6	24.989	22.433	27.836
non-BTS	2.127	2.015	2.245
Smoking Status			
Never smoked	Reference		
Current smoker	1.425	1.390	1.461
Ex-smoker	1.524	1.490	1.558
Additional Variables			
Atopy	0.989	0.970	1.009
GORD	1.515	1.469	1.563
Anxiety	1.410	1.376	1.446
Depression	1.479	1.446	1.513
Previous exacerbation	7.189	7.038	7.343

compliance with plans and different interventions such as inhaler technique checks would be useful.

Integrative working to improve patient experience in lung disease

S38 IMPROVING ACCESS TO PSYCHOLOGICAL THERAPY SERVICES IS A COST EFFECTIVE INTERVENTION TO REDUCE HOSPITAL BURDEN AND IMPROVE WELLBEING IN PATIENTS WITH LONG TERM RESPIRATORY CONDITIONS

K Taylor, C Bainbridge, C Carrier, A Taylor, J Warwick, R Evans, G Lowrey, D Draicchio. *Royal Derby Hospital, Derby, UK*

10.1136/thorax-2019-BTSabstracts2019.44

Background Patients with long term conditions (LTC) such as COPD have a higher incidence of depression and anxiety compared to the general population.[1] This patient group often have a high usage of healthcare services. Cognitive Behavioural Therapy (CBT) has been shown to improve welfare, although access to these services can be delayed and non-specific.[2]

Aim To see if improving access to Psychological Therapy services for patients with long term respiratory conditions could reduce healthcare costs and improve patient wellbeing.

Methods A tailored approach of fast accessible therapy was set up locally – Improved Access to Psychological Therapy (IAPT). Patients were referred via Respiratory Specialist Nurses, Healthcare professionals or self-referral. This group was compared to patients with registered LTC's assigned to general psychological therapy (PT). Healthcare usage was assessed 3 months prior to and post referral date and psychological scores recorded using WSAS (Work and Social Adjustment scale).

Results Within IAPT 45% of patients had a diagnosis of COPD and 32.3% had more than one LTC (20.2% in the PT group). In the IAPT group there was a 70.6% reduction in A&E attendances for those that completed treatment compared to 13.3% in PT group and a 59.1% versus 18.7% reduction in non-elective hospital admissions.

In the IAPT group, for CSRI (Client Service Receipt Inventory) paired responses taken before and immediately after treatment there was a 15.4% reduction in ambulance callout and a 27.3% reduction in GP appointments. For those in paid employment total days lost due to ill health reduced by 64% post treatment, with an average saving of £852.50 per person in the three months post treatment completion.

Abstract S38 Table 1 Outcomes measured between IAPT and PT groups

	IAPT	PT
Severe or mod sev (PHQ-9)	63.6%	63.2%
Recovery	39.5%	52.1%
Recovery >2 LTC	26.7%	46.4%
Improvement	57.8%	69.7%
WSAS improvement	73.8%	68.4%

Conclusions There was a significant reduction in cost, non-elective hospital admissions and wider healthcare activity in the IAPT group. Patient perception of their functional impairment also improved. Further development of fast accessible therapy tailored towards the breathless patient is required to improve outcomes in patients with long term respiratory conditions.

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S39 IMPACT OF A SPECIALIST BREATHLESSNESS MANAGEMENT GROUP

S Pilsworth, J Donohoe, L Jones, J Hillis. *Liverpool Heart and Chest Hospital, Liverpool, UK*

10.1136/thorax-2019-BTSabstracts2019.45

Introduction Breathlessness is a subjective feeling of breathing discomfort, a symptom that is common and can be chronic

and distressing for the individual experiencing it. Patients with chronic respiratory disease can experience significantly worse dyspnoea than patients with end stage lung cancer. 25% of all emergency admissions in the UK require treatment for dyspnoea. Despite this burden treatment and management of dyspnoea remains variable.

Method A pilot was carried out in the Merseyside region offering patients and family/careers access to a specialist community Breathlessness Management (BM) group. Patients who were under the care of a community respiratory service and highlighted as struggling with BM were offered a referral. The group was run by a respiratory physiotherapist with a specialist interest in palliative care, a respiratory counsellor and an assistant practitioner. The group ran for 5 weeks and offered educational and practical components including advanced care planning (ACP), relaxation, anxiety management and energy conservation.

Results 15 patients plus family members have been through the programme. Feedback was collated for patients and family to review suitability and acceptability of the group and attendance rates were reviewed.

Discussion The BM group was viewed as highly valued and informative by patients and family members suggesting the group were able to improve self-management ability of dyspnoea over a short space of time. Including family was invaluable as it gave them coping strategies on how to support the individual suffering with episodes of dyspnoea. The MDT approach of the group was key in improving dyspnoea management and future groups should ensure this approach. The inclusion of ACP sessions can help to prevent unnecessary crisis admissions if patients are moving towards end of life. Small groups were felt to be more effective, as patients could learn from each other, and felt comfortable to ask questions.

This pilot demonstrated developing a specialist BM groups is feasible, effective and well-liked by patients. It's an effective addition to respiratory services and can be delivered in community settings ensuring easy access for the target group. Follow up is required to assess the long term impact of this intervention.

S40 A QUALITATIVE STUDY EXPLORING THE ESSENTIAL ELEMENTS REQUIRED FOR A PALLIATIVE CARE SERVICE FOR PEOPLE WITH COPD

[1]DG Anderson, [2]S Browne, [2]K Rooney, [2]C Sime. *[1]QEUH Glasgow, Glasgow, UK; [2]University of West of Scotland, Paisley, UK*

10.1136/thorax-2019-BTSabstracts2019.46

Background Despite COPD being a progressive, life-threatening disease, few people living with end stage COPD are offered (or have access to) specialist palliative care services. This is despite having similar or worse symptom burden than people living with a cancer diagnosis.

Study aim To explore the perceptions and experiences of people living with end stage COPD regarding palliative care services.

Methods A qualitative interview study design, using semi structured interviews and framework analysis was utilised. A total of 20 people living with end stage COPD living in the West of Scotland took part in semi-structured interviews. Ten of these attended a palliative care clinic and generic services (Group A) and ten attended generic services only (Group B).

Results Three themes were identified using framework analysis: (1) essential elements of a palliative care clinic for people with advanced COPD; (2) acceptability of a palliative care clinic, and (3) unmet psychological needs of people with advanced COPD.

Conclusion Participants attending a palliative care clinic describe how the clinic helped reduce symptoms, exacerbations and hospital admissions. The clinic was praised for providing access to clinical expertise, providing access to a range of supportive services, and being accessible. The principles of a palliative care clinic were acceptable to both groups of people living with end stage COPD. However, in contrast to group A, the participants in group B who did not get the service presented stoic and hopeless narratives and relied heavily on their GPs for management of acute exacerbations. People living with end stage COPD described low mood, and anxieties about their future however they often did not raise psychological difficulties with health care professionals.

A prospective study should be undertaken to determine the measurable effect a palliative care approach has on the quality of life and management of people living with end stage COPD.

S41 UTILISATION OF A RESPIRATORY NON-MALIGNANT PALLIATIVE CARE MDT

WI Henderson, E Cameron, M Cross, M Embley, C Lee, D Morrison, W Newman, M Spears, M Wilczynska, FT Wood. *NHS Forth Valley, Larbert, UK*

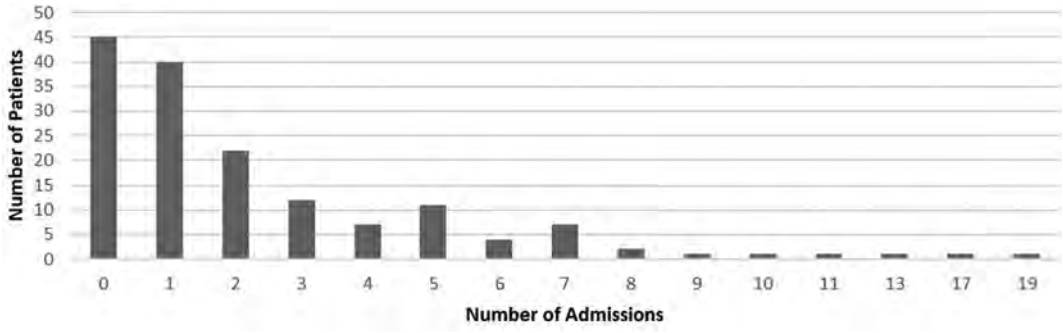
10.1136/thorax-2019-BTSabstracts2019.47

Introduction Palliative care support is often more limited for patients with non-malignant respiratory conditions, despite their mortality and symptom burden being comparable to patients with cancer[1]. Having established a monthly non-malignant palliative care MDT within our department in 2013, we wanted to ascertain the characteristics of patients discussed at this meeting, as well as outcomes in terms of survival and place of death. We also wanted to assess how well anticipatory care plans were being communicated for these patients using the Key Information Summary (KIS).

Methods Administration staff provided lists of patients discussed between October 2013 and October 2018. Clinical Portal was used to collect demographic and outcome data. We assessed completion of the KIS in a smaller group of patients discussed between January 2017 and October 2018.

Results 66.7% of the patients (104/156) had COPD, the majority of the rest (47) had interstitial lung disease. ILD patients were on average older (median age 78 vs 70) and accounted for far fewer admissions in the year prior to MDT discussion (47 vs 322). A small number of patients were admitted multiple times, some being admitted as many as 19 times. 105 patients in total had a place of death documented, of these 65 (approximately 62%) died in hospital. The median survival for both groups was less than 1 year post MDT discussion although greater in the COPD group (216.5 vs 152.5 days). The KIS summary was completed for 31 of the 44 patients, however only 11 had an explicit decision regarding escalation to critical care documented.

Discussion Our data identifies a group of patients that were admitted to hospital multiple times prior to MDT. These patients in our experience suffer immense psychosocial upheaval and would benefit from more targeted palliative care



Abstract S41 Figure 1 Number of admissions in 12 months prior to MDT

support. We propose that protocols are put in place to identify these patients and trigger an automatic consideration of palliative care needs, including referral to specialist services where required.

REFERENCE

1. Bloom, Slaich, Morales, *et al*. Low uptake of palliative care for COPD patients within primary care in the UK. *Eur Respir J* 2018; **51**:1701879

S42 WHERE DO INDIVIDUALS WITH IDIOPATHIC PULMONARY FIBROSIS (IPF) DIE?

C McKiernan, D Dosanjh, J Tomas, A Crawshaw. *University Hospitals Birmingham, Birmingham, UK*

10.1136/thorax-2019-BTSabstracts2019.48

Introduction Median survival in IPF is 2–3 years from diagnosis. A majority of individuals with a variety of terminal illnesses express a preference to die at home1. Those with IPF may have different needs which affect actual and preferred place of death, and the unpredictable trajectory in IPF can make it difficult to identify appropriate timing to refer to palliative and supportive care, and discuss advance care planning (ACP).

Methods We wanted to better understand the experience of those with IPF, where they die and opportunities to discuss ACP. We retrospectively examined records of 81 individuals with IPF who had most recently died. These were identified prior to introduction of process for individuals with IPF to be reviewed in our MDT clinic, where they are seen by ILD CNS, respiratory and palliative care consultants one one occasion. The opinion of those seen were sought to address whether early ACP discussions were helpful.

Results 32/81 (39.5%) had some form of ACP recorded, but in most cases (78.1%), this was during an inpatient admission. Discussions about preferred place of death were not recorded in outpatient clinic for any patients.

Of the 35 individuals local to the tertiary centre, 28 patients had been admitted to hospital at least once in their final year of life. For those 35 individuals, place of death is shown in table 1.

Abstract S42 Table 1

Place of Death	Number of Individuals
Emergency Department	1
ICU/HDU	2
Acute Medical Unit	4
Respiratory Ward	6
General Ward	4
Hospice	6
Continuing Healthcare Environment	4
Unknown	9

Discussion A significant proportion of patients with IPF die in an acute hospital setting. While preferences for their place of death are not known, high oxygen requirements, unpredictable disease trajectory and lack of directed specialist palliative care services may contribute to why this proportion is higher than expected for other cardiorespiratory conditions with a limited prognosis. We anticipate the introduction of early ACP discussions at annual review will provide opportunities to ensure individual wishes are known, with a view to avoid distressing admissions with unwanted and burdensome interventions at the end of life.

S43 HAS INTRODUCTION OF SEVERITY CRITERIA IMPROVED PALLIATIVE CARE PROVISION FOR PATIENTS WITH IDIOPATHIC PULMONARY FIBROSIS?

AR Tyas, AC Boland, S Gillon. *Leeds Teaching Hospital Trust, Leeds, UK*

10.1136/thorax-2019-BTSabstracts2019.49

Background NICE guidance states that we should 'Offer best supportive care to people with idiopathic pulmonary fibrosis (IPF) from the point of diagnosis'. NICE Quality standards also note that people with IPF and their carers should have access to services that meet their palliative care needs, which can include both generalist and specialist care.[1]

In 2016 it was recognised, that since the introduction of anti-fibrotic medications, clinic consultations had become focused on tolerability of medication rather than holistic assessments. Following 6 months of time-limited palliative care consultant input; 30 minute clinic slots with a respiratory physician with a specialist interest in palliative care were introduced. IPF disease specific indicators of severity were developed to identify those requiring this input.

IPF Specific Indicators of severity;

FVC<50% Ambulatory O2

LTOT Cor pulmonale

Anti fibrotic therapy stopped due decline

>15% decline in TLCO in 6 months

Methods Clinic letters of patients with IPF who attended clinic in November 2018 (n=47) were reviewed for markers

of severity using the 2016 disease specific criteria. Evidence of holistic assessment, advance care planning and referral to palliative care were analysed.

Results Of the 47 patients, 17 had one or more marker of severity a quarter of which were referred to specialist palliative care (SPCT). 4 of the 5 patients with two or more markers have SPCT input.

Other factors for SPCT referral were noted during the audit and included functional decline and weight loss, which are known general markers of decline. In 2018 there were 23 referrals to local hospices for patients with IPF, of which 9 died, only 1 death was in hospital. There was also an increase in holistic assessments compared to 2016 (28% from 9%).

Results

Abstract S43 Table 1

No. Markers severe IPF	0	1	2	3	4	All November 2018	Nov/Dec 2016
No. patients	30	12	2	2	1	47	120
Holistic Assessment	4	4	2	2	1	13 (28%)	11 (9%)
Gold Standard Framework	1	3	1	2	1	8 (17%)	15 (12.5%)
Prognosis	16	5	1	2	1	25 (53%)	6 (5%)
Incurable	25	9	2	2	1	39 (83%)	12 (10%)
CPR	1	1	0	1	1	4 (9%)	4 (3%)
Future Care Planning	1	2	0	2	1	6 (13%)	1 (1%)
Quality of life focus	1	4	0	2	1	8 (7%)	2 (2%)
Palliative care Referral	0	3	1	2	1	7 (15%)	12 (10%)

Conclusion Introducing IPF disease specific markers of severity, following the intervention from a SPCT consultant in 2016, along with having a respiratory consultant with a specialist interest in palliative care, has improved access to palliative care and symptom control for these patients. We also noted that patients known to SPCT are also more likely to die out of hospital.

REFERENCE

1. NICE Clinical Guidance Clinical Guideline (CG163) Updated May 2017.

Novel insights into malignant pleural disease

S44 DIAGNOSIS OF MALIGNANT PLEURAL EFFUSION: CAN CT FINDINGS PREDICT PLEURAL FLUID CYTOLOGY RESULTS?

[1]Q Lu, [1]R Mercer, [1]G Shepherd, [2]O Castro, [1]R Varatharajah, [1]A Thayanandan, [1]M Hassan, [1]E Bedawi, [1]D Mccracken, [1]R Asciak, [1]D Addala, [1]M Tsikrika, [2]R Hallifax, [2]N Rahman. *[1]Oxford University Hospitals, Oxford, UK; [2]Oxford Respiratory Trails Unit, Oxford, UK*

10.1136/thorax-2019-BTSabstracts2019.50

Introduction Malignant pleural effusion (MPE) signifies advanced disease and poor prognosis, with median survival ranging from 3 to 12 months. Pleural cytology is a widely used initial investigation for MPE but has a relatively low sensitivity of around 60%[1]. Negative pleural fluid cytology can result in a delay in diagnosis and treatment pathways. Negative CT findings alone cannot out malignancy. Pleural biopsy provides a definitive diagnosis of malignancy in the majority of cases of MPE,[1] but is more invasive and may not be suitable for every patient.

Objective The aim of this retrospective analysis was to assess the relationship between CT findings that are often associated with malignancy, and pleural cytology results.

Methods We performed a retrospective analysis of all patients who had a pleural aspiration between 2015 and 2017 (n=219) with either positive pleural fluid cytology or a malignant pleural biopsy following negative cytology at a UK tertiary hospital. Patients were divided into two groups according to the cytology results. Chi-Square tests were used to analyse the relationship between CT findings and cytology result. Patients with negative pleural fluid cytology who did not go on to have a pleural biopsy were excluded.

Results Of the 219 patients with diagnosed MPE, fluid cytology was positive in 151 (68.9%) patients. The remaining 68 (31.1%) patients had positive pleural biopsy as the initial cytology test was negative. Thoracic lymphadenopathy on CT was associated with positive pleural fluid cytology (odds ratio [OR]=1.82; p=0.042). Pleural nodularity (OR=4.76; p<0.001) and pleural thickening (OR=14.8; p<0.001) on CT were associated with negative pleural fluid cytology. After excluding patients with mesothelioma, pleural nodularity (p<0.001) and pleural thickening (p<0.001) were still associated with negative cytology reports.

Conclusions This study suggests that pleural nodularity and pleural thickening on CT are associated with negative pleural fluid cytology. In patients with such features on CT and suspected MPE, a 'straight to pleural biopsy' approach should be considered.

REFERENCE

1. Hooper C, Lee YCG, Maskell Investigation of a unilateral pleural effusion in adults: British Thoracic Society pleural disease guideline 2010.*Thorax* 2010;**65:**ii4-ii17.

S45 VISTA EXPRESSION IN MALIGNANT PLEURAL MESOTHELIOMA

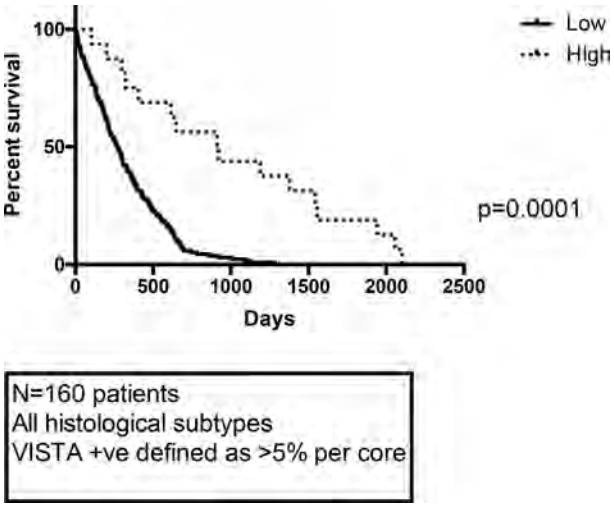
[1]C Rooney, [1]C Nixon, [1]K Blyth, [2]T Sethi, [1]D Murphy, [3]F McCaughan. *[1]University of Glasgow, Glasgow, UK; [2]Kings College London, London, UK; [3]University of Cambridge, Cambridge, UK*

10.1136/thorax-2019-BTSabstracts2019.51

Introduction and objectives Malignant pleural mesothelioma (MPM) pathogenesis is strongly influenced by the tumour microenvironment, supporting a role for immune checkpoint inhibition as a therapy. Only a small proportion of MPM patients benefit from checkpoint blockade and predictors of response are ambiguous.

V-domain Ig suppressor of T cell activation (VISTA) is a novel negative checkpoint regulator, recently reported as highly expressed in a TCGA cohort of MPM. It is a PD-1 homolog thought to have similar immune restraining effects on T cells. Unusually, in MPM it is expressed on tumour cells and infiltrating immune cells.

Clinical trials are already underway investigating VISTA inhibition in MPM. However there is no published data examining VISTA expression and clinical outcomes; thus we



Abstract S45 Figure 1 Survival proportions: VISTA

sought to determine the impact of VISTA expression on survival in 'all-comer' patients with MPM.

Methods Tissue microarray blocks from 161 MPM patients of all histological subtypes were obtained from MesobanK (Papworth Hospital). VISTA, CD8, CD163 and CD68 immunohistochemical staining was performed. Kaplan–Meier survival curves were used to estimate survival on the basis of levels of VISTA and other immune cells and were compared with the log-rank test. Cutoff values to define subgroups were the 25th or 50th percentile, i.e. the top 25th or 50th percentile was defined as high level and all others were defined as low level.

Results VISTA expression was detected in all MPM cases (n=160), comprising epithelioid (n=101), biphasic (n=38) and sarcomatoid (n=21). VISTA positivity was demonstrated in both tumour and immune cells. Kaplan-Meier curves demonstrated that patients with overall VISTA 'high' staining showed prolonged median survival than those with VISTA 'low' expression in all histological subtypes (916.5 days vs 274 days, p<0.0001). Immune infiltrating cell populations were quantified: CD163 'high' populations were associated with a poorer median survival; however there was no significant correlation between VISTA, CD8+, CD163, and CD68 status and survival outcome.

Conclusions To our knowledge this is the first study to analyse VISTA protein expression in a large cohort of MPM patients. We found that median survival is significantly higher in VISTA-'high' cohorts and is not influenced by CD8+ or macrophage status. Further studies should explore the mechanisms of VISTA effect in the context of tumour/stromal immunity in MPM.

S46 EVALUATION OF PHOSPHORYLATED 70S6K EXPRESSION IN MALIGNANT PLEURAL MESOTHELIOMA AND ITS ASSOCIATION WITH PATIENT SURVIVAL

[1]S Tariq, [1]L Oguh, [2]A Campbell, [3]L Cawkwell, [1]MJ Lind. *[1]Hull York Medical School, Hull, UK; [2]Cellular Pathology Department, Hull and East Yorkshire Hospitals NHS Trust, Hull, UK; [3]School of Life Sciences, University of Hull, Hull, UK*

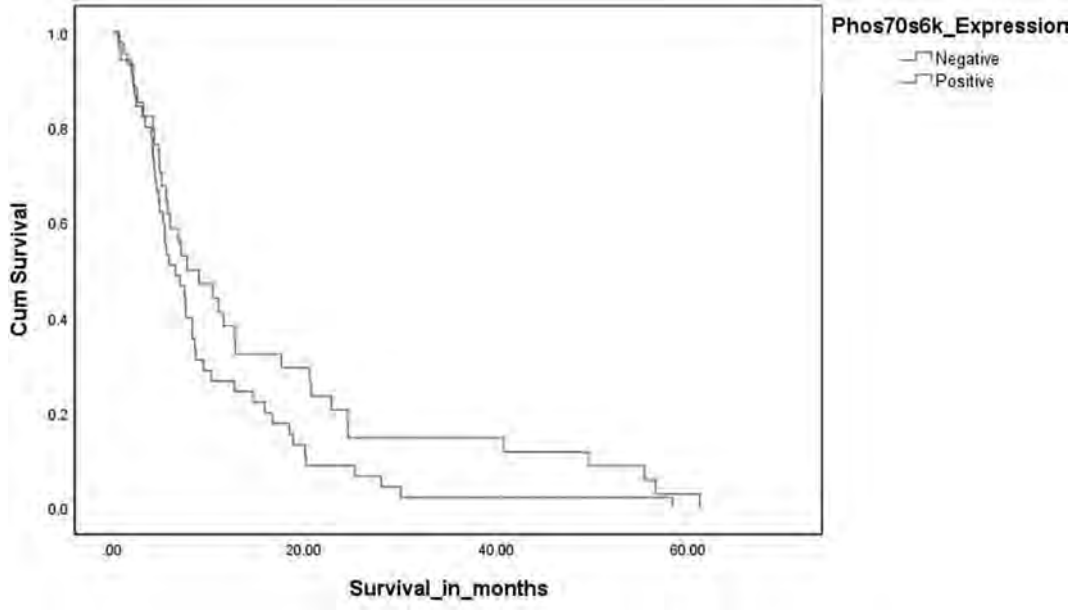
10.1136/thorax-2019-BTSabstracts2019.52

Introduction and objective Dysregulation of Mammalian target of rapamycin pathway has been shown in various cancers. Phosphorylated 70S6k is a vital downstream signalling protein of this pathway, dysregulation of this protein has also been linked to various malignancies and potentially to patient survival.

In this study, we aimed to investigate the expression of phosphorylated 70S6K in MPM and evaluate its relationship with patient survival.

Methods We performed immunohistochemical analysis on archival MPM tissue samples to examine the expression of phosphorylated 70S6K. Western blot analysis was also performed to evaluate the expression this protein in MPM cell lines.

Histopathological and clinical data of relevant patients were obtained from Hull Royal Infirmary. Univariate analysis was



Abstract S46 Figure 1 Survival function

performed for protein expression using Kaplan Meier survival curves with log rank analysis.

Multivariate Cox regression analysis taking histological subtypes into account was performed, to assess the effect of phosphorylated 70S6K expression on patient survival.

Results Our cohort consisted of total 79 archival MPM samples which included 43 Epithelioid, 24 Biphasic, and 12 Sarcomatoid MPM tissue samples. Of these 79 samples, 45 (57%) were found to be negative for Phospho 70s6K expression while 34 (43.%) showed positive expression.

A significant difference in expression of phospho 70s6K was found between MPM subtypes, on immunohistochemistry (p=0.01).

Phospho 70S6K protein was expressed in MSTO-211H and A549 cells, very weak expression in the NCI-H2452 cells was detected but none in the NCI-H2052 cell.

No significant difference in survival was found between patients who had positive and negative phospho 70s6K expression (p=>0.05).

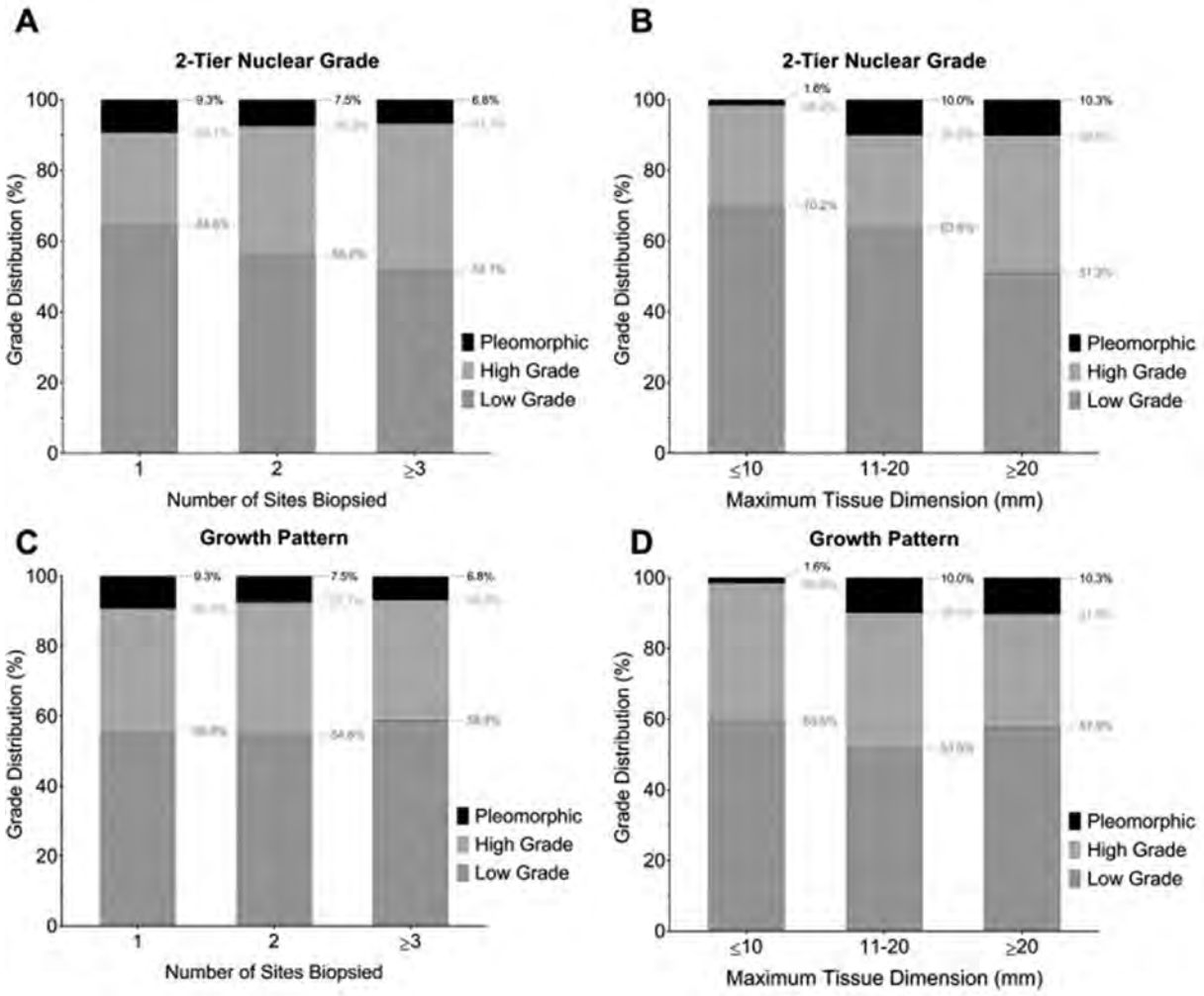
Conclusion Our data suggest that phosphorylated 70S6K is expressed in MPM and there was a difference in expression of phospho 70s6K between MPM subtypes. No statistically significant association was found between phosphorylated 70S6K expression and patient prognosis.

S47 IMPACT OF NUMBER OF SAMPLING SITES AND SPECIMEN DIMENSION ON THE PERFORMANCE OF NUCLEAR GRADE AND GROWTH PATTERNS IN PREDICTING SURVIVAL IN EPITHELIOID MALIGNANT PLEURAL MESOTHELIOMA: A SINGLE INSTITUTION REVIEW OF 614 CASES

[1]YZ Zhang, [2]C Brambilla, [3]PL Molyneaux, [2]A Rice, [2]JL Robertus, [4]S Jordan, [4]E Lim, [5]L Lang-Lazdunski, [4]S Begum, [4]M Dusmet, [4]V Anikin, [4]E Beddow, [4]J Finch, [4]N Asadi, [6]S Popat, [1]WOC Cookson, [1]MF Moffatt, [2]AG Nicholson. *[1]National Centre for Mesothelioma Research, National Heart and Lung Institute, Imperial College London, London, UK; [2]Department of Histopathology, Royal Brompton And Harefield NHS Foundation Trust, London, UK; [3]National Heart and Lung Institute, Imperial College London, London, UK; [4]Department of Thoracic Surgery, Royal Brompton And Harefield NHS Foundation Trust, London, UK; [5]Lung Centre, BUPA Cromwell Hospital, London, UK; [6]Department of Medicine, Royal Marsden Hospital NHS Foundation Trust, London, UK*

10.1136/thorax-2019-BTSabstracts2019.53

Introduction There is limited evidence regarding the optimal number of sampling sites and specimen dimension in histological diagnosis of malignant pleural mesothelioma (MPM). Previously we have validated 2-tier nuclear grade as an independent predictor of survival in epithelioid MPM. This study evaluates the association between sampling parameters and the performance of 2-tier nuclear grade and growth pattern as survival predictors using a biopsy-heavy cohort.



Abstract S47 Figure 1

Methods Clinicopathological information including the number of sampling sites, tissue dimension, 2-tier nuclear grade, predominant growth pattern and overall survival (OS) were retrieved from an institutional mesothelioma database comprising 614 consecutive cases of epithelioid MPM over a 15 year period. Survival analysis was performed using Kaplan-Meier method. Association between categorical variables was analysed using Fisher exact test, and was assessed in relation to biopsy size and number. Statistical significance was defined as $p<0.05$.

Results The mean age was 69.1 years, with male preponderance (75.6%). 87.0% (534/614) received biopsy only. The median number of sites sampled was 1 (range 1–20). The median maximum tissue dimension was 18 mm for biopsies (range 2–140 mm) and 145 mm for resections (range 40–350 mm). 17.7% of all biopsies (95/534) were taken from a single site with a maximum dimension of ≤10 mm (median: 8 mm). Low grade tumours showed significantly prolonged OS compared with high grade (19.3 months vs. 8.9 months, $p<0.001$). Overall, the median OS of our cohort was 14.7 months. 2-tier nuclear grade predicted OS independent of age, type of procedure, necrosis and atypical mitosis ($p=0.001$). Growth pattern was not an independent predictor of OS ($p=0.152$). This 2-tier nuclear stratification lost predictive power in the setting of single site biopsy, ≤10 mm maximum dimension ($p=0.572$). We observed 'grade-shift' phenomenon as more high grade disease was detected with increasing number of sampling sites (up to 3 sites, $p<0.001$) and maximum tissue dimension (≥20 mm, $p=0.017$). The impact on assessing growth pattern was less pronounced in comparison.

Conclusions We propose an optimal sampling standard of 3 sites or a maximum tissue dimension of ≥20 mm from a single site. This then allows a 2-tier nuclear grading system to provide prognostic stratification for clinical care and research of epithelioid MPM.

S48 PLEURODESIS OUTCOME AND SURVIVAL IN PATIENTS WITH MALIGNANT PLEURAL EFFUSION – A SYSTEMATIC REVIEW

[1]M Hassan, [2]M Gadallah, [3]E Harriss, [1]JP Corcoran, [4]NM Rahman. *[1]University Hospitals Plymouth, Plymouth, UK; [2]Alexandria Faculty of Medicine, Alexandria, Egypt; [3]Bodleian Healthcare Libraries, Oxford, UK; [4]University of Oxford, Oxford, UK*

10.1136/thorax-2019-BTSabstracts2019.54

Background Pleurodesis is an important method for palliating malignant pleural effusion (MPE). Recent observations show

Abstract S48 Table 1

Study	No	Study Design	Primary	Agent	% success	Hazard ratio of poor survival	Median survival (success vs. failure)
Viallat 1996	360	Retrospective	Miscellaneous	talc	93	UA	7.6 vs 2.6 m, p= 0.001
Love 2003	60	Retrospective	Miscellaneous	talc	47.6	UA	346 vs 133 d, p 0.03
Kolschmann 2005	85	Retrospective	Miscellaneous	talc	89.4	UA	No difference in 180-day survival, p= 0.44
Trotter 2005	202	Retrospective	Miscellaneous	talc	88.1	UA	107 vs 45 d, p= 0.26
Stefani 2006	109	Prospective	Miscellaneous	talc	83	UA	9.4, vs 5.8 m, p= 0.048
AK 2009	42	Retrospective	Miscellaneous	talc	61.9	2.59 (1.20-5.61) p= 0.005	UA
Nikbakhsh 2011	50	Prospective	Miscellaneous	Bleomycin	88	UA	No difference in 180-day survival, p = 0.57
Rena 2015	172	Retrospective	Mesothelioma	talc	76	2.04 (1.28 – 3.74), p= 0.002	UA
Verma 2015	13	Retrospective	Miscellaneous	talc	69.2	UA	No difference in 90-day survival, p 0.73
Hsu 2016	26	Prospective	Lung & breast	Minocycline	64	UA	220 vs 112 d, p 0.015
Santos 2017	202	Retrospective	Miscellaneous	talc	70.7	UA	400 d vs 170 d, p 0.01
Hsu 2017	389	Retrospective	Miscellaneous	Minocycline	70	UA	10 vs 3.5 m, p 0.001
Hassan 2018	266	RCT	Miscellaneous	talc	78	UA	12 vs 7.3 m, p 0.004

difference in survival among patients who achieve successful pleurodesis.[1]

Methods A literature search of Medline, Embase and Cochrane databases for studies in English was carried using relevant keywords. Studies were included if reported patients were adults undergoing chemical pleurodesis for MPE and pleurodesis success was clearly defined. (Protocol CRD42018115874)

Results From 972 titles the search returned, 13 studies (on 1976 patients) were included. The majority of studies were retrospective in design. The weighted mean age of studied patients was 68.45 (95% CI 67.7–69.1) years and the most common primaries were lung, breast and mesothelioma. Table 1 summarises the details of the included studies. Ten of the included studies showed difference in survival in favour of patients achieving successful pleurodesis.

Conclusion Pleurodesis success seems to be associated with a survival benefit in MPE patients, but most of the available data comes from retrospective series. The noticed survival difference could reflect a beneficial effect of the pleurodesis process. Conversely, this difference might only stem from the poorer response to pleurodesis in patients with heavier pleural disease burden and hence worse outcomes. More prospective studies are needed to explore this further.

REFERENCE

1. Hassan, *et al*. British Thoracic Winter Meeting 2018, London. Abstract S132.

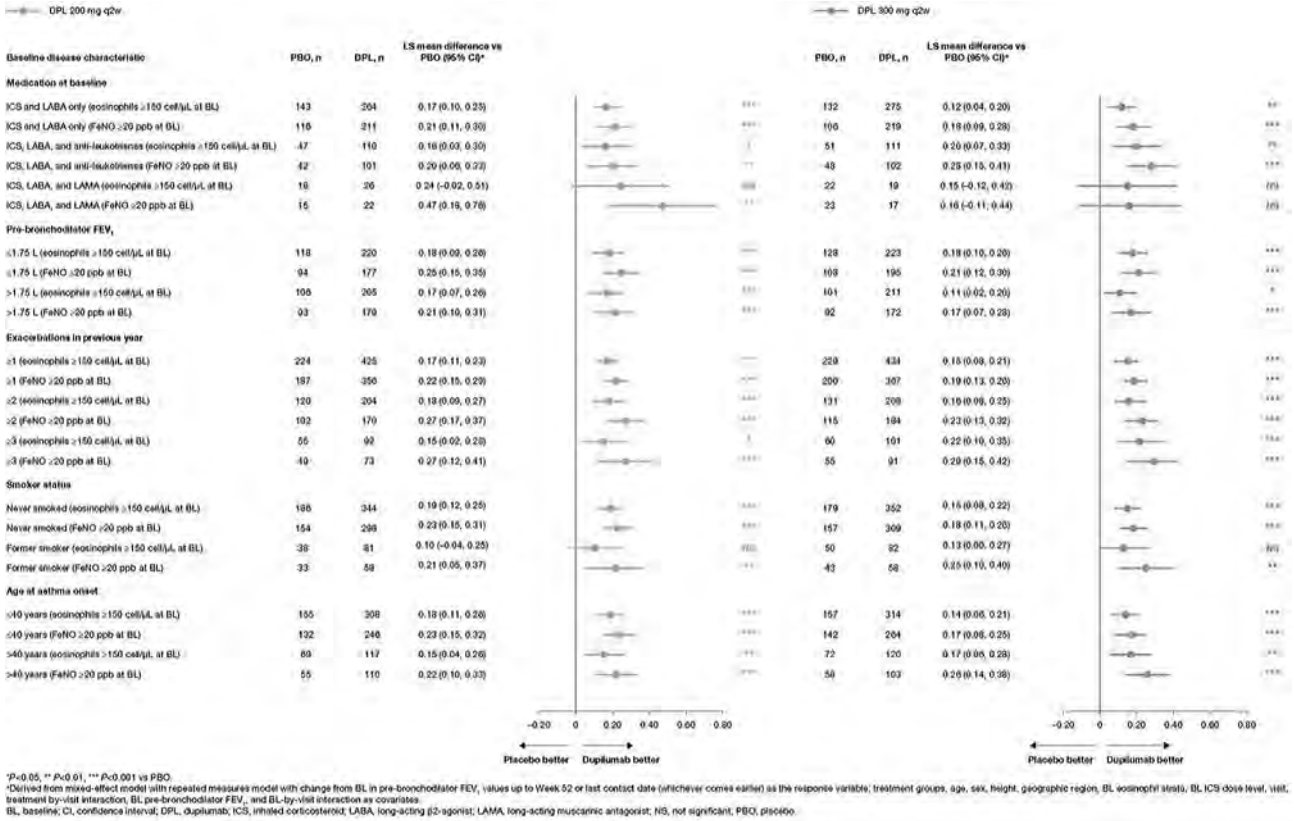
Increasing experience of biologics and asthma

S49 DUPILUMAB IMPROVES LUNG FUNCTION ACROSS BASELINE DISEASE CHARACTERISTICS IN PATIENTS WITH EVIDENCE OF TYPE 2 INFLAMMATION AT BASELINE: THE LIBERTY ASTHMA QUEST STUDY

[1]P Paggiaro, [2]M Castro, [3]WG Canonica, [4,5]JA Douglass, [6]Y Tohda, [7]MS Rice, [8]Y Deniz, [9]P Rowe, [8]N Amin, [9]A Teper. *[1]University of Pisa, Pisa, Italy; [2]Washington University School of Medicine, St. Louis, USA; [3]Humanitas University and Research Hospital, Milan, Italy; [4]Royal Melbourne Hospital, Melbourne, Australia; [5]The University of Melbourne, Melbourne, Australia; [6]Kindai University, Osakasayama, Japan; [7]Sanofi, Cambridge, USA; [8]Regeneron Pharmaceuticals, Inc., Tarrytown, USA; [9]Sanofi, Bridgewater, USA*

10.1136/thorax-2019-BTSabstracts2019.55

Introduction Dupilumab, a fully human VelocImmune®-derived monoclonal antibody, blocks the shared receptor component for interleukin (IL)-4/IL-13, key drivers of type 2 inflammation in multiple diseases. In the phase 3 LIBERTY ASTHMA QUEST study (NCT02414854), add-on dupilumab 200 mg/300 mg every 2 weeks (q2w) vs placebo reduced severe exacerbations and improved pre-bronchodilator forced expiratory volume in 1 second (FEV_1) in patients with uncontrolled, moderate-to-severe asthma. Treatment effects were greater in patients with elevated type 2 biomarkers at baseline. This post hoc analysis assessed the effects of dupilumab on pre-bronchodilator FEV_1 by baseline disease characteristics in



*P<0.05, ** P<0.01, *** P<0.001 vs PBO.
†Derived from mixed-effect model with repeated measures model with change from BL in pre-bronchodilator FEV_1 values up to Week 52 or last contact date (whichever comes earlier) as the response variable; treatment groups, age, sex, height, geographic region, BL eosinophil strata, BL ICS dose level, visit, treatment by-visit interaction, BL pre-bronchodilator FEV_1, and BL-by-visit interaction as covariates.
BL, baseline; CI, confidence interval; DPL, dupilumab; ICS, inhaled corticosteroid; LABA, long-acting β2-agonist; LAMA, long-acting muscarinic antagonist; NS, not significant; PBO, placebo.

Abstract S49 Figure 1 Change in pre-bronchodilator FEV_1 from baseline to Week 12 by baseline disease characteristics in patients with uncontrolled, moderate-to-severe asthma and elevated type 2 biomarkers at baseline (blood eosinophils $\geq$150 cells/µL or FeNO $\geq$ 20ppb

patients with baseline levels of blood eosinophils ≥150 cells/µL or fractional exhaled nitric oxide (FeNO) ≥20 ppb, biomarkers of type 2 inflammation.

Methods Least squares (LS) mean changes from baseline to Week 12 in pre-bronchodilator FEV_1 were assessed using mixed-effect models with repeated measures.

Results Dupilumab 200 mg/300 mg q2w vs placebo improved pre-bronchodilator FEV_1 in patients with elevated type 2 biomarkers in subgroups defined by controller medications at randomization, baseline pre-bronchodilator FEV_1 (≤1.75 L/ >1.75 L), number of severe asthma exacerbations (≥1, ≥2, ≥3) in the previous year, smoking history (never smoked/former smoker with a smoking history ≤10 pack-years), and age at asthma onset (≤40 years/>40 years) (figure). The effect of dupilumab was significant in all subgroups except for a couple of subgroups of patients with type 2 inflammation on triple asthma controllers and those who were former smokers. Overall, the most frequent dupilumab 200 mg/300 mg vs matched placebo adverse event was injection-site reaction (15%/18% vs 5%/10%).

Conclusions Dupilumab significantly improved pre-bronchodilator FEV_1 across most baseline disease characteristics in patients with uncontrolled, moderate-to-severe asthma with evidence of type 2 inflammation at baseline. Dupilumab was generally well tolerated.

S50 ASSOCIATION OF BASELINE BLOOD EOSINOPHIL COUNTS AND SERUM IGE CONCENTRATIONS ON EXACERBATIONS AND BENRALIZUMAB EFFICACY FOR PATIENTS WITH SEVERE, UNCONTROLLED ASTHMA

[1]DJ Jackson, [2]M Humbert, [3]I Hirsch, [3]P Newbold, [4]E Garcia Gil. *[1]Asthma UK Centre, King's College London, Guy's and St Thomas' NHS Trust, London, UK; [2]Service de Pneumologie, Hôpital Bicêtre, Le Kremlin-Bicêtre, France; [3]AstraZeneca, Gaithersburg, USA; [4]AstraZeneca, Barcelona, Spain*

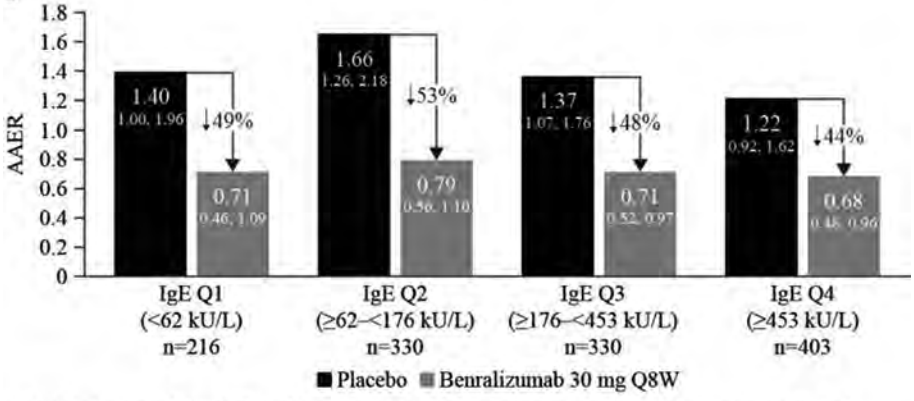
10.1136/thorax-2019-BTSabstracts2019.56

Introduction and objectives Understanding the key drivers of exacerbations for patients with overlapping eosinophilic and allergic severe asthma is important for identifying the optimal treatment strategy. Benralizumab every 8 weeks (Q8W; first three doses every 4 weeks) decreases the annual asthma exacerbation rate (AAER) for patients with severe,

A

AAER by:	BBEC (cells/μL)				
		<150	≥150–<300	≥300–<450	≥450
IgE concentration quartiles (kU/L)	Q1 (<61)	0.69 n=178	0.67 n=172	1.04 n=68	1.21 n=72
	Q2 (≥61–<170)	0.81 n=135	0.81 n=146	0.84 n=88	1.48 n=100
	Q3 (≥170–<456)	0.81 n=104	1.03 n=142	1.25 n=115	1.06 n=121
	Q4 (≥456)	0.60 n=79	0.75 n=161	0.77 n=91	0.99 n=165

B



A. Pooled placebo analysis of effect of BBEC and serum IgE concentrations on crude AAER estimated as the total number of exacerbations/total follow-up time.
B. Pooled SIROCCO/CALIMA analysis of effect of BBEC and serum IgE concentrations presented for benralizumab Q8W improvements for AAER vs. placebo. Estimates were calculated via a negative binomial model, with adjustment for study code, treatment, region, oral corticosteroid use at time of randomization, and prior exacerbations.
The log of each patient's corresponding follow-up time was used as an offset variable in the model.
n values represent all patients in the model, including patients receiving benralizumab Q4W. Data are for patients with BBEC ≥300 cells/μL who were also receiving high-dosage inhaled corticosteroids/long-acting β_2-agonists.
95% CI below values. Bold indicates nominal $p<0.05$.
AAER, annual asthma exacerbation rate; BBEC, baseline blood eosinophil counts; CI, confidence interval; IgE, immunoglobulin E; Q, quartile; Q4W, every 4 weeks; Q8W, every 8 weeks (first three doses Q4W).

Abstract S50 Figure 1 Effect of baseline blood eosinophil counts and serum IgE concentrations on annual asthma exacerbation rate and benralizumab efficacy

uncontrolled asthma with baseline blood eosinophil counts (BBEC) ≥300 cells/μL and serum IgE concentrations ≥150 or <150 kU/L by 42% and 43%, respectively, vs. placebo (*Ann Allergy Asthma Immunol* 2018;120:504–11). Our objectives were: 1) to determine the predictive value of serum IgE concentrations vs. BBEC on exacerbation risk for patients with overlapping eosinophilic and allergic asthma and 2) to evaluate benralizumab treatment effect for patients with eosinophilic asthma by baseline quartiles of serum IgE concentrations.

Methods For the first objective, pooled analyses of 1,937 patients who received placebo in the benralizumab (Phase III SIROCCO and CALIMA and Phase IIb), tralokinumab (Phase III STRATOS 1 and 2 and Phase IIb), and tezepelumab (Phase II PATHWAY) exacerbation studies of approximately 1-year duration were performed. Crude AAER by BBEC and serum IgE concentrations were estimated for all patients and by atopy status. For the second objective, pooled analyses of SIROCCO and CALIMA patients receiving benralizumab 30 mg Q8W or placebo were performed. AAER was evaluated for overlapping BBEC and serum IgE concentrations via a negative binomial regression approach.

Results For the pooled placebo analysis, AAER increased with increasing BBEC but did not increase with increasing serum IgE concentrations (figure), which was also regardless of atopy status. For the pooled SIROCCO/CALIMA analysis population with BBEC ≥300 cells/μL, benralizumab resulted in similar improvements in AAER vs. placebo across all baseline serum IgE concentration quartile groups (figure). Similar results were observed for patients with BBEC ≥150 cells/μL.

Conclusions BBEC are important predictors of exacerbation risk. However, this was not observed with serum IgE concentrations. Patients with severe eosinophilic asthma treated with benralizumab had consistent reductions in the risk of exacerbations compared with placebo, regardless of serum IgE concentrations.

S51 CHARACTERISATION OF EXACERBATIONS OF SEVERE EOSINOPHILIC ASTHMA ON MEPOLIZUMAB COMPARED TO PLACEBO

[1]R Shrimanker, [2]O Keene, [2]DJ Bratton, [3]SW Yancey, [4]LG Heaney, [1]ID Pavord. *[1]Respiratory Medicine Unit and Oxford Respiratory NIHR Biomedical Research Centre University of Oxford, Oxford, UK; [2]Clinical Statistics, GSK, Uxbridge, UK; [3]Clinical Development, GSK, North Carolina, USA; [4]Centre for Experimental Medicine, School of Medicine, Dentistry and Biomedical Sciences, Queen's University Belfast, Belfast, UK*

10.1136/thorax-2019-BTSabstracts2019.57

Mepolizumab reduces exacerbations of severe eosinophilic asthma. However, even with mepolizumab treatment, exacerbations still occur in this population.

We have previously shown that exacerbations on mepolizumab are associated with lower sputum eosinophil counts and lower decrements in symptoms measured by the visual analogue scale compared to placebo.

To further characterise exacerbations on mepolizumab, we carried out a post-hoc comparison of exacerbations on treatment with mepolizumab or placebo in three previously reported placebo-controlled trials. We investigated whether exacerbations in each group differ with respect to change in lung function and symptoms in the period before and after starting oral corticosteroid (OCS) rescue treatment.

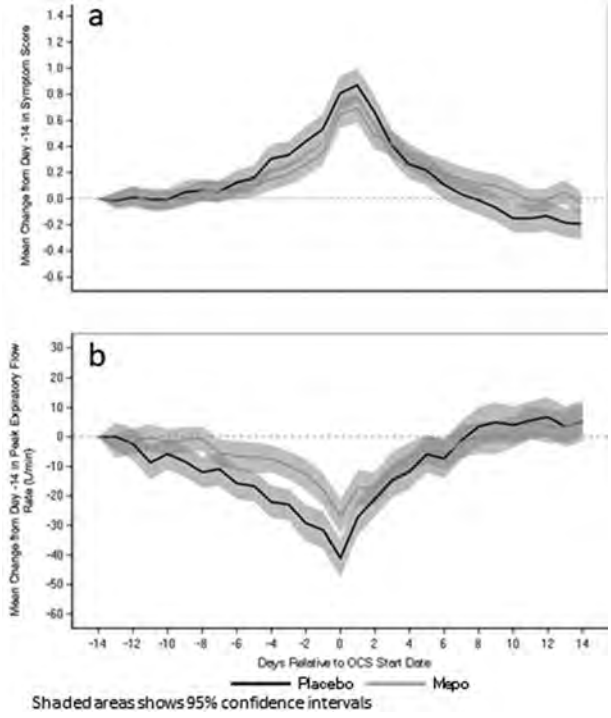
Methods Diary card data was reviewed from the 3 studies; DREAM, a 52-week study of 3 doses of mepolizumab (75, 250 or 750 mg IV 4 weekly) versus placebo; MENSA, an 32-week study of 2 doses of mepolizumab (75 mg IV or 100 mg s/c 4 weekly) versus placebo; and MUSCA, a 24-week study of mepolizumab 100 mg s/c 4 weekly versus placebo. All studies recruited patients with severe eosinophilic asthma and a history of 2 or more exacerbations in the previous year. Mepolizumab dose groups were combined for analysis.

Patients completed a daily diary card including a 6 point symptom score assessing asthma symptoms in the previous 24 hours and a best-of-three morning peak expiratory flow (PEF). Exacerbations requiring rescue OCS with at least 20 days of diary data in the period from 14 days prior to starting OCS (Day -14) to 14 days (Day 14) after starting OCS were included in the analysis.

Results 1026 exacerbations were analysed. 476 occurred in 248 subjects on placebo and 550 occurred in 338 subjects on mepolizumab.

Exacerbations on placebo were associated with a larger drop in PEF (-41.0 L/min [95% CI -47.3, -34.7]) compared to mepolizumab (-26.9 L/min [-32.7, -21.1]) over the 14 days prior to starting OCS. Exacerbations on placebo also tended to have a larger increase in daily symptom score compared to mepolizumab (0.81 points [0.68, 0.94] vs 0.65 points [0.54, 0.76] respectively).

Conclusion Exacerbations that occur on mepolizumab are less severe in terms of worsening in PEF and symptom scores.



Abstract S51 Figure 1 Changes in symptoms (panel a) and PEF (panel b)

S52 DEVELOPMENT OF A DEDICATED PROTOCOL FOR SCREENING FOR OCCULT PARASITIC INFECTION PRIOR TO INITIATION OF ANTI-IL5 THERAPY IN PATIENTS WITH SEVERE EOSINOPHILIC ASTHMA

B Cushen, R Stead, S Malley, D Armstrong-James, J Hull. *Royal Brompton Hospital, London, UK*

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Introduction and objectives Anti-IL5 therapies act by reducing blood and tissue eosinophils and are indicated in the management of patients with severe refractory eosinophilic Asthma. Eosinophils are important mediators in the host defence of parasitic infection. Prescribing guidelines recommend treatment of pre-existing parasitic infection prior to initiation of therapy. However, such infections are often chronic and asymptomatic and there is no clear guidance on who to screen and what to screen for. In addition, awaiting treatment by a specialist team can delay commencement of asthma therapy.

We sought to review our current practice and to develop a comprehensive protocol to guide screening and treatment of occult parasitic infection in patients selected to receive anti-IL5 therapy.

Methods A retrospective study of 219 severe asthma patients prescribed anti-IL5 therapy was performed to identify the prevalence of occult parasitic infection in this cohort. Anti-IL5 clinical trial protocols and infectious disease literature was also studied. Using these data, a protocol for parasite screening was developed.

Results Fifty-six patients (26%) had parasite screening carried out based on travel outside of Europe or North America. Seven of the patients screened (12.5%) had a positive test. Each patient was screened for an average of 5 different parasites (total number of tests=303), however positive tests were for Strongyloides (n=3) or Schistosoma (n=4) only.

A protocol which provides guidance for targeted screening for parasite infection and which includes comprehensive risk assessment and travel history was developed. Implementation of this protocol could reduce the number and costs of tests performed by 80% whilst maintaining the positive detection rate. The protocol incorporates additional guidance on how to manage and treat occult parasite infection when detected.

Conclusions Despite being recommended prior to initiation of anti-IL5 therapy, there is no clear guidance on screening for parasitic infections in this cohort, which can lead to inadequate screening or unnecessary tests being performed. We have developed a protocol to streamline this process to ensure the right tests are performed for the right patient first time.

S53 RESPONSE TO BENRALIZUMAB AFTER SUB-OPTIMAL RESPONSE TO MEPOLIZUMAB IN SEVERE EOSINOPHILIC ASTHMA

J Kavanagh, C Roxas, L Green, L Thomson, G d'Ancona, M Fernandes, J Dhariwal, AM Nanzer, BD Kent, DJ Jackson. *Guy's Severe Asthma Centre, Guy's Hospital, London, UK*

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Introduction Mepolizumab was the first anti-IL5 monoclonal antibody (mAb) to be licensed for severe eosinophilic asthma (SEA), and its use reduces exacerbation rate and maintenance oral corticosteroid (mOCS) requirement. A significant minority of patients fail to respond to Mepolizumab therapy, however; it is unclear if these patients may respond to other eosinophil targeting strategies, such as use of the IL5Ra mAb, Benralizumab.

Methods We retrospectively assessed patients with SEA who were switched from Mepolizumab to Benralizumab due to a sub-optimal response to the former, and had completed at least 24 weeks of treatment with the latter. We included SEA patients who had received Mepolizumab for ≥24 weeks, and had failed to achieve either a ≥50% reduction in OCS dose or a ≥50% reduction in annualised exacerbation rate (AER), or who had an ongoing requirement for ≥7.5 mg prednisolone/day. All patients had blood eosinophils of ≥0.3 in the year prior to Mepolizumab treatment.

Results Thirty-three SEA patients were included in the analysis (age 51.6±11.6, 48.5% female, BMI 32.6±7.1). Average length of Mepolizumab treatment was 42.5±11.8 weeks. At the end of Mepolizumab treatment AER was 3.94±2.13, falling to 1.71±2.22 after 24 weeks of Benralizumab (p<0.001). Twenty-nine patients were on mOCS at the end of Mepolizumab treatment, with a median daily prednisolone dose of 10 mg (IQR 5–19). By 24 weeks of Benralizumab, ten (34%) patients were able to discontinue mOCS completely, and the median dose fell to 5 mg (IQR 0–17, p=0.015). From end of Mepolizumab treatment to 24 weeks Benralizumab treatment, ACQ6 fell by 0.84 (from 3.27±1.37 to 2.43±1.35, p=0.001)

Abstract S53 Table 1

	Baseline mepolizumab A	End of mepolizumab B	Baseline benralizumab C	24 weeks benralizumab D	P value B vs D	P value A vs D
Annualised exacerbation rate	4.00 ± 3.23	3.94±2.13		1.71±2.22	<0.001	<0.001
On mOCS (number)	26 (78.8%)	29 (87.9%)	28 (84.8%)	18 (54.5%)	0.001*	0.039*
Median mOCS dose (prednisolone, mg/day)	15 (10–20)	10 (5–19)	17 (10–29)	5 (0–17)	0.015	0.009
FEV1 (L)	1.68 ± 0.63	1.45 ± 0.54	1.51 ± 0.55	1.74 ± 0.68	0.002	0.348
FEV1 (% predicted)	60.0 ± 19.7	51.5 ± 18.2	53.8 ± 18.6	61.5 ± 22.0	0.002	0.464
Blood eosinophil count ($x10^9$)	0.1 (0.0–0.3)	0.0 (0.0–0.1)	0.1 (0.0–0.1)	0.0 (0.0–0.0)	0.012	<0.001
FeNO (ppb)	44 (28–83)	57 (33–81)	56 (27–77)	50 (29–88)	0.859	0.808
ACQ-6	3.28 ± 1.35	3.27 ± 1.37	3.13 ± 1.52	2.43 ± 1.35	0.001	<0.001
Mini-AQLQ	3.49 ± 1.34	3.60 ± 1.49	3.48 ± 1.47	4.16 ± 1.45	0.018	0.006

ABBREVIATIONS: ACQ6 = Asthma Control Questionnaire 6; mOCS = maintenance Oral Corticosteroid; Mini-AQLQ = Mini Asthma Quality of Life Questionnaire; ppb = parts per billion
Values quoted are a mean when normally distributed (± standard distribution) or median when data is non-parametric (interquartile range, IQR).

and mini-AQLQ rose by 0.56 (from 3.60±1.49 to 4.16±1.45, p=0.018).

Conclusion These data suggest that a trial of Benralizumab after failure of Mepolizumab therapy may lead to significant clinical benefit in patients with SEA, with reductions in exacerbation frequency and OCS exposure, alongside improvements in patient reported outcome measures. Further investigation into the mechanisms of non-response is required, as are head to head trials to aid clinicians choosing between mAbs in SEA.

S54 EVIDENCE OF DRUG ANTIBODY DEVELOPMENT IN SEVERE EOSINOPHILIC ASTHMATICS TREATED WITH BENRALIZUMAB

[1]L Thomson, [1]J Kavanagh, [1]L Green, [1]M Fernandes, [1]C Roxas, [1]G d'Ancona, [1]J Dhariwal, [1]AM Nanzer, [1]BD Kent, [1,2]DJ Jackson. *[1]Guy's Severe Asthma Centre, London, UK; [2]Asthma UK Centre, King's College London, London, UK*

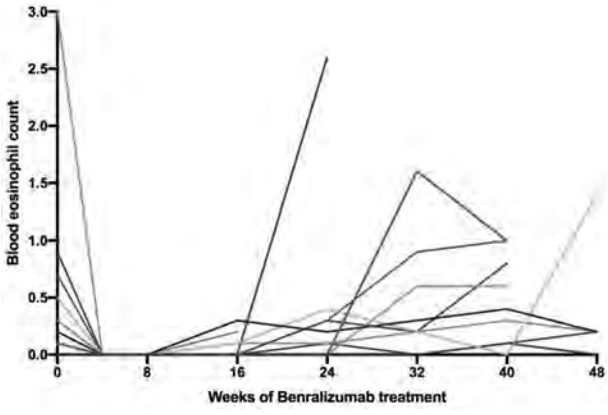
10.1136/thorax-2019-BTSabstracts2019.60

Introduction Benralizumab is an anti-IL5R monoclonal antibody (mAb) approved for the treatment of severe eosinophilic asthma (SEA). In phase 3 trials, 13%-15% of subjects developed anti-drug antibodies to benralizumab, however, study investigators reported no associated adverse clinical outcomes. Benralizumab fully depletes blood eosinophils in the vast majority of cases and a sudden rise in the blood eosinophil count on treatment can be used as a biomarker of antibody development. To date, no real-world data exists on the incidence of drug antibody development with benralizumab and whether any loss of clinical efficacy is observed.

Methods We conducted a retrospective review of all patients with SEA who had completed at least 12 weeks of treatment with benralizumab. As it was not possible to obtain the benralizumab drug antibody assay we identified those who had a rise in their blood eosinophil count to $\geq 0.1 \times 10^9$ cells on treatment. Baseline characteristics and any evidence of loss of clinical efficacy was recorded.

Results A total of 134 patients treated with benralizumab for SEA were identified. The median duration of treatment was 40 weeks (24–48). Having had undetectable blood eosinophils at the time of the second benralizumab dose, 13/134 (9.7%) patients (mean age 44.8±6.0, 5/13 female) subsequently had a rise in their blood eosinophils to $\geq 0.1 \times 10^9$ cells during treatment. The median peak eosinophil count on treatment in these patients was 0.40 (IQR 0.20–1.00). The median time to detectable eosinophils was 24 weeks (IQR 16–24). Median time to exacerbation after detectable eosinophils was 8 weeks (IQR 4–12). ACQ-reduced by 0.26±1.13 from baseline in this cohort. This compares to an improvement of 0.88±1.56 in our entire benralizumab cohort. 8/13 patients discontinued benralizumab due to loss of clinical efficacy and were switched to an alternative biologic therapy.

Conclusion In a large cohort of 134 SEA patients treated with benralizumab we report the first real-world evidence of possible antibody development in approximately 10% of patients. This was associated with an objective clinical decline in asthma control and/or acute exacerbation necessitating a switch of treatment in 62% of patients.



Abstract S54 Figure 1 Blood eosinophils in individuals over time

The failing lung in COPD

S55 WARD-BASED HIGH FLOW NASAL CANNULA OXYGEN – THE SOUTH WEST EXPERIENCE

[1]RC Jones, [2]A Dipper, [2]H Morrison. *[1]Southmead Hospital, Bristol, UK; [2]Musgrove Park Hospital, Taunton, UK*

10.1136/thorax-2019-BTSabstracts2019.61

High flow nasal cannula (HFNC) oxygen is increasingly used to deliver higher concentrations of humidified oxygen to patients than conventional oxygen therapy. Data on indications and outcomes is limited. Existing studies observe heterogenous populations, including post-operative and critical care patients. We sought to evaluate outcomes for adult medical inpatients commenced on HFNC across the South West region.

Methods Data was collected prospectively on all medical inpatients >18 years old commenced on HFNC from 9 centres across the South West. The first data collection period ran for 14 days in November 2018 and a second period of 28 days ran during February/March 2019. We looked at indications, treatment escalation trends and mortality.

Results 43 patients were started on HFNC. Age range was 29–91 (mean 64 years). The indication was acute type 1 respiratory failure in 40/43 cases, with hypercapnic respiratory failure in patients. Table 1 outlines the primary diagnosis.

86% of patients had an escalation status recorded prior to commencing HFNC. The overall in-hospital mortality rate was 30% and the 30-day mortality was 37%. For patients who were not suitable for full escalation of care, mortality was 50%. In total, 8 patients (19%) were referred to palliative care.

Abstract S55 Table 1 Primary Diagnosis of Patients started on HFNC

Primary Diagnosis	Number (%)
Pneumonia	23 (53)
Pulmonary Oedema	6 (14)
Viral Pneumonitis	4 (9)
Interstitial Lung Disease	3 (7)
Pulmonary Embolism	2 (5)
Other	5 (12)

There was no difference in mortality based on primary diagnosis, number/type of co-morbidities or oxygen level on pre-HFNC blood gas.

Conclusions This was a prospective, multicentre review of HFNC in a ward setting. Overall mortality rates for patients requiring HFNC in our population are similar to those reported for patients requiring acute non-invasive ventilation (NIV).[1] Mortality rates are higher in those patients who are not suitable for full escalation of treatment. This may guide clinical decision making and inform discussions in patients with limited escalation options. Given the significant mortality, it is important that HFNC is subject to the same audit and quality procedure as NIV.

On Behalf of PRISM, Trainee Research Network, South West.

REFERENCE

1. Juniper, *et al*. Inspiring change: a review of the quality of care provided to patients receiving non-invasive ventilation. London. NCEPOD. 2017.

S56 PREDICTORS OF NIV TREATMENT IN PATIENTS WITH COPD EXACERBATION COMPLICATED BY RESPIRATORY ACIDAEMIA

[1]C Echevarria, [2]J Steer, [2]SC Bourke. *[1]Royal Victoria Infirmary, Newcastle, UK; [2]North Tyneside General Hospital, Northumbria, UK*

10.1136/thorax-2019-BTSabstracts2019.62

Background Exacerbation of COPD (ECOPD) complicated by respiratory acidaemia (RA) is associated with significant morbidity and mortality. Non-invasive ventilation (NIV) substantially reduces mortality, but of ~26% of patients with RA during their admission, only ~12% receive NIV. Whilst a minority will correct RA with standard therapy, the reasons why others are not treated are unclear.

Methods All patients with an ECOPD and RA from the DECAF derivation and validation studies who attended one of six UK hospitals were identified. Sociodemographic data, markers of disease severity, co-morbidity, and admission clinical data (including serum tests) were compared between those that did and did not receive NIV on both univariate and multivariate analysis. These were compared to predictors of inpatient death.

Results 420 patients were identified (NIV treated=309; NIV-untreated=111). 60% were female, the mean (SD) age=72.2 (9.8) years, FEV1=37.7 (16.2)% predicted and median (IQR) pH=7.28 (7.22–7.32). Adverse indices in the NIV-untreated group included higher proportions of institutional care (p=0.002) and cerebrovascular disease (p=0.046), and higher median DECAF scores (p<0.001). The NIV-untreated group also had features consistent with better outcome, such as higher blood pressure (p=0.008), pH (p<0.001) and pO2 (p=0.028), suggesting a mixed population: one milder group with high oxygen levels and milder acidaemia, and another with frail patients from institutional care with cerebrovascular disease.

In multivariate analysis, independent predictors of NIV treatment were: admission hospital, institutional care, pO_2, cerebrovascular disease, pH, systolic blood pressure, and white cell count (see table). Of these predictors, only pH was also a predictor of inpatient death. On univariate analysis, other key predictors of death included age, DECAF score, AF, LVF, cognitive impairment, and CXR consolidation.

Abstract S56 Table 1 Multivariate regression analysis showing predictors of NIV treatment in patients that meet the criteria for NIV treatment at admission

	P value	Odds ratio	95% CI Lower	95% CI Upper
Hospital 1		Ref.		
Hospital 2	0.07	1.74	1.28	2.35
Hospital 3	0.55	1.41	0.46	4.33
Hospital 4	0.01	0.40	0.21	0.75
Hospital 5	0.32	1.87	1.02	3.44
Hospital 6	0.20	0.46	0.14	1.51
Institutional Care	<0.01	0.20	0.09	0.44
pO2	<0.01	0.95	0.93	0.96
CVD	0.09	0.52	0.36	0.77
pH	<0.01	0.00	0.00	0.00
Sys BP	<0.01	0.99	0.98	1.00
White cell count	0.08	0.97	0.94	1.00

CVD - cerebrovascular disease

Discussion The patient characteristics that indicate mortality risk are different from those that clinicians primarily use to guide NIV treatment. Clinicians may be using indices that they see as informing future quality of life rather than those that predict outcome, or clinicians may be unaware of the key predictors of death. This, and the variation in practice between hospitals, supports the need for improved prediction of mortality in patients with ECOPD meeting criteria for NIV.

S57 PREDICTING OUTCOME FROM EXACERBATIONS OF COPD REQUIRING ASSISTED VENTILATION: RESULTS FROM THE NIV OUTCOME (NIVO) STUDY

[1]TM Hartley, [1]ND Lane, [1]J Steer, [2]MW Elliott, [3]M Sovani, [4]HJ Curtis, [5]ER Fuller, [6]PB Murphy, [6]N Hart, [7]D Shrikrishna, [8]KE Lewis, [9]NR Ward, [10]C Turnbull, [1]SC Bourke. *[1]Northumbria Healthcare NHS Foundation Trust, North Shields, UK; [2]St James's University Hospital, Leeds, UK; [3]Nottingham University Hospitals NHS Trust, Nottingham, UK; [4]Gateshead Health NHS Foundation Trust, Gateshead, UK; [5]South Tyneside NHS Foundation Trust, South Shields, UK; [6]Guy's and St. Thomas' NHS Foundation Trust, London, UK; [7]Taunton and Somerset NHS Foundation Trust, Taunton, UK; [8]Hywel Dda University Health Board, Llanelli, UK; [9]University Hospitals Plymouth NHS Trust, Plymouth, UK; [10]Oxford University Hospitals NHS Foundation Trust, Oxford, UK*

10.1136/thorax-2019-BTSabstracts2019.63

Introduction Exacerbations of COPD account for approximately 12% of UK hospital admissions. Over 20% will be complicated by respiratory acidaemia, which has high mortality. Non-Invasive ventilation (NIV) confers a 2–3 fold mortality reduction, but practice is sub-optimal; the intervention is underused, infrastructure is lacking, and complex decisions are made by a wide range of clinicians.[1] It is likely that prognostic pessimism contributes to underuse. We aimed to derive and separately validate a simple, bedside, clinical tool to predict in-hospital mortality in exacerbations of COPD complicated by respiratory acidaemia requiring assisted ventilation.

Methods Derivation was single-centre and retrospective. Consecutive patients meeting selection criteria were identified and clinical data collected. Multivariable regression identified independent predictors of in-hospital death and a simple model

Abstract 57 Table 1

NIVO Score	Survived	Died	Total	Mortality
0	87	3	90	3.3%
1	70	6	76	7.9%
2	134	7	141	5.0%
3	121	25	146	17.2%
4	95	23	118	19.5%
5	48	39	87	44.8%
6	23	26	49	53.1%
7	7	10	17	58.8%
8	1	7	8	87.5%
9	0	1	1	100%
Total	586	147	733	20.1%
Risk category (score)	**Survived**	**Died**	**Total**	**Mortality**
Low (0–2)	291	16	307	5.2%
Medium (3–4)	216	48	264	18.2%
High (5–7)	78	75	153	49.0%
Very High (8–9)	1	8	9	88.9%

created. For validation, consecutive patients were prospectively recruited from 10 sites and model performance assessed.

Results 489 patients were identified in the derivation study and 733 in the validation (in-hospital mortality 25.4 and 20.1% respectively). Key validation descriptors: 70% hospitalised during previous year, Mean (SD) age 70.5 (9.3) years and FEV_1 % predicted 37.2 (15.4). 56% were unable to leave the house unassisted (eMRCD 5a or 5b) and 29% prescribed LTOT. 36% had previously required NIV and 9% were receiving home ventilation. Median (IQR) pH at onset of ventilation 7.27 (7.22–7.30), with $CO_2$10.2 (2.7) kPa.

The final prognostic (NIVO) score comprised: Atrial fibrillation, chest X-ray consolidation, pH <7.25, Glasgow coma scale ≤14 (all 1 point), timing of acidaemia >12 hours from admission time (2 points) and eMRCD (1–4=0, 5a=2, 5b=3) yielding a maximum score of 9 using 6 indices. Stepwise increase in mortality was observed with an area under the receiver operated curve of 0.79 in the validation cohort (0.83 derivation). The NIVO score outperformed pre-identified comparator scores (APACHE II, CAPS, Confalonieri risk chart) in both its derivation and validation studies.

Discussion Using only simple, readily available indices good prediction of in-hospital mortality is feasible. Potential practical applications include but are not limited to guiding level of care, setting treatment limitations and objectifying both clinician decision making and discussion with patients/family members.

REFERENCE

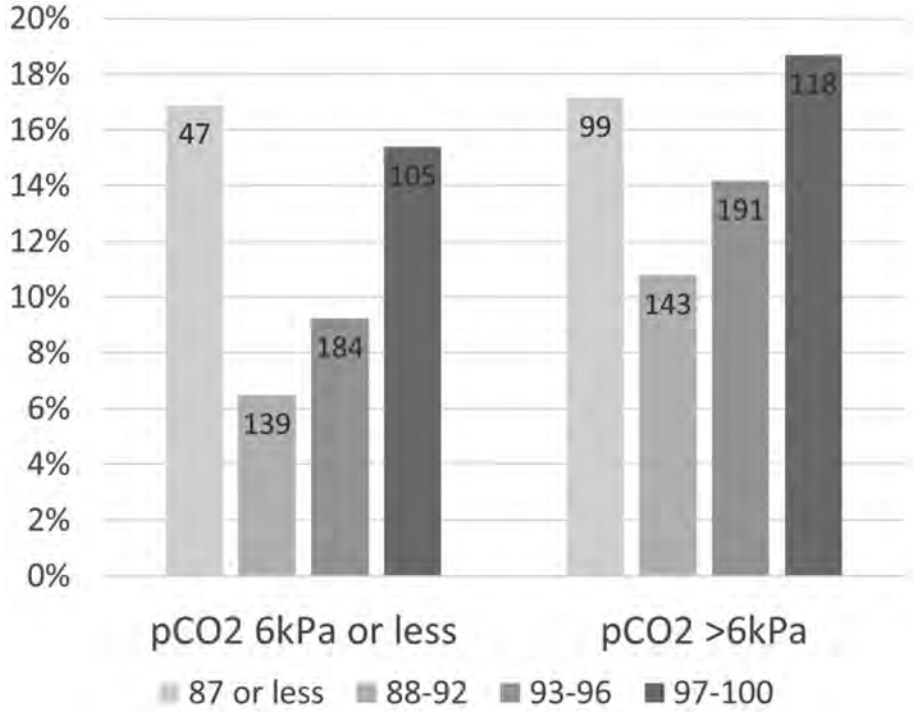
1. Inspiring change 2017

S58 OXYGEN THERAPY AND DEATH IN COPD EXACERBATION

[1]C Echevarria, [2]J Steer, [2]SC Bourke. *[1]Royal Victoria Infirmary, Newcastle, UK; [2]North Tyneside General Hospital, Northumbria, UK*

10.1136/thorax-2019-BTSabstracts2019.64

Background In hospitalised patients with COPD exacerbation, targeted oxygen therapy can save lives, but excess oxygen use is common and associated with higher rates of ventilation and mortality. The British Thoracic Society recommend initial oxygen target saturations of 88–92%, which can be adjusted to 94–98% if carbon dioxide levels are normal on arterial blood gas analysis. Conversely, the National Early Warning Score 2 (NEWS2) promotes target saturations of 88–92% only after an arterial blood gas has confirmed hypercapnia and after clinician approval.



Abstract S58 Figure 1 Inpatient death by admission oxygen saturation

Methods Of 2,645 patients with COPD exacerbation consecutively admitted across six UK hospitals, 1,027 patients were in receipt of supplemental oxygen at admission. All patients had ten or more cigarette pack years and airflow obstruction on previous spirometry. These patients were subdivided into the following groups: admission oxygen saturations of 87% or less, 88–92%, 93–96% or 97–100%. Inpatient mortality was calculated for each group, shown as percentages for raw data and expressed as odds ratios for adjusted between group comparisons. The NEWS2 score excluding oxygen saturation and DECAF were used in binary logistic regression to adjust for baseline risk.

Findings The mean age (standard deviation) was 73.3 (10.2), 56% were female, and the mean (SD) FEV1 was 41.7 (17.4) percent predicted. Mortality in each group was: saturations 87% or less=17.1%; 88–92%=8.7%; 93–96%=11.7%; and 97–100%=17.1%. Higher oxygen saturations were associated with an increase in mortality in both hypercapnic and normocapnic patients (see figure). This association was stronger after adjustment for baseline risk. Compared to the 88–92% group, the risk of death in the 93–96% and 97–100% group was 1.98 (95% Cl 1.09–3.60, p=0.025) and 2.97 (95% Cl 1.58–5.58, p=0.001).

Conclusion Inpatient mortality was lowest in those with oxygen saturations of 88–92%. Even modest elevations in oxygen saturations above this range were associated with increased risk of death, and- of key importance- this association was seen in both normocapnic and hypercapnic patients. This shows that the practice of setting different target saturations based on carbon dioxide levels is not justified. Treating all COPD patients with target saturations of 88–92% will simplify prescribing and should improve outcome.

S59 REDUCTION IN FATALITIES FOLLOWING INTRODUCTION OF AN INITIAL HOME OXYGEN RISK MITIGATION FORM (IHORM) FOR ALL NEW PATIENTS ON HOME OXYGEN IN ENGLAND AND WALES

[1]J Turner-Wilson, [2]S Smith, [3]S Channon. *[1]Oxford Health NHS Foundation Trust respiratory and home oxygen team, Oxford, UK; [2]University of Derby and Burton NHS Foundation Trust, Derby, UK; [3]NHS North Hampshire Clinical Commissioning Group, Basingstoke, UK*

10.1136/thorax-2019-BTSabstracts2019.65

Introduction Home Oxygen can be ordered by any registered Healthcare professional in England and Wales. There are approximately 130,000 patients on Home Oxygen at any time.

No specialist training is required to request Home Oxygen and there was previously no mandatory evaluation of risk before it was requested for patients. However, fatalities and serious incidents occurred, and local risk assessments were developed by several Home Oxygen teams to mitigate these risks. It was identified nationally that a risk evaluation for all new patients should be developed, resulting in the IHORM which was introduced for mandatory use from 1st August 2017.

The IHORM identifies a number of risks and has clear actions for clinicians to follow if the patient's responses are too high risk to install oxygen.

Method Incident data was collated for 2 year periods before and after roll out of the IHORM. Data was categorised into 5 levels oxygen incidents. Data for level 3 (minor), 4 (injury) and 5 (fatality or other serious incidents) was retrospectively analysed.

Results 454 incidents were reported before and 327 incidents after IHORM introduction.

Abstract S59 Table 1

IHORM Risks Table (Copied from approved IHORM Document)
HIGH RISK QUESTIONS
Does the patient smoke cigarettes / e-cigarettes?
Have they smoked in the last 6 months? Quit date.....
Does anyone else smoke at the patients premises?
A recent history of drug or alcohol dependency?
Patient reported they have had a fall in the last 3 months?
Have they had previous burns or fires in the home?
Does the person have identified mental capacity issues?
MODERATE RISK QUESTIONS
Can the patient leave their property un-aided?
Is the patient or any dependents/ in the property vulnerable? E.G. disabilities/ children
Do they live in a home that is joined to another?
Patient reports they have working smoke alarms at home? (if unknown please state no)
Do they live in a multiple occupancy premises (Bedsit/flat)

Following the introduction of IHORM:-

- Level 5 serious incidents associated with smoking and fires reduced by 62%.
- No incidents related to use of emollients oxygen and air mattresses were reported.
- Number of falls relating to oxygen tubing fell by 15%.
- Overall IHORM evaluated risks reduced by 28%.

Conclusion The implementation of compulsory risk assessment using IHORM led to an important reduction in adverse events in home oxygen patients.

Recommendations

1. Standardisation of all reporting including incident levels and terminology by NHS home oxygen suppliers is required.
2. Repeat risk assessment of all current smokers with oxygen insitu as 'safe' smokers should be recommended. As health changes may result in increased risk.
3. Education training modules available to NHS staff who complete IHORM
4. Standardisation of ex-smoker definition
5. Rigorous assessment of frailty risks
6. Recognition of NICE COPD Guidelines[1] and the future BTS COPD guideline recommendations.

REFERENCE

1. Chronic obstructive pulmonary disease in over 16s: diagnosis and management. NICE guideline [NG115] web accessed 11/7/19 https://www.nice.org.uk/guidance/ng115

Diagnostic and therapeutic advances in paediatrics

S60 UPPER VS. LOWER AIRWAY MICROBIOLOGICAL CULTURE IN CHILDREN WITH RESPIRATORY SYMPTOMS

[1,2]LE Gardner, [1,2]C Hogg, [1,2]SB Carr, [1,2,3]A Shoemark, [1]G Marsh, [1,2]JC Davies. *[1]Royal Brompton Hospital, London, UK; [2]National Heart and Lung Institute, Imperial College, London, UK; [3]Tayside Respiratory Research Group, University of Dundee, Dundee, UK*

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Introduction Obtaining samples for microbiological culture of the lower airways is challenging in children. We wished to determine whether microbiological culture taken from the upper airway (which is easier to obtain) could act as a surrogate marker for lower airway infection.

Abstract S60 Table 1 Characteristics of patients

Patient Characteristic	Total (n= 121)
Male : Female (n, %)	67 : 54 55% : 45%
Age (median, range)	2.6 years (0.43 – 15.7 years)
Clinical Phenotype (n):	
Persistent wet cough	55
Recurrent lower respiratory tract infection	48
Recurrent severe wheeze	47
Other	8
Diagnostic Outcome of Investigations (n):	
Aspiration Lung Disease (abnormal swallow)	55
Asthma	17
Gastro-oesophageal reflux	17
Ciliopathy	5
Prescribed Inhaled Corticosteroid:	
Inhaled Corticosteroids (n, %)	66, 55%
Mean dose/patient/day (Budesonide equivalent)	377 micrograms
Prescribed Topical Nasal Corticosteroid:	
Topical Nasal Corticosteroids (n, %)	6, 5%
Mean dose/patient/day (Budesonide equivalent)	158 micrograms
Prescribed Antibiotic:	
Total (n, %)	11, 9%
Long-term Prophylaxis (n, %)	10, 8.3%
Treatment Course (n, %)	1, 0.8%

The Royal Brompton Hospital (RBH) is a specialist diagnostic centre for Primary Ciliary Dyskinesia (PCD). PCD diagnosis involves taking a ciliary brush biopsy from the nose. At RBH these samples are routinely sent for bacterial culture to ensure that local infection does not, unknowingly, influence diagnostic outcome.

Methods We retrospectively collected data from 121 patients who underwent paired bronchoscopy and nasal ciliary brushing at RBH for investigation of respiratory symptoms.

Results Please see table 1 for patient characteristics data.

A total of 56 bacterium were cultured from 121 nasal brush biopsies (with 10 patients growing more than 1 bacteria) and 75 patients had no growth. A total of 93 bacterium were cultured from 121 BAL samples (with 23 patients growing more than 1 bacteria) and 55 patients had no growth. The most common bacteria cultured from the nose and bronchoalveolar lavage (BAL) were *Haemophilus influenzae* (43% of nasal bacteria; 33% of BAL bacteria), *Streptococcus pneumoniae* (29% of nasal bacteria; 24% of BAL bacteria) and *Moraxella catarrhalis* (18% of nasal bacteria; 23% of BAL bacteria).

41 (33.9%) of paired nasal and BAL samples were concordant in being culture negative; 19 (15.7%) were fully concordant (of 1 or more bacteria) in being culture positive; and 48 (39.7%) were fully discordant. The remaining 13 (10.7%) had 1 or more bacteria in common between paired samples but were not fully concordant, with it being more common to see additional bacteria in the BAL sample.

Conclusion With less than 50% of samples being fully concordant, nasal samples may not be a good surrogate for lower airway microbiology. Further data is required to understand the relationship of inflammation and infection across the upper and lower airways. We are now working on determining the influence of viral co-infection, inhaled and topical corticosteroids and the prescription of antibiotics.

S61 ONASEMNOGENE ABEPARVOVEC GENE-REPLACEMENT THERAPY (GRT) FOR SPINAL MUSCULAR ATROPHY TYPE 1 (SMA1): PRELIMINARY PULMONARY AND VENTILATORY FINDINGS FROM THE PHASE 3 STUDY (STR1VE)

[1]R Shell, [2]JW Day, [3]CA Chiriboga, [4]TO Crawford, [5]BT Darras, [6]RS Finkel, [7]AM Connolly, [8]ST Iannaccone, [9]NL Kuntz, [10]LDM Peña, [11]PB Shieh, [12]EC Smith, [13]I Kausar, [13]M Schultz, [13]DE Feltner, [13]FG Ogrinc, [13]TA Macek, [13]E Kernbauer, [13]J L'Italien, [13]DM Sproule, [13]BK Kaspar, [14]JR Mendell. *[1]Department of Pediatrics, Section of Pulmonary Medicine, Nationwide Children's Hospital, Columbus, USA; [2]Department of Neurology, Stanford University Medical Center, Stanford, USA; [3]Division of Pediatric Neurology, Columbia University Medical Center, New York, USA; [4]Department of Neurology, Johns Hopkins Medicine, Baltimore, USA; [5]Department of Neurology, Boston Children's Hospital, Boston, USA; [6]Division of Neurology, Department of Pediatrics, Nemours Children's Hospital, Orlando, USA; [7]Department of Neurology, Nationwide Children's Hospital, Columbus, USA; [8]Department of Pediatrics, University of Texas Southwestern Medical Center, Dallas, USA; [9]Division of Neurology, Ann and Robert H. Lurie Children's Hospital of Chicago, Chicago, USA; [10]Division of Human Genetics, Cincinnati Children's Hospital, Cincinnati, USA; [11]Department of Neurology, David Geffen School of Medicine at UCLA, Los Angeles, USA; [12]Department of Pediatrics, Duke University School of Medicine, Durham, USA; [13]AveXis, Inc., Bannockburn, USA; [14]Center for Gene Therapy, Nationwide Children's Hospital, Columbus, USA*

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Introduction and objectives SMA1 is a rapidly progressing neurologic disease caused by biallelic loss/mutation of the survival motor neuron 1 gene (*SMN1*). Onasemnogene abeparvovec (formerly AVXS-101) is a one-time GRT designed to treat the genetic root cause of SMA by providing immediate, sustained neuronal SMN protein expression. In the phase 1/2a study (NCT02122952), symptomatic SMA1 infants treated with onasemnogene abeparvovec demonstrated exceptional permanent ventilation-free survival, motor milestone achievements, and increased independence from ventilatory and nutritional support. Here we report study design and preliminary pulmonary and bulbar function data from the STR1VE study (NCT03306277).

Methods STR1VE is a phase 3, multicenter, open-label, single-arm study in SMA1 patients aged <6 months (biallelic *SMN1* mutations/deletions, 2 *SMN2* copies). Primary outcomes: independent sitting (≥30 seconds) at 18 months of age; survival (avoidance of death/permanent ventilation) at 14 months. Secondary outcomes: ability to thrive and ventilatory support at 18 months of age. Exploratory outcomes: Children's Hospital of Philadelphia Infant Test of Neuromuscular Disorders and Bayley Scales of Infant and Toddler Development score.

Results Enrollment is complete (N=22 dosed patients). Mean (range) age at symptom onset, genetic diagnosis, and enrollment: 1.9 (0–4.0), 2.6 (0–5.4), and 3.7 (0.5–5.9) months. At baseline, no patient required ventilatory/nutritional support; all exclusively fed by mouth. As of 8 March 2019, 1 patient died due to causes unrelated to onasemnogene abeparvovec (May 2018); 1 withdrew consent. Eighteen of 22 patients had not had any bilevel positive airway pressure (BiPAP) support during the study. All 20 (100%) continuing patients had functional/normal swallowing. Two patients had gastrostomy tubes; 1 who discontinued the study. Eleven of 22 patients achieved independent sitting (mean, 8.2 months post-treatment); 19/20 patients ≥10.5 months of age or who discontinued the study prior to 10.5 months were surviving without permanent ventilation. The discontinued patient met the ventilatory support endpoint by clinical report, but this was not verified by download of ventilator usage from the BiPAP machine.

Conclusions Preliminary data from STR1VE parallel the phase 1/2a study findings and may be associated with future survival, as well as pulmonary and bulbar function improvements.

S62 CHANGING LANDSCAPE OF PAEDIATRIC TRACHEOSTOMY VENTILATION: SINGLE CENTRE EXPERIENCE

IM Brookes, M Desai, P Kenia, S Rao, P Nagakumar. *Birmingham Women's and Children's Hospital, Birmingham, UK*

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Introduction and objectives Children on long term tracheostomy ventilation (tr-LTV) have complex needs and are high users of PICU, specialist inpatient beds, and community care packages. Improvements in survival in PICU, and changing expectations mean children with previously life limiting conditions are often offered tr-LTV. Although a Canadian study showed no increase in total numbers of tr-LTV patients,[1] data on complexity and outcomes of tr-LTV children is sparse. We hypothesised that both numbers of patients, and complexity, were increasing. Our goal was to examine

Abstract S62 Table 1

	1998–2008	2009–2019
n	10	46
Sex (M:F)	5:5	20:26
Age of T-LTV initiation n(%)		
<1 yr	4 (40)	27(59)
>1 yr	6 (60)	19(41)
Primary diagnosis n(%)	6 (60)	10(22)
Neuromuscular	4 (40)	16(35)
CNS	0	20 (43)
Respiratory		
Multisystem n(%)	1 (10)	24(52)
24 hr ventilation n (%)	6 (60)	24(52)
Outcome n(%)		
Liberated	1 (10)	8(17)
Transitioned	5(50)	5(11)
Death	2(20)	10(22)
Current patient	2(20)	19(41)
Inpatient-awaiting 1st discharge	0	4(8)
Destination patients n(%)	9(90)	28(61)
Bridge patients n(%)	1(10)	18(39)

outcomes to inform counselling of families when tr-LTV was being considered.

Methods All children established on home tr-LTV since 1998 at a large Children's Hospital were included. Year/age of initiation, diagnostic group, treatment intention ('bridge to recovery' or 'destination'[2]), and outcomes were recorded. Data were compared between 2 decades (1998–2008, 2009–19).

Results 56 patients were established on tr-LTV (table 1). Between the two decades 4.5 times (10 vs 46) more children were established on tr-LTV. Both the proportion established under 1yr of age (40% to 59%), or with multi-system problems (10% to 52%) increased.

Whilst mortality was similar (20% vs 22%) in both groups, of the total 12 deaths, 9 patients had multi-system problems. Median time on tr-LTV for patients who died was 12 months (12,48 months). In total 9 patients weaned off ventilation of which 8 had single system involvement only.

Conclusions Not only has there been an increase in the number of patients receiving tr-LTV, but the patients are younger and have multi-system problems. This may impact on mortality.

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S63 ADHERENCE, AIRWAY INFLAMMATION AND ADRENAL FUNCTION IN A COHORT OF PAEDIATRIC ASTHMA PATIENTS

L Selby, S Saglani, A Bush, L Fleming. *Royal Brompton Hospital, London, UK*

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Introduction Systemic absorption of inhaled corticosteroids (ICS) is greater in healthy adults than asthmatics [Lancet 2000;356:556]. ICS are the mainstay of paediatric asthma treatment, however adverse effects can occur. The incidence of adrenal suppression in children with asthma treated with ICS is unknown. There are case reports of deaths in children with asthma with undiagnosed adrenal suppression; the dose at which adrenal suppression occurs is not known.

Aim/Short hypothesis We hypothesized adrenal suppression for a given dose of ICS is less in asthmatic children with worse airway obstruction and inflammation. We investigated the relationship between airway obstruction, airway inflammation and adrenal function and objectively defined dose of ICS inhaled.

Methods Single centre prospective cohort study of children aged 4–16years prescribed ≥400 micrograms/day beclomethasone (BDP) equivalent. 46 children with asthma, median age 11.6years (range 9.5–14.0years) were recruited and issued an electronic monitoring device (EMD) to record adherence to ICS. After the monitoring period, a low dose short Synacthen test (LDSST) was performed, with baseline cortisol level taken at 0 minutes prior to administration of 300ng/m^2 Synacthen, and response assessed with serial plasma cortisol levels taken at 15, 20, 25, 30 and 35 minutes post-administration. (Normal result baseline cortisol >100nmol/L increasing to >500nmol/L).

Results EMD data were available in 24 patients in the period prior to LDSST. 12 had normal and 12 abnormal Synacthen tests. There were no significant differences in airway obstruction, adherence to ICS, or average daily dose of ICS taken for a median of 71 (62–121) days prior to the test (based on EMD data). FeNO was significantly higher in children with a normal Synacthen test (p=0.002). Symptom scores were lower and blood eosinophils were higher in children with normal adrenal function, but this was not significant.

Conclusions Children with normal adrenal function had significantly higher FeNO, suggesting ongoing airway inflammation. Although not significantly different, they also had lower median adherence to ICS, suggesting this may be the explanation. However, inflammation causes increased bronchial blood flow, therefore more systemic absorption of ICS and more adrenal suppression would be expected. As adrenal function remains normal, this group of children may exhibit steroid insensitivity and have poor symptom control.

Abstract S63 Table 1

	Normal Synacthen n=12	Abnormal Synacthen n=12	Significance
Dose of ICS prescribed (mcg BDP equivalent/day)	1000 (850–1000)	800 (800–1000)	Ns
Asthma control test (ACT) score	15 (12–20)	18 (15–21)	Ns
Overall adherence (%)	57 (43–88)	70 (59–80)	Ns
Average dose of ICS taken based on EMD data	490 (282–887)	615 (471–810)	Ns
FEV_1% predicted	85 (74–99)	87 (80–107)	Ns
FEV_1:FVC	0.96 (0.77–1.00)	0.90 (0.82–1.00)	Ns
Bronchodilator reversibility (BDR) (%)	7 (3–26)	19 (11–32)	Ns
FeNO ppb	67 (37–87)	16 (6–34)	p=0.002
Blood eosinophils x10^9/L	0.7 (0.5–0.9)	0.5 (0.2–0.9)	Ns

S64 USE OF PATHOLOGICAL PHENOTYPE TO DETERMINE OPTIMAL MANAGEMENT FOR MODERATE TO SEVERE PRESCHOOL WHEEZE

[1]Y Bingham, [2]J Moreiras, [3]S Goldring, [4]J Cook, [1]L Selby, [5]L Baynton, [4]A Gupta, [1]L Fleming, [5]I Balfour-Lynn, [1]A Bush, [5]W Banya, [5]M Rosenthal, [1]S Saglani. *[1]Imperial College London, London, UK; [2]Whittington Health NHS Trust, London, UK; [3]The Hillingdon Hospitals NHS Foundation Trust, London, UK; [4]King's College Hospital NHS Foundation Trust, London, UK; [5]Royal Brompton and Harefield NHS Foundation Trust, London, UK*

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Introduction Persistent episodes of wheezing are common in preschool children, however we have few effective therapies. We hypothesised that objective biomarker based management of preschool wheeze would be superior to current clinical guidelines.

Methods A single-centre randomised, controlled trial in children aged 1–5 years with moderate to severe recurrent wheeze, requiring at least 2 admissions ± short courses of oral steroids in the last 12 months, with at least one in the last 6 months. Children were recruited from September-April over a 3 year period. Clinical (episodic viral wheeze [EVW], or multiple trigger wheeze [MTW][1]) and pathological phenotypes based on blood eosinophilia ≥3%, or bacterial infection in sputum or cough swab were determined at recruitment. Children were randomised to pathological phenotype based management (beclomethasone 400 mcg/day if blood eosinophils ≥3%, or targeted antibiotics if positive culture on sputum/cough swab) or clinician directed care (control arm) for 4 months. Primary outcome was number of unscheduled healthcare visits (UHCVs). Daily symptoms were reported via a text message system. Patients treated with inhaled corticosteroids (ICS) had adherence assessed using an electronic monitoring device.

Results 60 children were randomised, 30 in each group. Baseline blood eosinophils were similar in the two groups (5.18% control, 5.15% intervention). 6 children had positive sputum cultures. 38/60 had EVW and 22/60 had MTW. Prevalence of clinical phenotypes was similar in both groups (control-EVW 18/30, MTW 12/30; intervention- EVW 20/30, MTW 10/30). In both groups 20/30 (67%) were prescribed ICS, with median adherence 67% (range 0–91%). There was no significant difference in the rate of UHCVs or symptoms between the two groups (p=0.46).

Conclusions Phenotype based management of children with moderate to severe preschool wheeze did not result in a significant reduction in UHCVs compared to clinical guideline based management. However, 56% of children in the control group with EVW were prescribed ICS by their clinician even though this is not recommended in clinical guidelines and 80% of those with EVW in the pathological phenotype had blood eosinophilia, suggesting little relationship between clinical phenotype and objective biomarkers to guide ICS prescription.

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S65 CAPILLARY CARBON DIOXIDE AS A MEASURE OF DISEASE SEVERITY IN ACUTE BRONCHIOLITIS

[1]SA Unger, [1]C Halliday, [1]A Ziaie, [2]S Cunningham. *[1]Royal Hospital for Sick Children Edinburgh, Edinburgh, UK; [2]University of Edinburgh, Edinburgh, UK*

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Carbon dioxide (CO_2) using capillary blood gas (CBG) analysis is commonly used children with acute bronchiolitis. Evidence to support its use is limited.

A retrospective observational study was conducted over two bronchiolitis seasons (2014 -2016) of infants admitted to a tertiary teaching hospital using patient electronic medical records. Using logistical regression models (STATA/IC 12.1) the association between CBG pCO_2 and markers of disease severity (length of stay (LOS) and high dependency admission (HDU)) was examined.

332 children were assessed with 526 CBG performed in 158 infants (mean age 0.31 years, 54% male, 27% premature, 77% RSV positive). The initial CBG pCO_2 was a mean 5.9kPa (SD1.1) and a maximum mean of 6.4kPa (SD1.5). Median LOS was 3 days (range 0–35). A CBG pCO_2 >7.0kPa during the admission (in 23% infants (36/158)) was significantly associated with younger age (OR 0.005 (95%CI 0.0007, 0.03); p<0.0001), the use of supplemental oxygen (OR 1.9 (95%CI 1.1, 3.3); p=0.033) (adjusted for age) and inspired fraction of oxygen (FiO_2) (slope coefficient 2.01 (95%CI 1.08, 2.94), p<0.0001) (adjusted for age). In 62% (98/158) a CBG was performed in ED and a pCO_2 >7kPa (N=26/98) in ED was significantly associated with LOS (IRR 1.4 (95%CI 1.1,1.8); p=0.008) and HDU admission (OR 3.5 (95%CI 1.7,7.8); p=0.001).

CBG pCO_2 >7 kPa identifies children in ED with more severe disease with longer length of stay and risk of admission to HDU. Our results suggest that CBG pCO_2 may be a possible marker of severity in future intervention trials for bronchiolitis.

ILD and rare respiratory diseases: cracking the code

S66 DELIVERING THE 100,000 GENOMES PROJECT TO ESTABLISH THE FUNCTIONAL ROLE OF DNA SEQUENCE VARIANTS IN RESPIRATORY RARE DISEASES

[1]CL Shovlin, [2]DJ Morris-Rosendahl, [3]F Copeland, [4]A De Soyza, [2]C Hogg, [5]G Jenkins, [6]SJ Marciniak, [1]M Lovett, [1]MF Moffatt, [1]WOC Cookson, [7]M Alikian, [2]S Hasan, [1]R Slade, [1]S Xiao, [8]F Boardman-Pretty, [8]D Brown, [8]M Caulfield, [8]A Devereau, [8]T Fowler, [8]E McDonagh, [8]R Scott, [8]ERA Thomas, [8]Genomics England Research Consortium, [1]EWFW Alton. *[1]Imperial College, London, UK; [2]Royal Brompton NHS Foundation Trust, London, UK; [3]PCD Family Support Group, Milton Keynes, UK; [4]Newcastle University, Newcastle, UK; [5]University of Nottingham, Nottingham, UK; [6]University of Cambridge, Cambridge, UK; [7]Imperial College Healthcare NHS Trust, London, UK; [8]Genomics England, London, UK*

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Background and aims Between July 2016 and September 2018, NHS Genomic Medicine Centres (GMCs) recruited families with specified rare diseases to the 100,000 Genomes Project for whole genome sequencing (WGS), and linkage to phenotypic information from NHS Health Records.

Methods Genomics England protocols were followed for disease nominations, data model generation based on human phenotype ontology (HPO) terms,[1] and development/review of PanelApp gene panels.[2] Genomics England performed all WGS, data alignments, and initial variant tiering. This incorporated appropriate familial segregation patterns for variants in genes known to cause the patient's disease (Tier 1: clear loss of function variants, Tier[2]: other variants), and

clear loss of function or de novo variants in other genes (Tier 3). The Respiratory GeCIP (Clinical Interpretation Partnership) was established to analyse full WGS/phenotypic datasets.

Results Six respiratory diseases were nominated and passed through 100K pipelines: primary ciliary dyskinesia (PCD), familial pulmonary fibrosis (FPF), aggressive non-CF bronchiectasis, pulmonary arteriovenous malformations (PAVMs), hereditary haemorrhagic telangiectasia (HHT) and familial pneumothorax. National and international networks were established for each, including a focus on patient/public engagement. Patient results were returned to UK GMCs from August 2017. Recruited participants with recessive and dominant diseases each had 0–2 Tier 1 variants, 0–2 Tier 2 variants and up to 536 Tier 3 variants. Genomic diagnoses have been fed back to 57 respiratory families for 15 different genes in PCD, FPF, non-CF bronchiectasis, and PAVMs/HHT, already modifying PanelApp, with validations in two potentially new ciliopathy genes in progress. Full WGS results have been released quarterly to the Research Data Embassy at steadily increasing numbers. HPO term capture identifies further patients; for example, there are data on 269 families recruited with bronchiectasis plus another 27 with relevant HPO terms. Respiratory GeCIP Data Embassy access and Projects were secured through 2018–2019. New analytic resources available through the Data Embassy (particularly LabKey and IVA 2.0) enable >90 Domain members to identify annotated variants through indexed systems. Custom scripts are being used to access variant information from the whole genome.

Conclusions The Respiratory GeCIP has established a collaborative resource for the advancement of NHS Respiratory Genomics.

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S67 EVIDENCE THAT TELOMERE LENGTH IS CAUSAL FOR IDIOPATHIC PULMONARY FIBROSIS BUT NOT CHRONIC OBSTRUCTIVE PULMONARY DISEASE: A UK BIOBANK MENDELIAN RANDOMISATION STUDY

[1]A Duckworth, [2]MA Gibbons, [1]AR Wood, [1]K Lunnon, [1]MA Lindsay, [1]J Tyrrell, [1]CJ Scotton. *[1]University of Exeter, Exeter, UK; [2]Royal Devon and Exeter NHS Foundation Trust, Exeter, UK*

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Introduction and objectives Idiopathic Pulmonary Fibrosis (IPF) is a fatal lung disease that accounts for 1% of UK deaths. Causal genes have been found accounting for about 30% of familial cases of pulmonary fibrosis and the majority relate to telomere maintenance. However, no evidence of causality in the idiopathic form of the disease has yet been found.

Prematurely shortened leukocyte telomere length (LTL) has been associated with IPF and also Chronic Obstructive Pulmonary Disease (COPD), a disease with a similar demographic and symptomatology. Studies have shown age adjusted LTL values of 0.85 ± 0.60 vs 1.15 ± 0.6, p=0.0001 for IPF[1] and 0.68 ± 0.25 vs. 0.88 ± 0.52 (smoking controls), p = 0.003 for COPD.[2]

We sought to investigate causality in IPF using Mendelian randomisation (MR) with UK Biobank data. To our knowledge, this is the first genetic study of this IPF cohort and the first application of MR to investigate causality in IPF. We hypothesised that prematurely shortened telomeres are causal in IPF but not in COPD.

Methods We performed one- and two-sample MR in the UK Biobank data. This study had 1,133 IPF cases (defined by ICD10 code J84.1), 11,413 COPD cases and 378,575 controls, all of European ancestry. Seven variants previously associated with telomere length were used in the MR analysis. Pleiotropy was explored using MR approaches including MR-Egger and Median MR.

Results A genetically instrumented one unit LTL shorter telomere length was associated with higher odds of IPF (OR 4.19 [95%CI: 2.33–7.55], P=0.0031). Similar results were found in males and females separately. Despite being an age-related lung disease with similar symptoms, there was no evidence that telomere length caused COPD.

Conclusions Prematurely shortened telomeres have a likely causal effect in IPF. This enables a greater focus on telomere-related diagnostics, treatments and the search for a cure. Safe telomere activation therapy is being explored in the cardiology field, amongst others, using transient delivery of telomerase and there are also accessible therapies that show improved telomere length. Such approaches warrant investigation in IPF.

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S68 UNDERSTANDING THE PATHOLOGICAL ROLE OF A GENETIC ABNORMALITY IN DOCK3 IN FAMILIAL PULMONARY FIBROSIS

[1]R Kaur, [1]I Stewart, [1]RG Jenkins, [1]A John, [2]D Brown, [3]L Wain. *[1]Respiratory Research Unit NIHR Biomedical Research Centre, University of Nottingham, Nottingham, UK; [2]Genomic England, London, UK; [3]Department of Health Sciences, University of Leicester and National Institute for Health Research, Leicester Respiratory Biomedical Research Centre, Glenfield Hospital, Leicester, UK*

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Idiopathic Pulmonary Fibrosis (IPF) is an uncommon but serious progressive fibrotic lung disease characterised by deteriorating symptoms, respiratory failure and death, often within 5 years from diagnosis. Up to 10% of patients with IPF have a family history of this disease, known as Familial Pulmonary Fibrosis (FPF). Prior genetic studies have identified rare variants in genes relating to telomere and epithelial function and are responsible for about 20% of FPF cases. To identify the missing heritability we recruited FPF patients to the 100k Genome Project and analysed data from the Whole Genome Sequencing from 169 cases (140 probands and 29 family members) and 8127 controls. Our filtering strategy identified rare deleterious variation (tier 1 and tier 2) in over 20% of the patients. Novel variants in over 20 genes, not previously associated with pulmonary fibrosis, were found to be present at much greater frequency in FPF patients compared with controls, including two missense exonic DOCK3 variants.

DOCK3 is a member of the DOCK-B subfamily of guanine nucleotide exchange factors (GEFs) which function as activators of small G proteins. DOCK3 specifically activates the small G protein Rac and can promote reorganisation of the

cytoskeleton and activation of downstream signalling pathways. Analysis of a number of lung tissue datasets has revealed lung tissue DOCK3 mRNA is increased in patients with pulmonary fibrosis. To determine whether DOCK3 protein is increased in whole lung tissue from patients with pulmonary fibrosis, immunohistochemical analysis was performed. In non-fibrotic lung tissue, a low level of DOCK3 expression was throughout the lung. In lung samples from IPF patients, DOCK3 was expressed widely in numerous cells within fibrotic areas of the lung although the exact cell types expressing DOCK3 in these regions have yet to be determined.

These data suggest that DOCK3 could be a novel and important genetic contributor to fibrotic lung disease and studies to replicate these findings and define the functional consequences DOCK3 variants are ongoing.

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S69 VERIFICATION OF GENETIC ASSOCIATIONS WITH SCLERODERMA ASSOCIATED INTERSTITIAL LUNG DISEASE

[1]CJW Stock, [1]A DeLauretis, [1]D Visca, [1]C Daccord, [1]M Kokosi, [1]V Kouranos, [1]G Margaritopoulos, [1]PM George, [1]PL Molyneaux, [1]F Chua, [1]TM Maher, [2]DJ Abraham, [2]CP Denton, [2]V Ong, [1]AU Wells, [1]EA Renzoni. *[1]Royal Brompton Hospital, London, UK; [2]Royal Free Hospital, London, UK*

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Although genetic associations with scleroderma (SSc) as a whole are clearly established, very little is known on genetic susceptibility to SSc-associated interstitial lung disease (SSc-ILD) specifically. A number of common gene variants have been associated with SSc-ILD, but most have not been replicated in separate populations. We genotyped 4 SNPs in *IRF5,* and one in each of *STAT4*, *CD226,* and *IRAK1,* in 633 Caucasian patients with SSc, of whom 379 had ILD. The control population (n=503) comprised individuals of European descent from the 1000 Genomes project. Statistical analysis was performed using Unphased v 3.1 and STATA12. Three of the *IRF5* SNPs and the *STAT4* rs7574865 were significantly associated with SSc compared to controls: rs2004640 (p=0.0013), rs4728142 (p=0.019), rs10488631 (p=0.0025) and *STAT4* rs7574865 (p=0.00013). Two SNPs in *IRF5* showed a significant difference between patients with SSc-ILD and controls; rs2004640 (p=0.01), and rs10488631 (p=0.028). Three SNPs in *IRF5* showed a significant difference between controls and patients without ILD, rs4728142 (p=0.036), rs10488631 (p=0.0023), and rs2004640 (p=0.0042), as did *STAT4* rs7574865 ($p=4.2\times10^{-7}$). A significant difference between SSc with and without ILD was only observed for *STAT4* rs7574865, which was less frequent in patients with ILD (MAF 0.27 compared to 0.36, p=0.00093). An association between time to decline in FVC by $\geq$10% was seen for *IRF5* rs10488631 (p=0.007), and for *CD226* rs763361 (p=0.029). In conclusion, of the seven tested SNPs, *STAT4* rs7574865 was protective against ILD. *IRF5* and *CD226* variants may be associated with progressive SSc-ILD and will need to be further tested.

Translational science in COPD

S70 INACCURATE NEUTROPHIL MIGRATION IN SYMPTOMATIC SMOKERS WITHOUT CHRONIC OBSTRUCTIVE PULMONARY DISEASE

KP Yip, M Hughes, R Stockley, E Sapey. *Institute of Inflammation and Ageing, Birmingham, UK*

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Introduction Chronic obstructive pulmonary disease (COPD) remains a major cause of morbidity and mortality worldwide. Not all smokers develop COPD and currently we cannot predict those most at risk although chronic bronchitis (CB) is associated with worse outcomes and may be an indicator of risk. Neutrophil dysfunction has been implicated in COPD pathogenesis, but it is unclear if this is causative or reflects a secondary response to COPD itself.

We hypothesised that CB would identify individuals most at risk of COPD and that these individuals would have impaired neutrophil functions, prior to the progression to COPD.

Methods As part of the BLF Early COPD Consortium, current smokers (CS) aged 30–45, with $\geq$10-pack year history but with normal spirometry, were matched by age to patients with COPD and healthy never smokers (NS). CS were divided into asymptomatic smokers (AS) and those with CB. Peripheral neutrophils were isolated from whole blood and migrated in gradients of interleukin-8(IL8) or vehicle control, in an Insall chemotaxis chamber. Migration was assessed for speed and accuracy in real-time using video capture microscopy.

Results Neutrophils from patients with COPD migrated with significantly increased speed compared with all other groups (mean ± SD). COPD 5.62μm/min ±0.25; NS 4.72μm/min ±0.19, p=0.02; AS 4.37μm/min ±0.30, p=0.0005; CB 4.24μm/min ±0.21, p=0.005).

COPD neutrophils migrated with reduced accuracy compared to NS and AS (COPD: 0.57μm/min ±0.13; NS 1.68μm/min ±0.14, p<0.0001; AS 1.74 μm/min ±0.23, p=0.0005) but was similar to CB patients (0.79 μm/min ±0.15, p=0.28). Neutrophils from AS also migrated with increased velocity compared to neutrophils from participants with CB. (p=0.01).

Conclusions Peripheral neutrophils from symptomatic smokers share some migratory phenotypic features of patients with COPD, being as inaccurate though slower in their migratory pathways. This suggests that aspects of neutrophil dysfunction are an early marker of COPD susceptibility although further longitudinal studies are required.

Abstract S70 Table 1 Participant demographics recruited into study. Age and pack year history is described in a median (range) format

	AS	CB	NS	COPD
Numbers, n	15	8	10	11
Age (years)	34 (30–44)	39.5 (32–45)	34 (30–44)	43 (31–45)
Pack year history	12.6 (10–28)	11.4 (10–26)	0	14.7 (12–19)

AS = asymptomatic smokers, CB = smokers with chronic bronchitis, NS = never-smoker

S71 SUSTAINED IMPAIRMENT OF NEUTROPHIL MIGRATION FOLLOWING ACUTE EXACERBATIONS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

[1]WJ McIver, [1]M Hughes, [1]GM Walton, [2]RA Stockley, [1]E Sapey. *[1]Institute of Inflammation and Ageing, University of Birmingham, Birmingham, UK; [2]Department of Respiratory Medicine, Queen Elizabeth Hospital, Birmingham, UK*

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Introduction/objectives In stable COPD (sCOPD), peripheral blood neutrophils migrate with greater speed but less accuracy, potentially reducing the efficiency of bacterial clearance and increasing the potential for tissue damage. These defects can be normalised *in-vitro* by Phosphoinositide 3-kinase (PI3K) inhibition.[1] Acute exacerbations of COPD (AECOPD) are often associated with bacterial infections. Neutrophil migration during AECOPD has not been characterised. Given the repetitive nature of and poor outcomes from AECOPD, we hypothesised that neutrophil functions would be similarly impaired.

Methods Peripheral neutrophils were isolated from 33 hospitalised patients on day 0 and day 56 (recovery) of an AECOPD, and 33 sCOPD patients, matched by age and FEV_1% predicted. An Insall chamber and time-lapse microscopy assessed neutrophil migration towards Interleukin-8 (IL8) and formyl-Methionyl-Leucyl-Phenylalanine (fMLP) following pre-incubating with PI3K inhibitors or vehicle controls. Expression of the key receptor for IL8, C-X-C motif chemokine receptor 2 (CXCR2), and 3 markers of activation (CD11b, CD66b, CD62L) were assessed by flow cytometry.

Results Neutrophils from patients on day 0 of AECOPD migrated towards IL8 and fMLP with lower speed and velocity compared with sCOPD (table 1). Day 0 velocity towards IL8 inversely related to Day 0 serum C-reactive protein concentration (r= -0.37, p=0.037). 56 days later (when clinically stable), migration had not improved and remained lower than sCOPD patients.

Unlike sCOPD, incubation with PI3Kδ or γ inhibitors did not improve migration compared to vehicle control.

CXCR2 was expressed at a lower level on AECOPD neutrophils compared to sCOPD [Median MFI (IQR): 2739 (2469–3496) vs 3891 (3216–4229), (p=0.006)]. Expression of CD11b was higher in AECOPD compared to sCOPD [Median MFI (IQR): 2559 (1315–2647) vs 1301 (1001–2061); p=0.015].

Conclusions AECOPD are associated with a sustained reduction in neutrophil migratory accuracy, with the degree of impairment related to the systemic inflammatory burden at onset and seeming to reflect a primed state. Unlike sCOPD, inhibition of PI3K δ or γ was unable to normalise migration during AECOPD. Moreover, expression of CXCR2 was reduced in AECOPD compared to sCOPD, offering a putative mechanism for the observed migratory defects.

Abstract S71 Table 2 neutrophil migration on day 0 of AECOPD compared to stable COPD

Parameter	sCOPD - IL8	AECOPD- IL8	P value	sCOPD- fMLP	AECOPD- fMLP	P value
Speed, μm/min	5.57 (6.68–8.9)	3.84 (2.51–5.17)	<0.001	5.74 (4.43–7.05)	3.78 (2.35–5.18)	<0.001
Velocity, μm/min	1.80 (0.71–2.98)	1.23 (0.25–2.21)	0.003	1.86 (0.63–2.49)	0.76 (-0.14–1.66)	<0.001

Data are median + IQR. Mann-Whitney U tests were performed to test for differences between groups, with statistical significance accepted when p<0.05. n=33 AECOPD and n=33 sCOPD controls, matched by age and FEV_1% predicted. sCOPD= stable Chronic Obstructive Pulmonary Disease. AECOPD= Acute Exacerbation of Chronic Obstructive Pulmonary Disease. IL8= Interleukin 8. fMLP= formyl-Methionyl-Leucyl-Phenylalanine

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S72 INVESTIGATING THE NEUTROPHIL PHENOTYPE IN COPD WITH COMMON CO-MORBIDITIES

[1]M Hughes, [1]W McIver, [2]H McGettrick, [1]E Sapey. *[1]Birmingham Acute Care Research Group, Institute of Inflammation and Ageing, University of Birmingham, Birmingham, UK; [2]Rheumatology Research Group, Institute of Inflammation and Ageing, University of Birmingham, Birmingham, UK*

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Introduction Neutrophils are implicated in the pathogenesis of Chronic Obstructive Pulmonary Disease (COPD). Multi-morbidity is increasingly common and COPD is often present with cardiovascular disease (CVD) and Type-2 Diabetes Mellitus (T2D). Studies have shown altered neutrophil function in chronic inflammatory conditions including COPD, CVD and T2D. We hypothesised that these conditions may cause a shift in neutrophil phenotype and we aimed to assess the surface expression of functional markers, in patients with COPD, stratified based on their co-morbidities of CVD and T2D, focusing on activated, immature, or senescent surface expression.

Methods All samples were obtained with informed consent. Neutrophils from 15 healthy young donors (median 27±8 years), 15 age-matched controls (median 72±3.5 years), 45 patients with stable COPD (15 with both a CVD and T2D, median 70±7.75 years; 15 with a CVD, median 72±1.75 years; 15 with T2D, median 73±4 years and 15 with neither a CVD or T2D, median 71±4 years) and 15 patients with exacerbations of COPD (AECOPD, median 73±7) were isolated from whole blood and incubated with primary antibodies prior to analysis by flow cytometry. Patients with stable COPD were then stratified based on previous clinical diagnoses of T2D or CVD.

Results There were no differences in activation markers (CD11b, CD66b and CD62L) on neutrophils between patients with COPD and healthy controls.

There was a trend towards a reduction in the surface expression of the chemokine receptor for CXCL8, CXCR2 (mean±sd 3989±615 healthy age-matched vs 3596±561, p=0.08). This reduction in CXCR2 expression was significant when assessing patients with COPD and CVD (median 3216 ±600, p=0.005 vs healthy age-matched control) or presenting with an acute exacerbation of COPD (2839±791, p=0.005 vs stable COPD).

Changes in CXCR2 expression were not mirrored by increases in CXCR4 expression, as previously reported in neutrophil senescence (Yildirim et al., 2005).

Conclusion Differences in neutrophil function in patients with COPD, CVD and T2D do not appear to be due to distinct

changes in cell phenotype. COPD with CVD and AECOPD are associated with a reduction in CXCR2 expression, but there is substantial heterogeneity within this patient population.

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S73 NEUTROPHIL SUB-TYPES ACROSS LUNG DISEASES

[1]SJ Thulborn, [1]J Cane, [1]M Downs, [1]C Connolly, [1]C Borg, [1]A Gittins, [1]G Hynes, [2]N Talbot, [1]M Bafadhel, [1]I Pavord. *[1]Respiratory Medicine Unit, Nuffield Department of Medicine, Oxford NIHR Biomedical Research Centre, University of Oxford, Oxford, UK; [2]Nuffield Department of Clinical Medicine, University of Oxford, Oxford, UK*

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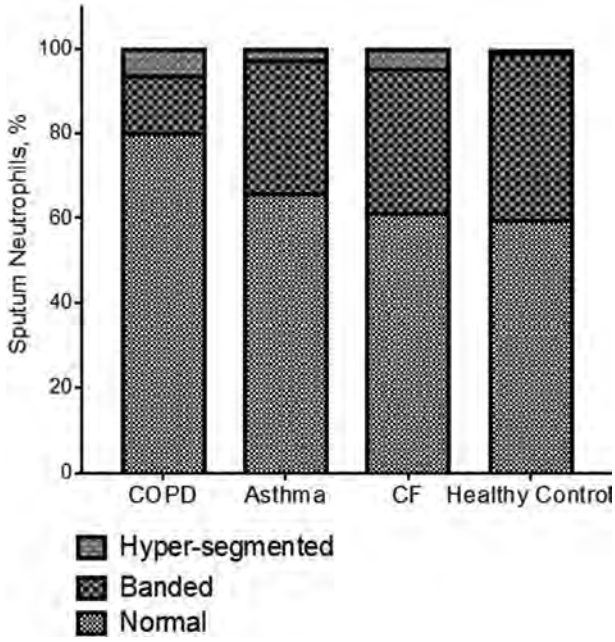
Introduction and objectives Neutrophilic inflammation is a key component of many chronic lung diseases including COPD, asthma and cystic fibrosis. Despite progress in the treatment of eosinophilic airways disease neutrophilic inflammation still requires a deeper understanding of underlying biology to aid treatment development. Recent studies have identified three types of neutrophils present in broncho-alveolar lavage; banded, segmented and hypersegmented. Hypersegmented neutrophils have been shown to be elevated in patients with airways disease and linked to a reduction in lung function.[1] We aimed to determine if these subtypes could be identified in the sputum of patients with three distinct lung diseases and how they differ between disease types and healthy controls.

Method Sputum samples from 24 patients with airways disease (10 asthmatics, 10 COPD and 4 CF) and 7 healthy controls was collected. Sputum was processed as per standard protocol. Neutrophils were classified based on morphology into segmented (2–4 clearly defined lobes), banded (1 lobe) and hyper-segmented (>4 lobes).

Results We were able to identify each sub-group of neutrophil in the sputum of the 4 different groups analysed. There are distinct differences in the distribution of these sub-types of neutrophils (Segmented p=0.016; Banded p=0.008; Hyper-segmented p=0.070), specifically between segmented and banded neutrophils across the 4 groups (figure 1). COPD had significantly less banded neutrophils (p=0.008) and more hypersegmented neutrophils (0.060) than healthy controls.



Abstract S73 Figure 1

Conclusion There is a variation in neutrophil sub-groups in sputum across lung diseases and healthy controls. COPD patients have significantly lower proportions of immature banded neutrophils perhaps suggesting a distinct activating environment.

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S74 REGULATION OF MITOCHONDRIAL TRANSFER BETWEEN AIRWAY SMOOTH MUSCLE CELLS (ASMCS): RELEVANCE TO COPD

[1]J Frankenberg Garcia, [2]B Xu, [2]C Hui, [1]KF Chung, [1]T Rodriguez, [1]C Michaeloudes, [1]PK Bhavsar. *[1]Imperial College London, London, UK; [2]Centre for Respiratory and Critical Care Medicine, Hong Kong – Shenzhen Hospital, Shenzhen, China*

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Background Mitochondria are vital organelles in mammalian cells. In addition to their canonical role in bioenergetics, mitochondria also participate in cellular communication and signalling. Recent evidence suggests that exchange of mitochondria between cells has an important role in cellular homeostasis and responses to stress. Mitochondrial transfer by stem cells has been shown to have rescue effects in models of acute lung injury, airway inflammation and stroke. Alternatively, transfer of defective mitochondria may have detrimental effects on cellular function under disease conditions. To investigate these possibilities, it is important to understand mitochondrial transfer in healthy cells and in diseases of mitochondrial dysfunction such as chronic obstructive pulmonary disease (COPD).

Methods Mitochondrial transfer was quantified between human primary airway smooth muscel cells (ASMCs) from healthy and COPD ex-smoker patients. Mitochondrial donor cells were stained with MitoTracker dyes and directly co-cultured with CellTrace-stained recipient cells. Co-cultures were exposed to transforming growth factor β (TGF-β; 1 or 10ng/ml) or cigarette smoke media (CSM; 10 or 25%), respectively. Mitochondrial transfer was quantified by flow cytometry and visualised using fluorescence microscopy. Cells that received mitochondria were separated from cells that did not by fluorescence activated cell sorting (FACS) and re-plated for assessment of: mitochondrial respiration using the Seahorse CellMitoStress Test, mitochondrial ROS (mtROS) and mitochondrial membrane potential (Δψm) using MitoSOX and TMRM dyes, respectively, and proliferation using the BrdU Assay Kit.

Results Mitochondrial transfer between ASMCs was inhibited by TGF-β (p<0.01) and stimulated by CSM (p<0.01). Transfer of mitochondria between ASMCs led to increased mitochondrial respiration, increased mtROS and Δψm and decreased cellular proliferation (p<0.01), and this effect was the same when mitochondria were donated from COPD and healthy ASMCs.

Conclusions Transfer of mitochondria occurs between ASMCs, a process regulated by inflammation and cellular stress. Mitochondrial transfer modulates mitochondrial and cellular function in ASMCs, suggesting it may be an important homeostatic mechanism. Modulating mitochondrial transfer could be an effective strategy for the treatment of conditions associated with mitochondrial dysfunction, such as COPD.

S75 PROTEINASE ACTIVATED RECEPTOR-2 INDUCED AUTOPHAGY DYSREGULATION

[1]K McCallum, [1]L Dunning, [2]L McGarvey, [3]M Hollywood, [3]J Brzeszczynska, [1]A Crilly, [1]JC Lockhart, [1]GJ Litherland. *[1]University of the West of Scotland, Paisley, UK; [2]Queens University Belfast, Belfast, UK; [3]Dundalk Institute of Technology, Dundalk, Republic of Ireland*

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Lungs from patients with chronic obstructive pulmonary disease (COPD) display hallmarks of premature ageing including reduced autophagy, contributing to cellular senescence. The mechanisms underlying dysregulated lung autophagy remain unclear and under researched. While proteinase activated receptor-2 (PAR2) is a potential therapeutic target for inflammatory conditions, with documented roles in lung pathology, a role for this receptor in lung ageing is yet unexplored.

To investigate this, primary human bronchial epithelial cells from healthy (HBEC) and COPD patient donors (DHBEC) were stimulated with PAR2 activators (SLIGKV, FLYGRL, trypsin) and inhibitors and autophagic flux quantified through fluorescent imaging and FACS analysis of an autophagosomal marker (CYTO-ID detection kit). Western blotting was used to analyse expression of autophagy-related genes to confirm findings. Parallel experimentation in human epithelial cell lines (A549 and BEAS-2B) provided supporting data, with immunohistochemistry (IHC) used to determine expression of autophagy markers, LC3 and ATG7, in PAR2 knock out murine tissue. PAR2 expression was assessed by immunofluorescence (IF).

PAR2 was present on primary human bronchial epithelial cells, in both healthy and COPD patient donors and epithelial cell lines. Autophagic vesicles were successfully detected and modulated by appropriate autophagy control stimuli. PAR2 expression, assessed alone or in combination with activating synthetic peptide, resulted in reduction in autophagic flux within airway epithelial cultures. Further, immunohistochemical analysis of ATG7 ($n=3$, $P=\leq 0.005$) and LC3 ($n=6$, $P=0.05$) in PAR2 knock out murine lung indicated an involvement of PAR2 in regulating autophagy, as both markers were significantly upregulated.

Our study provides the first data suggesting a role for PAR2 in the regulation of autophagy in lung airway epithelia, indicating a possible novel and targetable pathological mechanism underlying conditions such as COPD.

An update in lung physiology

S76 USE OF PARASTERNAL INTERCOSTAL ELECTROMYOGRAPHY TO INVESTIGATE THE IMPACT OF COMORBID HEART FAILURE ON NEURAL RESPIRATORY DRIVE IN COPD

[1]M Crossley, [2]L Estrada, [2]M Lozano-García, [1]A Moore, [1]S Maxwell, [1]PSP Cho, [3]HV Fletcher, [2]A Torres, [1]J Moxham, [1]GF Rafferty, [2]R Jané, [1]CJ Jolley. *[1]Centre for Human & Applied Physiological Sciences, King's College London, London, UK; [2]Institute for Bioengineering of Catalonia (IBEC), The Barcelona Institute of Science and Technology (BIST), Barcelona, Spain; [3]Department of Respiratory Medicine, King's College Hospital NHS Foundation Trust, London, UK*

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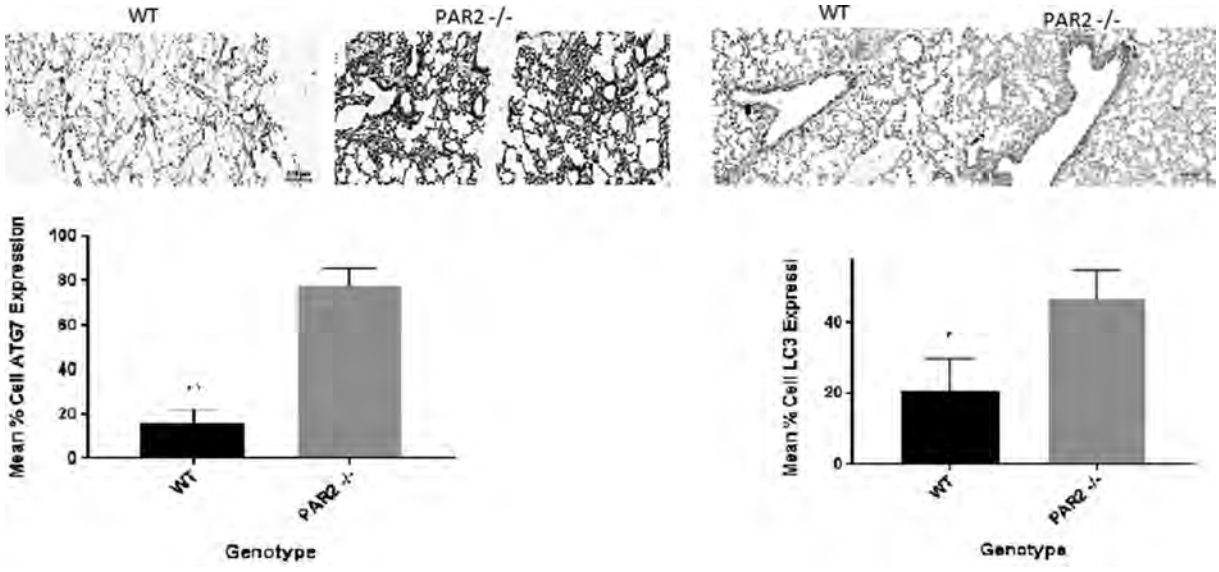
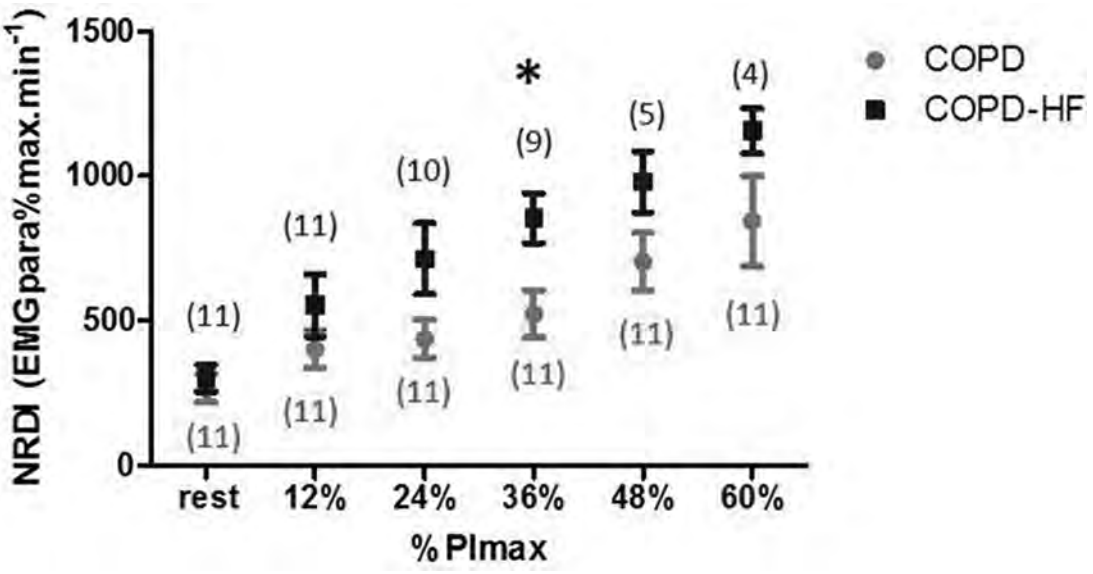
Introduction and objectives Heart failure is a common comorbidity of COPD and contributes to increased breathlessness and adverse clinical outcomes. Neural respiratory drive (NRD) is closely related to breathlessness intensity in COPD. This study aimed to investigate the impact of comorbid left heart failure (COPD-HF) on NRD in patients with COPD. We hypothesised that NRD would be higher during an inspiratory



Abstract S75 Figure 1 upregulation of autophagy markers ATG7 and LC3 in PAR2-/- murine lung tissue.Autophagic marker expression was significantly increased in PAR-/- murine lung tissue.LC3 was significantly upregulated specifically in the airways, with ATG7 upregulated in the lung parenchyma.



Abstract S76 Figure 1 Neural respiratory drive index at rest and during inspiratory threshold loading at 12%,24%,36%48% and 60% of PImax in COPD and COPD-HF patients. Data are presented as means ±SEM.*indicates p<0.05.
NRDI = neural respiratory drive index; EMGpara = parasternal intercostal muscle electromyogram; PImax = maximal inspiratory mouth pressure; COPD = chronic obstructive pulmonary disease patients; COPD-HF = COPD patients with comorbid left heart failure. Numbers in brackets indicate the number of patients completing each inspiratory load in each patient group.

threshold loading protocol (ITL) in COPD-HF than in COPD patients without left heart failure.

Methods COPD and COPD-HF patients underwent incremental ITL at 12%, 24%, 36%, 48% and 60% of maximal inspiratory mouth pressure (PImax). NRD was recorded continuously using 2nd intercostal space transcutaneous electromyography (EMGpara). EMGpara signals were converted to root mean square (RMS), normalised to peak RMS EMGpara during maximal inspiratory manoeuvres (EMGpara%max) and multiplied by respiratory rate to calculate NRD index (NRDI). NRDI in COPD and COPD-HF were compared at each load using mixed effect model repeated measurement analysis.

Results 11 COPD patients without left heart failure (mean (SD) age 69(7) years, FEV_1%predicted 49.3 (16.4)%, VC%predicted 99.8 (22.0)%, PIMax 55.7 (15.8)cmH_2O) and 11 COPD-HF patients (mean (SD) age 72(6) years, FEV_1%predicted 54.8 (13.6)%, VC%predicted 86.8 (17.4)%), PIMax 53.1 (30.9)cmH_2O) were studied. mMRC dyspnoea scores were higher in COPD-HF (median (IQR) 3 (2 – 4) than in COPD (median (IQR) 2 (1 to 3), p=0.0406).

11/11 COPD patients completed all loads of the ITL protocol to 60% PImax, compared to 4/11 patients in the COPD-HF group (p=0.0039). There were significant fixed effects of diagnosis (p=0.0136), load (p<0.0001) and diagnosis x load (p=0.048) on NRDI during ITL. Increased NRDI in COPD-HF reached statistical significance at 36% of PImax (p=0.0465) only. Although raised, NRDI levels in COPD-HF at loads above 36%PImax were not significantly different to NRDI in COPD, likely due to smaller sample size at the highest loads (Figure 1).

Conclusions Observations of higher levels of NRDI at equivalent inspiratory threshold loads in COPD-HF suggests that heart failure further increases the mechanical load on the respiratory muscles in COPD. Contributions of potential aetiological factors, such as reduced lung and chest wall compliance, require further study.

S77 EFFECTS OF BISOPROLOL AND CELIPROLOL ON CARDIOPULMONARY PERFORMANCE IN COPD

[1]WJ Anderson, [1]PM Short, [1]S Jabbal, [1]RW Kuo, [2]RA Ross, [1]AE Morrison, [1]BJ Lipworth. *[1]University of Dundee, Dundee, UK; [2]NHS Tayside, Dundee, UK*

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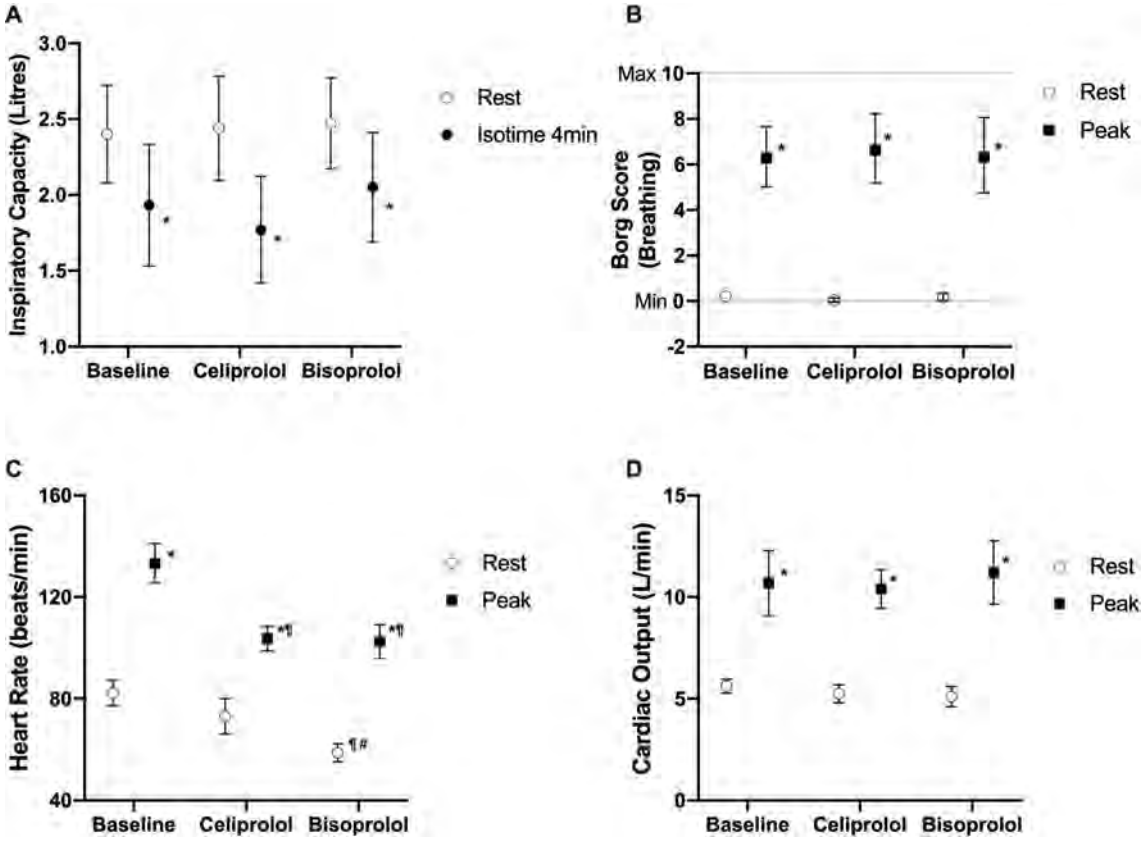
Background Beta-blockers (BB) are underused in COPD despite evidence for reducing mortality from cardiovascular comorbidities. Beta-1 selective antagonists such as bisoprolol (BIS) may cause bronchoconstriction due to dose related beta-2 blockade. Celiprolol (CEL) is a beta-1 selective antagonist which also exhibits partial beta-2 agonist activity. Patients with COPD can get dynamic hyperinflation (DH) upon exercise which in turn can impair cardiopulmonary performance. We have therefore compared for the first time the chronic dosing effects of BIS and CEL on cardiopulmonary exercise testing (CPET) in patients with COPD.

Patients and methods Patients with moderate to severe (GOLD 2/3) COPD were enrolled to receive in randomised crossover fashion either BIS 2.5 mg od (2 weeks) followed by 5 mg od (2 weeks) or CEL 200 mg od (2 weeks) then 400 mg od (2 weeks). CPET to symptom limit using cycle ergometer at constant work rate was performed at baseline pre-BB and post-BB at 4 weeks.

Results 11 patients with COPD were enrolled: 7M4F; Age 69yr (95%CI:65–73yr); Post-salbutamol $FEV_1$56% (95%CI:49–63%); FVC 100% (95%CI:86–114%); FEV_1/FVC 46% (95% CI:36–53%); RV/TLC 50% (95%CI:44–56%). 10 patients were taking long-acting beta-agonists, 10 patients long-acting muscarinic antagonists and 6 patients inhaled corticosteroids. Inspiratory capacity (IC) showed a significant fall when comparing rest vs isotime peak exercise (4 min) in keeping with DH, with no differences post exercise for baseline vs either BB (figure 1A). Borg scales for dyspnoea (figure 1B) and perceived exertion on exercise were no different from baseline vs BB. Peak exercise heart rate was significantly lower comparing



Abstract S77 Figure 1 Cardiopulmonary exercise test outcomes: A, Inspiratory capacity at rest and 4 minute isotime exercise; B, Borg score of perception of breathing at rest and peak exercise (higher score indicates greater breathlessness); C, Heart rate at rest and peak exercise; D, Cardiac output (non-invasive) at rest and peak exercise. Data presented as mean values with 95% confidence interval bars (Geometric mean for Borg Score). All baselines are pooled between treatments. Repeated measures analysis of variance with Bonferroni correction for normally distributed data or equivalent non-parametric analysis (Borg score). Statistical significance set at $p<0.05$. *Significant difference to resting value, ¶Significant difference to baseline value, #Significant difference to celiprolol.

baseline vs BB, with resting heart rate only significantly lower with BIS and not CEL (figure 1C). Resting and peak exercise cardiac output were not significantly different comparing baseline vs BB (figure 1D). A significant difference was seen for mean arterial blood pressure between rest and peak exercise at baseline but not after BB. Lung function as FEV_1, FVC, Relaxed VC and RV/TLC ratio were not significantly altered by either BB vs baseline.

Conclusions Overall cardiopulmonary performance was relatively well preserved while taking BB. Our results support the more widespread use of cardio-selective BB in patients with COPD who have cardiovascular comorbidity.

S78 ESTIMATING RESIDUAL VOLUME AND PREDICTING PRESENCE OR ABSENCE OF SIGNIFICANT HYPERINFLATION FROM SPIROMETRY DATA: VALIDATING TWO DESCRIBED EQUATIONS

S Dawson, D MacFarlane, C Carlin. *University of Glasgow, Glasgow, UK*

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Background Lung hyperinflation associates with adverse outcomes in smokers without airflow obstruction (AFO), and identifies subgroup of COPD patients who may benefit from lung volume reduction procedures. Undertaking lung volume measurements routinely in all such patients is unrealistic. Two equations to calculate%predicted residual volume (RV%calc) have recently been described. We retrospectively reviewed a lung function dataset to validate and compare these, and to determine potential of RV%calc to stratify patients who do not require plethysmography.

Methods Retrospective analysis of spirometry and plethysmography data from 716 consecutive patients who attended for lung function testing at one of our hospital sites in 2017. RV %calc was derived from the Elbehairy equation[1]: [RV% predicted=3.58(FVC%) −164(FEV1/FVC) −81(SQRT-FVC%) −0.83(age) −10.7(gender) +732 (male=1, female=0)]and Evankovich equation[2]: [RV% predicted = FVC(%pred)*2.96 – (FEV1/FVC)*177 –FVC(sqrt)*71 –0.83*age –10.2*gender +704 (male=1, female=0)].

Results AFO (FEV1/FVC <0.7) was present in 271 (of 716). RV%measured was >150% in 76 patients, and >175% in 47 patients.

Bland-Altman plots indicated good agreement between RV %measured and RV%calc from both equations (median difference -10%, 95% agreement -77% to 58%). Agreement was better at lower values of RV%.

Both equations showed good performance predicting plethysmography confirmed hyperinflation at RVmeasured >150% and >175% thresholds in the overall cohort (AUROCs 0.91 for Elbehairy equation and 0.94 for Evankovich equation) and in the sub-cohort of patients with AFO (AUROCs 0.89 and 0.93). Table 1 shows sensitivity/specificity

Abstract S78 Table 1 ROC curve derived sensitivity and specificity for RV%calc cutoff values predicting presence or absence of hyperinflation, at RV%measured >150% and >175% thresholds

	RVmeasured >150%		RVmeasured >175%	
RV% calc cutoff	*Sensitivity*	*Specificity*	*Sensitivity*	*Specificity*
95%	100%	24%	100%	23%
115%	92%	65%	96%	63%
195%	17%	100%	23%	100%

for prediction of measured hyperinflation for selected RV% calc cutoff values, derived from the ROC curves.

Conclusions Both equations for estimating residual volume% predicted from spirometry data showed good performance vs RV%measured. Including RV%calc in spirometry reports seems appropriate. Prospective validation of an approach stratifying patients who do not require plethysmography - based on RV %calculated <95% (hyperinflation excluded) or >195% (definite hyperinflation) – is merited. These cutoffs would have potentially allowed plethysmography to be omitted in 22% (154/716) of patients in this cohort.

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S79 QUALITY OF SPIROMETRY IN COMMUNITY LED PHYSIOLOGIST SERVICES

S Hawkes, R Peat, M Hopkinson, S Town, L Lukehirst. *Liverpool Heart and Chest Hospital, Liverpool, UK*

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Introduction Delivery of high quality diagnostic spirometry allows for an accurate and prompt diagnosis of conditions that limit flow and/or volume. Quality assured spirometry should be performed by those competent in performance and interpretation, consistent with ARTP standards. This is of particular importance within primary care services where the majority of chronic respiratory conditions are managed. Quality assured spirometry helps clinicians plan treatment pathways; conversely poorly performed spirometry can lead to inappropriate diagnosis and patients can therefore receive unnecessary treatment or be denied treatment. Spirometry performed in primary care can be of variable quality, regularly performed by those who lack relevant competencies or training. In the Merseyside region diagnostic spirometry services are commissioned by the CCG and delivered by a specialist respiratory physiology unit based within a heart and chest hospital, performing diagnostic testing across 17 community healthcare sites.

Methods Quality of spirometry was studied in 593 patients (mean age [SD] 63 [13], 303 female), 293 of these were performed in by qualified respiratory physiologists; a further 300 were performed by associate physiologists (ARTP accredited). Spirometry was assessed against ATS/ERS guidelines.

Results Within-manoeuvre criteria for spirometry was achieved on 84.6% vs. 77% of patients for qualified vs. associate physiologists p=0.018. Between-manoeuvre 86.3% vs. 85.3%, p=0.723.

Abstract S79 Table 1

Spirometry	*Qualified Physiologist*		*Associate Physiologist*		
Within-manoeuvre criteria met?	***n***	***%***	***n***	***%***	***p***
Yes	*248*	*84.6*	*231*	*77.0*	0.018
No, < 3 acceptable spirometry	*36*	*12.3*	*41*	*13.7*	0.613
No, significant artefact	*9*	*3.1*	*28*	*9.3*	0.001
Total	*293*	*100.0*	*300*	*100.0*	
Between-manoeuvre criteria met?	***n***	***%***	***n***	***%***	
Yes	*253*	*86.3*	*256*	*85.3*	0.723
No, two largest FEV1 not within 150 mls	*8*	*2.7*	*2*	*0.7*	0.051
No, two largest FVC not within 150 mls	*25*	*8.5*	*23*	*7.7*	0.696
No, neither two largest FEV1 and FVC within 150 mls	*7*	*2.4*	*19*	*6.3*	0.018
Total	*293*	*100.0*	*300*	*100.0*	

Conclusions Within-manoeuvre criteria for spirometry was achieved more consistently by qualified staff, due to reduced rates of significant artefact (p=0.001). This suggests that qualified staff were better at identifying and/or correcting technique in patients who struggle to perform spirometry. Between-manoeuvre was achieved at similar rates. Spirometry performed by associate physiologists was of a high standard out-performing similar studies undertaken in community settings. We suggest that physiologist led community spirometry services deliver high quality diagnostic spirometry and that input from qualified staff helps maintain standards with continuity of training, supervision and QA processes. This model may help drive forward the quality of community diagnostic testing. The drive to deliver quality assured spirometry and the addition of a national register by 2021 further encourages the modernisation of healthcare science professionals and their involvement in primary care.

S80 CAN 'COMPUTER VISION' USING A CONVOLUTIONAL NEURAL NETWORK BE USED TO IDENTIFY OBSTRUCTIVE SLEEP APNOEA FROM OVERNIGHT OXIMETRY TRACINGS?

JWS Davidson, F Easton, JCT Pepperell. *Taunton and Somerset NHS Foundation Trust, Taunton, UK*

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Introduction Overnight pulse oximetry is routinely used to screen patients for obstructive sleep apnoea (OSA) and triage patients for CPAP therapy trials or additional sleep studies. Visual analysis of oximetry summary plots showing a typical 'saw-tooth' pattern characteristic of obstructive apneas can be useful diagnostically. We investigated the technique of training a convolutional neural network (CNN), a type of machine learning used for image classification, to identify oximetry tracings showing this pattern.

Methods A sample of 900 oximetry tracings from 2010 to 2018 were classified into two groups; OSA (n=520) or no features of OSA (380). Borderline cases were classified as

OSA if the oximetry outcome was for a trial of continuous positive pressure (CPAP) therapy without additional investigation. The oximetry summary plot was converted to an image file (portable network graphics). A convolutional neural network was created using Spyder (Scientific Python Development Environment version 3.3). Images were split on an 80:20 ratio into the training and test sets. A convolutional neural network was designed using 2 deeply connected layers of 128 'neurons'. The neural network was optimized over 75 epochs. A further validation set of 110 images was scored by two observers and inter-rater reliability tested including the optimized CNN.

Results The optimized CNN achieved an accuracy of 99.3% on the training image set, and 82.4% on the test set. The validation set of images scored by two human scorers achieved an agreement of 86.4%, κ=0.73 (95% CI 0.60, 0.86). Including the CNN classifications an agreement of 77.6%, κ=0.55 (0.43, 0.67) was achieved.

Conclusion A CNN can be trained to identify oximetry traces showing features of OSA, achieving only slightly inferior performance to human interpretation. This technique would allow more efficient triaging of results and could hopefully be developed to allow more detailed interpretation, e.g. significant sleep fragmentation or hypoventilation, mimicking the pattern recognition of a human expert. However there are significant limitations, a large number of images are required to train a model accurately and its advantages over interpretation using the oxygen desaturation index or other algorithm generated data remain to be demonstrated.

S81 USE OF THE DIAPHRAGM ELECTROMYOGRAM TO INVESTIGATE THE EFFECT OF HEALTHY AGEING ON NEURAL RESPIRATORY DRIVE

[1]V Wong, [1]R Shah, [1]W Zhang, [1]A Mohindra, [2]HV Fletcher, [1]GF Rafferty, [1]J Moxham, [1]SDR Harridge, [1]NR Lazarus, [1]CJ Jolley. *[1]Centre for Human and Applied Physiological Sciences, King's College London, London, UK; [2]Department of Respiratory Medicine, King's College Hospital NHS Foundation Trust, London, UK*

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Introduction and objectives Ageing is typically associated with progressive deleterious changes in respiratory mechanics which increase the work of breathing and neural respiratory drive (NRD). The relationship between age-related changes in lung function and NRD in healthy ageing remains incompletely understood, in part due to a failure of previous research to control for negative effects of physical inactivity.

This study aimed to compare neural respiratory drive (NRD) between highly active older adults (HAOA) and recreationally active younger adults (YA). We hypothesized that NRD, quantified as diaphragm electromyogram activity (EMGdi) as a percentage of volitional maximum (EMGdi%max), would be higher in HAOA than in YA and that EMGdi %max would be associated with a decline in lung function and respiratory muscle strength.

Methods 23 YA (median (IQR) age 24 (22 to 29) years) and 20 HAOA (median (IQR) age 60 (52 to 66.50), all male were studied. Participants were instrumented with a multipair oesophageal recording electrode for the measurement of EMGdi, and a dual oesophageal/gastric pressure transducer for the measurement of transdiaphragmatic pressure (Pdi = Poes – Pgas). Mean root mean square (RMS) EMGdi per breath was calculated over a 3-minute period of resting breathing, and normalised to peak RMS EMGdi recorded during maximal inspiratory manoeuvres (EMGdi%max). Sniff nasal inspiratory pressure (Sniff Pnasal), sniff oesophageal pressure, sniff transdiaphragmatic pressure and twitch transdiaphragmatic pressure following bilateral anterolateral magnetic phrenic nerve stimulation (TwPdi) were also recorded and compared between YA and HAOA groups. Relationships between recorded variables were assessed by correlation analysis.

Results Resting EMGdi%max was significantly higher in HAOA compared to YA (median (IQR) EMGdi%max HAOA 12.5 (6.0 to 15.8)%max vs YA 5.9 (5.1 to 8.7)%max, p=0.0073 (table 1). EMGdi%max correlated significantly with age (r=0.4309, p=0.0039), residual volume (r=0.4677, p=0.0035), RV%TLC (r=0.4518, p=0.0050), and bilateral TwPdi (r=-0.4905, p=0.0028).

Abstract S81 Table 1 Demographic, anthropometric, lung function and respiratory muscle function data recorded in the YA and HAOA groups. Data are presented as median (interquartile range)

	YA	HAOA	p-value
n	23	20	
% Male (%)	100%	100%	
Age (years)	24 (22 to 29)	60 (52 to 66.5)	<0.0001*
BMI (kg/m^2)	23.3 (22.7 to 25.9)	25.0 (23.7 to 26.3)	0.1923
Resting EMGdi%max (%)	5.9 (5.1 to 8.7)	12.5 (6.0 to 15.8)	0.0073*
FEV_1 (L)	4.60 (4.07 to 5.14)	3.58 (2.97 to 4.45)	0.0021*
%predicted FEV_1 (%)	101.4 (91.8 to 112.1)	103.5 (94.6 to 117.2)	0.1649
VC (L)	5.78 (4.90 to 6.39)	4.96 (4.06 to 5.67)	0.0154*
%predicted VC (%)	104.0 (95.2 to 109.1)	110.6 (96.7 to 117.1)	0.1045
FEV_1%VC (%)	81.5 (75.9 to 84.3)	72.6 (68.3 to 78.9)	0.4802
TLC (L)	7.40 (6.54 to 7.88)	7.04 (6.61 to 8.22)	0.8340
%predicted TLC (%)	98.5 (92.6 to 106.2)	105.7 (93.2 to 113.9)	0.1984
RV (L)	1.53 (1.38 to 2.11)	2.35 (2.01 to 2.64)	0.0001*
%predicted RV (%)	91.8 (73.5 to 118.0)	94.6 (88.2 to 107.8)	0.9877
RV%TLC (%)	23.0 (19.3 to 25.5)	33.8 (26.3 to 38.4)	<0.0001*
Sniff Pnasal (cmH_2O)	85.0 (75.1 to 105.4)	81.6 (65.9 to 95.4)	0.3157
Sniff Poes (cmH_2O)	111.8 (88.7 to 126.6)	93.8 (82.6 to 103.1)	0.0329*
Sniff Pdi (cmH_2O)	139.4 (118.4 to 156.4)	139.7 (109.7 to 151.8)	0.7291
PImax (cmH_2O)	95.5 (77.6 to 112.8)	89.9 (70.1 to 107.3)	0.2928
Bilateral TwPdi (cmH_2O)	33.6 (29.5 to 39.2)	24.9 (22.3 to 35.1)	0.0053*

* indicates p<0.05.
YA = younger adults; HAOA = highly active older adults; EMGdi%max = root mean square oesophageal diaphragm electromyogram expressed as a percentage of volitional maximum; FEV_1 = forced expiratory volume in 1s; VC = vital capacity; RV = residual volume; TLC = total lung capacity; Sniff Pnasal = sniff nasal inspiratory pressure; Sniff Poes = sniff nasal oesophageal pressure; Sniff Pdi = sniff transdiaphragmatic pressure; TwPdi = twitch transdiaphragmatic pressure following anterolateral phrenic nerve stimulation at 100% of maximum stimulator output.

Conclusions These data collected in a highly-active group of older individuals confirm that healthy ageing is associated with increased NRD. Increases in NRD were associated with age-related increases in gas trapping and reduced diaphragm contractility.

There is more to ILD than IPF

S82 HOW DO SPECIALISTS TREAT HYPERSENSITIVITY PNEUMONITIS IN BRITAIN?

[1]CM Barber, [2]PS Burge, [3]JR Feary, [4]EA Renzoni, [5]LG Spencer, [2]GI Walters, [6]RE Wiggans. *[1]Centre for Workplace Health, Sheffield Teaching Hospital NHS Trust, Northern General Hospital, Sheffield, UK; [2]Birmingham Regional NHS Occupational Lung Disease Service, Birmingham Chest Clinic, Birmingham, UK; [3]Department of Occupational Lung Disease, Royal Brompton and Harefield NHS Foundation Trust, London, UK; [4]Interstitial Lung Disease Unit, Royal Brompton and Harefield NHS Foundation Trust, London, UK; [5]Liverpool Interstitial Lung Disease Service, University Hospital Aintree, Liverpool, UK; [6]Wythenshawe Hospital, Manchester Foundation Trust, Manchester, UK*

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Background Although immunosuppression is commonly used in HP, there are no studies that compare treatment regimes.
Aims and objectives The aim of this study was to survey specialist ILD consultants to determine how HP is treated in Britain.
Methods British ILD consultants were provided with clinical scenarios, and asked how they would treat patients with HP. They were also asked to rate their level of agreement with a series of statements. A priori 'consensus agreement' and 'majority agreement' were defined as at least 70% and 50% respectively of participants replying that they 'Strongly agree' or 'Tend to agree'.
Results 54 consultants took part in the survey from 27 centres. The choice of first line immunosuppression in progressive HP was relatively evenly split between dual therapy with corticosteroids plus a 'steroid-sparing' immunosuppressant (46%) and monotherapy with oral corticosteroids (39%). On average, the initial starting dose of oral prednisolone (for an 80 kg patient) was 40 mg continued for 6 weeks prior to weaning, aiming for a maintenance of 10 mg. 75% of participants reported that mycophenolate mofetil was their first choice 'non-corticosteroid immunosuppressant' for the long-term management of HP. A number of statements relating to the treatment of HP reached consensus or majority agreement (table 1).
Conclusions This survey has demonstrated a degree of variation in the treatment of patients with suspected HP in Britain, but has found consensus and majority agreement for some key areas.

S83 PIGEON FANCIERS WITH NORMAL SPIROMETRY AND NO KNOWN ILD, DISPLAY FORCED OSCILLOMETRY FINDINGS SUGGESTIVE OF SUB-CLINICAL INTERSTITIAL LUNG DISEASE

[1]M Spears, [1]W Henderson, [1]S Dickson, [1]E Johnson, [2]SJ Bourke, [3]B Gooptu, [4]R Allen, [4]LV Wain, [5]C McSharry. *[1]Department of Respiratory Medicine, Forth Valley Royal Hospital, Larbert, UK; [2]Respiratory Medicine, Royal Victoria Infirmary, Newcastle upon Tyne, UK; [3]NIHR Leicester Biomedical Research Centre, Glenfield Hospital, Leicester, UK; [4]Department of Health Sciences, University of Leicester and National Institute for Health Research, Leicester Respiratory Biomedical Research Centre, Glenfield Hospital, Leicester, UK; [5]Department of Immunology, Institute of Infection, Immunity and Inflammation, University of Glasgow, Glasgow, UK*

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Introduction Pigeon fanciers are recognised to suffer from acute through to chronic hypersensitivity pneumonitis (HP), and given their HP is driven by a known antigen, provide a potentially useful group to identify novel causative mechanisms for HP.

The forced oscillation technique (FOT) employs sound waves to examine the relationships between pressure and flow during tidal respiration, and has been advocated as an approach to assess the small airways and lung parenchyma. It is also simple to perform, as it requires tidal breathing only. Given this we examined FOT in a group of pigeon fanciers at a recent national meeting.
Methods Volunteers were recruited from among the attendees at the National Royal Pigeon Fancier's Meeting Blackpool, 2019. Participants completed a questionnaire with experienced clinicians, which focused on; presence of a diagnosis of interstitial lung or connective tissue disease, current medication, symptoms post pigeon exposure, number of pigeons kept and occupational dust exposure. All subjects provided blood for genetic and immunological assessment, and performed spirometry. An unselected subgroup performed FOT using the Resmon Pro (Intermedical UK Ltd).
Results 178 subjects participated over two days. Of these 94 performed FOT.

51 participant's FOT results were analyzed, after exclusion of those with known interstitial lung disease, abnormal spirometry or no result due to inadequate spirometry technique.

23 subjects (45%) demonstrated abnormal FOT results, with the consistent finding being high expiratory reactance at 5Hz (exp Xrs5). Median exp Xrs5 was -3.5 cmH_2O (-6.3 to

Abstract S82 Table 1 Consensus (**C**) and majority (M) statements with level of agreement

Statement	% agree
HP patients with an acute onset of severe symptoms (often with hypoxia) should be treated with short courses of oral corticosteroids, to speed up the rate of clinical improvement (**C**).	91%
In some cases of biopsy confirmed HP, fibrosis progresses despite cessation of exposure and treatment with immunosuppression (**C**).	96%
I have had patients with progressive fibrotic HP unresponsive to immunosuppression, whom I would have treated with antifibrotic agents, had they been routinely available as standard NHS care (**C**).	81%
In HP that progresses (despite cessation of exposure) immunosuppression should be considered (where not contraindicated):	19%
- only if there is evidence of active inflammation	50%
- in all cases irrespective of the radiological diagnosis or histological pattern (M)	13%
- in all cases unless there is a definite UIP pattern of fibrosis	4%
- other (please specify)	
In HP with a predominantly fibrotic picture, immunosuppression should be stopped after a three-month trial unless there is a clear improvement or stabilisation of lung function (M).	67%
In HP with a predominantly fibrotic picture, I have concerns that treating patients long-term with immunosuppression may increase mortality as in IPF (M).	61%

-2.5), equating to 244% predicted (204 to 446) (both median (IQR)).

Discussion FOT, specifically elevated expiratory Xrs at 5Hz, is abnormal in a large proportion of pigeon fanciers who have no known ILD and normal spirometry. Given this we suggest that exp Xrs5 may be able to detect sub-clinical lung inflammation in otherwise healthy subjects with known exposure to a risk factor for development of HP.

Further research is required to determine how exp Xrs5 relates to interstitial changes on CT, and whether changes in FOT can predict subsequent progression to chronic fibrosis in subjects with ongoing antigen exposure.

S84 IDIOPATHIC PULMONARY FIBROSIS, ASBESTOSIS, OR ASBESTOS-RELATED UIP? FINDINGS FROM THE IDIOPATHIC PULMONARY FIBROSIS JOB EXPOSURES STUDY (IPFJES)

[1]C Reynolds, [1]R Sisodia, [2]C Barber, [1]P Cullinan. *[1]National Heart and Lung Institute, Imperial College London, London, UK; [2]Centre for Workplace Health, University of Sheffield, Sheffield, UK*

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Introduction and objectives Idiopathic pulmonary fibrosis (IPF) should not be diagnosed in the presence of an identifiable cause. Asbestos is fibrogenic and can cause usual interstitial pneumonia. Occupational asbestos exposure is common in the UK in the population at risk of developing IPF (mostly men in their 70s who have worked in manual occupations). Establishing occupational asbestos exposure in a particular individual, and determining whether or not to attribute causation, is difficult. Our aim was to characterize asbestos exposure in IPF with a view to informing diagnosis.

Methods Asbestos exposure was assessed using a job exposure matrix (JEM) based on occupational proportional mortality data for pleural mesothelioma and by means of a validated asbestos exposure reconstruction method for 856 participants (488 cases, 368 controls) from a UK based multicentre hospital-based case-control study, the idiopathic pulmonary fibrosis job exposures study (IPFJES).

Results 65% of cases and 63% of controls ever had a high or medium risk (for asbestos exposure) job. Cases spent an average of 24 years (std 17.6, median 21 years) in a high or medium risk job (std 17.1, median 27 years) and controls spent an average of 26 years (std 17.1, median 27 years). 25% of cases and 26% of controls recalled occupational asbestos exposure in sufficient detail to allow exposure reconstruction; mean estimated asbestos exposure was 1129 fibre ml years for cases (std 5663, median 7 fibre ml years) and 586 fibre ml years (std 3194, median 4 fibre ml years) for controls.

Conclusions Occupational asbestos exposure is common in patients with IPF and asbestosis is under-diagnosed. Overall, occupational asbestos exposure is not markedly different between patients with IPF and hospital controls; there does not appear to be a clear dose-response relationship or threshold effect.

S85 ANALYSIS OF BLOOD CELL COUNTS AS PREDICTORS OF SURVIVAL IN PATIENTS WITH HYPERSENSITIVITY PNEUMONITIS VERSUS IDIOPATHIC PULMONARY FIBROSIS IN A MULTICENTRE RETROSPECTIVE COHORT

[1]SL Barratt, [1]H Adamali, [1]A Creamer, [2]A Duckworth, [2]R Wollerton, [3]J Fallon, [4]MA Gibbons, [5]B Gooptu, [6]S Fidan, [2]T Nancarrow, [3]J Pepperell, [3]RA Stone, [7]FA Woodhead, [2]CJ Scotton. *[1]Bristol Interstitial Lung Disease Service, North Bristol NHS Trust, Bristol, UK; [2]University of Exeter Medical School, Exeter, UK; [3]Somerset Lung Centre, Musgrove Park Hospital, Taunton, UK; [4]Respiratory Department Royal Devon and Exeter NHS Foundation Trust, Exeter, UK; [5]Leicester Institute of Structural and Chemical Biology/NIHR Leicester BRC – Respiratory, University of Leicester, Leicester, UK; [6]University of Leicester, Leicester, UK; [7]Institute for Lung Health, Glenfield Hospital, University Hospitals of Leicester NHS Trust, Leicester, UK*

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Introduction Hypersensitivity pneumonitis is a disease triggered by repeated inhalation and sensitisation to a variety of antigenic stimuli in susceptible individuals. It can be challenging to distinguish idiopathic pulmonary fibrosis (IPF) from fibrotic hypersensitivity pneumonitis (fHP). Predictors of disease progression are not well defined. Neutrophil: Lymphocyte ratio (NLR) and monocyte count have shown promise in providing prognostic value in IPF, but have not been examined in HP.

Objectives To further characterise a large, UK-based, multicentre, retrospective cohort of patients with HP to enable clinical phenotyping and investigation of factors that might predict survival.

Methods A multicentre evaluation of clinical data of IPF and HP patients presenting to the interstitial lung disease clinics at the North Bristol NHS Trust, University Hospitals of Leicester NHS Trust, Taunton and Somerset NHS Foundation Trust and the Royal Devon & Exeter NHS Foundation Trust was undertaken. All patients had received multidisciplinary team evaluation between 2005 and 2018. Mann-Whitney U tests and Kaplan Meier survival curve analysis were used as appropriate.

Results In a cohort of 493 IPF patients, the survival of patients with a high NLR was significantly lower than in those with a low NLR (median survival 36 months vs 62 months; Hazard Ratio (HR) 1.7, 95% C.I. 1.3–2.4, p=0.0002). NLR did not predict survival in a cohort of 182 HP patients. Monocyte count was statistically higher in IPF vs HP patients (median monocyte count 0.7 K/ul IPF n=408 vs 0.6 HP n=76 p=0.0051). For IPF only, monocyte count >0.95 K/ul predicted significantly poorer outcome (median survival 37 months vs 74 months; HR 2.0, 95% C.I. 1.3 – 3.2, p=0.0119); monocyte count was within normal range for the majority of HP patients. IPF patients also had significantly faster decline in both FVC and DL_{CO}than HP patients (p=0.007 and 0.018, respectively).

Conclusion Further analysis of our fHP cohort has revealed that cellular biomarkers which may predict survival in IPF, namely Neutrophil:Lymphocyte ratio and monocyte count, do not significantly predict a poorer outcome in HP. More detailed interrogation of patient data may reveal other key baseline measures which will support clinical management.

S86 SERUM BIOMARKERS IN SSC-ILD: ASSOCIATION WITH PRESENCE, SEVERITY AND PROGNOSIS

[1]CJW Stock, [1]D Visca, [1]A DeLauretis, [1]C Daccord, [1]M Kokosi, [1]V Alfieri, [1]V Kouranos, [1]G Margaritopoulos, [1]PM George, [1]PL Molyneaux, [1]F Chua, [1]TM Maher, [2]V Ong, [2]DJ Abraham, [2]CP Denton, [1]AU Wells, [1]EA Renzoni. *[1]Royal Brompton Hospital, London, UK; [2]Royal Free Hospital, London, UK*

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Interstitial lung disease (ILD) is the main cause of death in systemic sclerosis (SSc). The progression of SSc associated ILD (SSc-ILD) is highly variable, and markers predictive of severe or progressive ILD are needed to identify patients at risk. Serum levels of 15 biomarkers were measured by Luminex assay and ELISA, as appropriate, in 189 SSc patients. Genotyping of rs2015085 in *CCL18* in was carried out using a TaqMan assay in 174 patients. Statistical analysis was performed using STATA12. CCL18 and MMP-7 levels were significantly higher in patients with ILD (median: 61,886 pg/ml and 1,385 pg/ml, respectively) compared to patients without ILD (48,486 pg/ml, p=0.0049 and 1,155 pg/ml, p=0.046, respectively), and periostin levels were significantly lower in patients with ILD than without (84,620 pg/ml compared to 105,096 pg/ml, p=0.027). Serum levels of CCL18 (p=0.038), MMP-7 (p=0.0069), CXCL12 (p=0.016), and MMP-12 (p=0.049) were all significantly higher in patients with extensive, rather than limited, lung involvement according to the Goh et al staging (Goh et al. Am.J.Respir.Crit.Care.Med. 2008 177:1248–1254), while periostin levels were significantly lower in extensive compared to limited lung disease (p=0.025). We observed a borderline trend for a higher level of CCL18 in patients carrying the G allele of rs2015085 (65,034 pg/ml vs 62,541 pg/ml, p=0.05). Higher concentrations of CCL18 (p=0.001) and IL-10 (p=0.018) were associated with mortality, and neopterin was associated with time to decline in DLCO $\geq$15% (p=0.042). Our results suggest that CCL18, MMP-7, CXCL12, MMP-12, periostin, and neopterin may be effective biomarkers for predicting severity and or progression of lung involvement in SSc.

S87 2-YEAR FOLLOW UP OF PATIENTS WITH INCIDENTAL FINDINGS OF THORACIC LYMPH-NODAL NON-CASEATING GRANULOMAS

[1]O Thomas-Orogan, [2]A Kwok, [2]A Simons, [2]EP Judge, [3]R Daly, [4]A Jeyabalan, [4]M Plummeridge, [2]LG Spencer, [4]SL Barratt, [4]HI Adamali, [4]ARL Medford. *[1]Bristol Interstitial Lung Disease Service, Southmead Hospital, North Bristol NHS Trust, Bristol, UK; [2]Liverpool Interstitial Lung Disease Service, University Hospital Aintree, Liverpool, UK; [3]Department of Cellular Pathology, North Bristol NHS Trust, Southmead Hospital, Bristol, UK; [4]North Bristol Lung Centre, Southmead Hospital, North Bristol NHS Trust, Bristol, UK*

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Introduction Sarcoidosis is a multi-system granulomatous disease. Thoracic involvement can sometimes present asymptomatically, only being detected incidentally during imaging studies for other conditions or non-specific symptoms. Appropriate follow up of these patients has not been well defined.

Objective To define the clinical course of incidentally identified Scadding stage 1 sarcoidosis.

Methodology Retrospective case note analysis of endobronchial-ultrasound guided lymph node biopsy confirmed cases of sarcoidosis was undertaken. These were patients who presented incidentally to Bristol and Liverpool ILD services, with Scadding stage 1 disease. Clinical features, lung function parameters and radiological staging were examined at baseline, 12 and 24 months. We hypothesized that there would be no progression of disease in these patients. T-test was used with statistical significance of $p<0.05$.

Results Fifty-two cases were identified; 52% were male. The cohort had a median (IQR) age of 54 (43–63) years, and baseline FEV1 of 99 (86–112)%, FVC of 106 (99–119)%, FEV1/FVC ratio of 76 (72–81)% and TLCO of 90 (76–102)%.

All patients were asymptomatic in terms of fatigue, arthralgia, eye and respiratory symptoms at baseline. Baseline calcium was normal in all patients.

At 12 months there was no significant change in FEV1 3.21 ± 9.44% (n=24; $p=0.75$) and FVC 0.47 ±7.44% (n=23; $p=0.68$) compared to baseline. At 24 months there was also no significant change in FEV1 1.17 ±12.2% (n=11; $p=0.90$) and FVC -0.66% ±10.96% (n=10; $p=0.49$) compared to baseline.

Chest X-rays showed stability or regression in 90.3% of cases (n=31) at 12.7 ±4.9 months and 100% of cases (n=17) at 23.9 ±4.2 months.

No patients required therapeutic intervention over 24 months of follow up, for organ threatening disease or symptoms deemed by patient and/or physician to be significantly impacting on quality of life.

Furthermore, no patients went on to develop any symptomatic features attributable to sarcoidosis during the study period.

Conclusion Our results show that patients with incidental findings of non-caseating granulomas and Stage 1 disease at baseline remain asymptomatic over a 24 month period. Our results suggest that prolonged follow up is unnecessary.

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Modelling lung disease in vitro/vivo

S88 A HUMAN MODEL OF LUNG FIBROSIS FOR THE ASSESSMENT OF ANTI-FIBROTIC STRATEGIES IN IDIOPATHIC PULMONARY FIBROSIS

KM Roach, P Tongue, E Castells, G Elliot, H Marshall, M Richardson, S Mason, L Chachi, P Bradding. *University of Leicester, Leicester, UK*

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Introduction Idiopathic pulmonary fibrosis (IPF) is a progressive and invariably lethal interstitial lung disease. Animal models help with understanding disease mechanisms, but to-date, the bleomycin mouse model of lung fibrosis has failed to predict drug efficacy. We have developed a human model of lung fibrosis that provides a more physiological representation for the assessment of anti-fibrotic strategies in IPF. Pirfenidone and nintedanib are currently approved for the treatment of IPF but have limited efficacy and their mechanisms of action are poorly understood. In this study we have compared the anti-fibrotic effects of pirfenidone, nintedanib and a potential novel therapy, senicapoc ($K_{Ca}3.1$ channel inhibitor) in our human model.

Methods 2 mm^3 pieces of human lung parenchyma were cultured for 7 days in DMEM ± TGFβ1 (10 ng/ml) ± pirfenidone (500 μM), nintedanib (1 μM), senicapoc (100nM). Pro-fibrotic pathways were examined by RT-PCR and soluble collagen secretion.

Results In 45 donor lung samples tested, 44 out of 84 IPF- and fibrosis-associated genes tested were significantly upregulated by TGFβ1. Nintedanib (n=13) and pirfenidone (n=11) dysregulated the mRNA expression of 14 and 2 fibrosis-associated genes respectively. Nintedanib attenuated the TGFβ1-dependent upregulation of mRNA for numerous MMPs, Integrin's and PDGF, but upregulated α-SMA. Pirfenidone attenuated the TGFβ1-dependent expression of MMP3 and 13, but did not upregulate the expression of any genes. In comparison, senicapoc (n=11) attenuated TGFβ1-dependent upregulation of 28 fibrosis-associated genes, including α-SMA, PDGF, collagen type III, ITGAV and ITGB6.

Conclusions This human experimental model of lung fibrosis recapitulates pro-fibrotic events evident in IPF and shows sensitivity to pirfenidone and nintedanib inhibition. Pirfenidone and nintedanib impact different molecular pathways. Senicapoc inhibited significantly more fibrosis-associated genes than pirfenidone and nintedanib, supporting the view that $K_{Ca}3.1$ channels are a promising target for the treatment of IPF

S89 EX VIVO STUDIES OF THE GAL-3-FIBROSOME HYPOTHESIS IN IPF AND NON-FIBROTIC CONTROL LUNG TISSUE AND MYOFIBROBLASTS

A Miah, P Stylianou, P Tongue, K Roach, P Bradding, B Gooptu. *University of Leicester, Leicester, UK*

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Background Galectin-3 critically mediates experimental fibrosis, potentiating pro-fibrotic effects of transforming growth factor (TGF)-β1, and is highly expressed in idiopathic pulmonary fibrosis (IPF). Therefore, a galectin-3 small molecule glycomimetic antagonist is in Phase 2B trials. Galectin-3 may mediate pathogenesis in alveolar epithelial cells (AECs) and myofibroblasts by nucleating a macromolecular complex assembly on the cell surface. We term this the 'gal-3-fibrosome'. In addition to galectin-3, putative components include CD98:β1-integrin complex and TGF-β receptor II (TGF-βRII). Through multiple experimental techniques, we have established evidence for the gal-3-fibrosome hypothesis in AECs.

Aim Characterise mRNA and protein levels and co-localisation of galectin-3 with CD98:β1-integrin and TGF-βRII, basally and with pro-fibrotic stimulation in non-fibrotic control (NFC) and IPF contexts *ex vivo*.

Methods We studied the expression levels of galectin-3, CD98 heavy chain (CD98hc) and β1-integrin at mRNA and protein levels, and their co-localisation. We characterised lung tissue and low passage IPF and NFC lung myofibroblasts (passage 4–5), basally and with TGF-β1 stimulation.

Results IPF lung tissue stained positively for galectin-3, β1-integrin and CD98 but NFC lung tissue did not. TGF-β1 treatments increased mRNA levels for transcripts of β1-integrin and CD98hc, but not galectin-3 in human lung tissue cultured *ex vivo*. More pronounced differential responses were detected at the protein level in lung myofibroblasts purified *ex vivo*: protein levels of β1-integrin and CD98hc increased, whilst galectin-3 levels dropped. There was a concomitant decrease in galectin-3 co-localisation with β1-integrin and CD98hc in NFC lung myofibroblasts. However, no alteration in co-localisation was observed in IPF-derived lung myofibroblasts.

Conclusion Putative gal-3-fibrosome components co-localise at the cellular level in IPF lung tissue. Co-localisation is also evident in IPF lung myofibroblasts purified *ex vivo*. Our data indicate this is mediated by increased transcription of mRNA encoding CD98hc and β1-integrin but that observed galectin-3 increases are more likely related to stabilisation at the protein level. Our unexpected findings regarding reductions in galectin-3 levels with TGF-β1 treatment in human NFC lung tissue and myofibroblasts *ex vivo* are consistent with a negative feedback loop restricting gal-3-fibrosome formation. This may then be counteracted by increased gal-3-fibrosome stabilisation in IPF to enhance pathogenic TGF-β1 signalling.

S90 A NOVEL ORGANOTYPIC MODEL OF BRONCHIAL DYSPLASIA FOR PRECLINICAL SCREENING OF POTENTIAL THERAPEUTIC AGENTS FOR EARLY SQUAMOUS LUNG CANCER (SQC)

LJ Porter, L Correia, F McCaughan. *University of Cambridge, Cambridge, UK*

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Background Squamous lung cancer has 5-year survival rates of less than 15%. Strategies to reduce lung cancer prevalence include smoking cessation, early detection and chemoprevention. There are currently no licensed strategies for the chemoprevention of lung cancer, so this represents a significant unmet need.

Bronchial dysplasia precedes the development of invasive SQC. We have developed a novel organotypic (OTC) model of bronchial dysplasia that recapitulates key genetic events in clinical specimens of bronchial dysplasia.

Aim Our aim is to screen potential chemoprevention compounds for efficacy in a model of human bronchial dysplasia.

Methods We use a novel OTC model incorporating immortalised human bronchial epithelial cells (HBECs) genetically manipulated to reproduce the key genetic lesion reported in the human disease (*TP53*, and *CDKN2A* disruption, deregulated *SOX2*). Importantly the epithelial layer, once confluent, is maintained at the air-liquid interface (ALI) mimicking the physical microenvironment *in vivo*. Dysplastic lesions develop 3–5 days after inducible deregulation of SOX2. Potential chemoprevention agents are added simultaneously to SOX2 induction to mimic primary chemoprevention, or after the dysplastic phenotype forms in response to SOX2 induction (secondary chemoprevention). We measure phenotypic response using phase-contrast microscopy, histology, immunohistochemistry and western blotting. Results are then corroborated by genetic targeting (shRNA/CRISPR) of drug targets in the OTC and in unrelated squamous carcinoma cell lines and in xenograft models.

Results We screened multiple tool compounds or compounds already in late phase clinical trials. All demonstrate therapeutic

target engagement in the epithelial layer confirmed by western blotting despite that layer being maintained at ALI.

Most screened compounds have negligible impact over a range of doses or lead to generalised toxicity at higher doses.

Remarkably, multiple compounds from two therapeutic classes can a) prevent of the emergence of dysplastic lesions thus mimicking 'primary' chemoprevention; and b) induce complete resolution of the established dysplastic phenotype with no measurable impact on the intact 'normal' epithelial monolayer. CRISPR and shRNA targeting corroborated the therapeutic screening results.

Conclusions A rational organotypic model of human bronchial dysplasia can be used to perform preclinical screens for potential efficacy in the chemoprevention/treatment of squamous lung cancer. We are now developing a clinical trial in patients with early stage lung cancer to translate this work.

S91 INVESTIGATING THE ROLE OF AKAP13 IN EPITHELIAL CELLS ON TGF-β ACTIVATION

J Porte, A John, RG Jenkins, L Organ. *The University of Nottingham, Nottingham, UK*

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Rationale We recently identified a polymorphism associated with the AKAP13 gene resulted in higher levels of AKAP13 gene expression and Idiopathic pulmonary fibrosis (IPF) susceptibility. Furthermore, higher expression of AKAP13 were associated with diseased epithelium.[1] AKAP13 is a Rho-GEF for RhoA, a key intermediate signal in the activation of the TGF-β activating integrin, αvβ6, in lung epithelial cells. However, the role for AKAP13 in the lung is still not understood.

Aim To investigate the role of AKAP13 in lung epithelial cells, including Rho-A and TGFβ.

Method Localisation of protein expression of AKAP13 and αvβ6 was assessed in IPF human lung tissue via immunohistochemistry, using serial sections. AKAP13 gene expression was assessed via qPCR in primary human lung fibroblasts (normal, n=3; IPF, n=4) and primary epithelial cell lines (small airway SAEC, n=9; human bronchial HBEC, n=4). Immortalised human bronchial epithelial cells (iHBECs) were treated with AKAP13 siRNA to knockdown expression of AKAP13 and assessed for changes to mRNA after 48 hrs. iHBECs were treated with 10uM of A13, an inhibitor for AKAP13-RhoA interaction, to assess for functional changes to Rho-A activation in response to LPA.

Results Assessment of serial lung sections from IPF patients (n=106) show that positive staining for AKAP13 and αvβ6 is observed in lung epithelial cells, within the same regions of lung. AKAP13 gene expression was found to be 19-fold higher in epithelial cells, compared to fibroblasts, which had very low expression for AKAP13 (both normal and IPF), confirming our previous and current immunohistochemistry findings.[1] Knockdown of the AKAP13 gene in iHBECS also resulted in a significant decrease in ITGB6 expression, the gene for αvβ6 (n=4, p=0.03). In addition, treatment of iHBECS with 10uM of A13 was able to supress RhoA activation in response to LPA.

Conclusion AKAP13 expression is found predominantly in epithelial cells in the lung. AKAP13 appears to regulate RhoA activation in iHBECs and influence αvβ6 expression. This suggests that it is involved in the RhoA- αvβ6 pathway that drives TGF-β activation in epithelial cells

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S92 CALCIUM-SENSING RECEPTOR AS A THERAPEUTIC TARGET FOR PULMONARY FIBROSIS

[1]K Wolffs, [1]B Mansfield, [1]R Bruce, [2]L Verckist, [3]R Paes De Araújo, [4]R Attanoos, [5]J Ward, [5]C Corrigan, [1]P Kemp, [2]D Adriaensen, [3]L Mur, [6]B Hope-Gill, [1]D Riccardi. *[1]School of Biosciences, Cardiff University, Cardiff, UK; [2]Laboratory of Cell Biology and Histology, University of Antwerp, Antwerp, Belgium; [3]Institute of Biological, Environmental and Rural Sciences (IBERS), Aberystwyth University, Ceredigion, UK; [4]Department of Cellular Pathology, University Hospital of Wales and School of Medicine, Cardiff University, Cardiff, UK; [5]Division of Asthma, Allergy and Lung Biology, King's College London, London, UK; [6]University Hospital Llandough, Cardiff and Vale University Health Board, Llandough, Penarth, UK*

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Introduction Idiopathic pulmonary fibrosis (IPF) is a disease with very poor prognosis and no curative therapies. The extracellular calcium-sensing receptor (CaSR) is a chemosensor which is activated by several agonists/modulators including polyvalent cations, polyamines, and basic polypeptides. Previously we and others have shown that CaSR activation drives pulmonary inflammation and remodelling in preclinical models of asthma, COPD and pulmonary hypertension. The aims of the study are to investigate the role of the CaSR in pulmonary fibrosis and evaluate the scientific rationale for repurposing CaSR antagonists (calcilytics) as potential novel therapeutics for IPF.

Methods Immunostaining was used to assess lung CaSR expression in IPF patients and control. CaSR-related metabolites were assessed in patient saliva samples (IPF and control) using high-resolution mass spectrometry. In primary human lung fibroblasts (HLF), the polyamine, spermine, was used to assess the functional activation of the CaSR via calcium imaging. HLF were also treated with transforming growth factor-β 1 (TGF-β1) in the presence or absence of calcilytics to assess expression of known fibrotic markers and CaSR. Histology was carried out in 15 month old mice with targeted CaSR deletion from sm22α-positive cells to assess age-induced lung remodelling.

Results CaSR expression was increased in specific cells of the IPF lungs compared to controls. The expression of several CaSR activators (amines and polyamines) was significantly increased in IPF patients compared to control ($p<0.05$). In human lung fibroblasts, calcilytics prevented spermine-induced increase in intracellular calcium concentration. Calcilytics also suppressed the effects of exogenous TGF-β1 supplementation on α-smooth muscle actin expression, proliferation, collagen deposition, and inflammation ($p<0.01$). Selective CaSR deletion from fibroblasts and smooth muscle cells protected mice from age-induced fibrosis ($p<0.05$).

Conclusions This study supports the role of the CaSR in PF, as receptor deletion significantly attenuates fibrosis. Since CaSR activators are elevated in IPF patient saliva, increased levels of these metabolites suggest a role for the CaSR in the pathophysiology of IPF. The efficacy of calcilytics in reducing pro-fibrotic changes seen in activated lung fibroblasts further supports the development of calcilytics as a novel treatment for IPF.

S93 TOLL-LIKE RECEPTOR 2 HAS A TUMOUR SUPPRESSOR FUNCTION IN MURINE NON-SMALL CELL LUNG CANCER

FR Millar, A Quintanilla, P Hari, M Muir, M Arends, M Frame, S Wilkinson, JC Acosta. *CRUK Edinburgh Centre, Edinburgh, UK*

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Background Lung cancer is the leading cause of cancer related deaths worldwide. Patients typically present with late stage metastatic disease, making curative treatment impossible in the majority of cases. The value of targeting early stage disease has been widely recognised to improve overall mortality. Oncogene induced senescence (OIS) is an innate cell cycle arrest program instigated following the activation of oncogenes, and is a well known tumour suppressor mechanism. OIS is abundant in pre-malignant lesions in murine lung cancer models, however is lost during the progression to malignancy. We have recently identified a regulatory role for Toll-like receptor 2 (Tlr2) in oncogene-induced senescence[1], however the functional relevance of this has yet to be established *in vivo*.

Methods To determine the effect of Tlr2 signalling during non-small cell lung cancer (NSCLC) progression, we used mice heterozygous for the loxp-STOP-loxp-$Kras^{G12D}$allele ($Kras^{LSL\text{-}G12D/+}$), allowing lung specific activation of mutant $Kras^{G12D}$ signalling upon intranasal infection with Cre-recombinase expressing adenovirus (Adeno-CMV-Cre). $Kras^{LSL\text{-}G12D/+}$ mice were interbred with $Tlr2^{-/-}$ mice to generate a $Kras^{LSL\text{-}G12D/+}$; $Tlr2^{-/-}$strain. 1.5 x 10^7 PFU of Adeno-CMV-Cre was delivered intranasally and mice were culled 12 weeks later. Tumour burden, proliferative markers (Ki67) and senescence markers (p21) were assessed by immunohistochemistry.

Results Tumour burden was significantly increased in $Kras^{LSL\text{-}G12D/+}$;$Tlr2^{-/-}$ mice in comparison to $Kras^{LSL\text{-}G12D/+}$;$Tlr2^{+/+}$ mice ($p<0.01$). This was associated with an increased proliferative index ($p<0.001$) and reduced p21 staining ($p<0.001$), indicating a reduced inability to undergo senescence.

Conclusions We have identified an *in vivo* functional role for Tlr2 in the suppression of murine lung cancer progression. By understanding the mechanisms regulating this early stage tumour suppressor process we may be able to develop biomarkers of early disease to better stratify lung cancer screening approaches.

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Genetic and cellular mechanisms of pulmonary hypertension

S94 IDENTIFICATION OF NATURAL TARGETS OF NONSENSE-MEDIATED DECAY RELEVANT TO PULMONARY VASCULAR DISEASES

[1]AM Bielowka, [1]M Bernabeu-Herrero, [1]D Patel, [1]FS Govani, [2]NJ Dibb, [3]L Game, [4]M Aldred, [5]IG Mollet, [1]CL Shovlin. *[1]NHLI Cardiovascular Sciences, Imperial College London, London, UK*; *[2]Institute of Reproductive and Developmental Biology, Imperial College London, London, UK*; *[3]Medical Research Council Clinical Sciences Centre, Imperial College London, London, UK*; *[5]University of Indianapolis, Indianapolis, USA*; *[4]Universidade Nova de Lisboa, Lisbon, Portugal*

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Introduction and Objectives Nonsense-mediated decay (NMD) is a quality- control mechanism that degrades RNA transcripts harbouring premature stop codons and consequently reduces production of truncated proteins. Inhibition of NMD is being evaluated as a therapeutic approach for pulmonary vascular diseases caused by pathogenic nonsense substitutions causing hereditary haemorrhagic telangiectasia (HHT). As this non-specific approach might also affect the expression of transcripts that are naturally regulated by NMD, our aim was to identify exons that are controlled by NMD and the biological processes they are involved in.

Methods Primary human microvascular endothelial cells (HMEC) were cultured to confluence in antibiotic-free medium before treatment for 1 hour with 100µg/ml cycloheximide to inhibit NMD, or fresh media. Ribosomal (r)-RNA-depleted total RNA was used to prepare strand-specific whole transcriptome libraries which were sequenced on an Illumina Genome Analyser II, aligned to hg18, counted using custom scripts, and normalized to total valid reads and exon size. Further scripts were written to identify exons present in HMEC treated with cycloheximide but not media-treated HMEC. Separately, blood outgrowth endothelial cells (BOECs) were established from 23 HHT patients with pathogenic nonsense substitutions in *ENG*, *ACVRL1* and *SMAD4*.

Results In the cycloheximide and media-treated normal HMEC, there were alignments to 15,756 RefSeq genes, and 113 micro (mi)RNAs. The 419 most differentially expressed RefSeq genes ($p<0.15$), clustered to Gene Ontology (GO) biological process compatible with the observed induction of membrane proteolysis in cycloheximide-treated cells, validating the methodological approach. There were overlaps between miRNAs that were differentially expressed, and their mRNA targets predicted by Targetscan. The approach also identified candidate alternate exons observed only in the cycloheximide-treated HMEC, including 333 alternate first exons, 662 mid exons, 275 terminal exons and 59 exon extensions. Candidate exons that introduced a premature stop codon into transcripts of genes involved in GO biological processes other than protein translation were validated by reverse transcriptase PCR, prior to selection as a panel to quantitatively evaluate NMD inhibition in BOECs from HHT patients.

Conclusion Natural targets of nonsense-mediated decay in HMEC were identified. Further investigation should provide new insights into the role of NMD in cellular physiology.

S95 IDENTIFYING NEW HEREDITARY HAEMORRHAGIC TELANGIECTASIA GENES BY APPLYING A MACHINE LEARNING APPROACH TO SCREEN WHOLE GENOME SEQUENCING DATA

[1]S Xiao, [2]D Brown, [3]IG Mollet, [1]FS Govani, [1]D Patel, [1]L Game, [2]HHT/PAVM GeCIP, [2]Genomics England Research Consortium, [1]CL Shovlin. *[1]Imperial College, London, UK*; *[2]Genomics England, London, UK*; *[3]Universidade Nova de Lisboa, Lisbon, Portugal*

10.1136/thorax-2019-BTSabstracts2019.101

Introduction and objectives Hereditary haemorrhagic telangiectasia (HHT) is a rare autosomal dominantly-inherited disease that causes pulmonary arteriovenous malformations and pulmonary hypertension. Four disease-causing genes have been identified- *ENG*, *ACVRL1*, *SMAD4* and *GDF2*. Here, we

demonstrate an unbiased screening method using whole genome sequencing (WGS) to identify novel genes that may cause HHT.

Methods Through the UK 100,000 Genomes Project Data Release 6.0, WGS data were available for 160 HHT participants from 126 families, following Illumina pipeline alignments and variant calling. For the current project, customised scripts were written in Python to extract all variants in HHT patients' variant call files (vcfs, currently for single nucleotide variants and small indels). The variants were then prioritized by characteristics such as allele frequency, deleteriousness, gene location and gene expression profiles, using both stepwise filtering and machine learning feature selection algorithms including LASSO and SVM-RFE.

Results A mean of 4,813,192 variants (range 4,726,104 to 5,362,271) were found in each HHT patient. Stepwise filters removed an average of 3,663,003 variants which exceeded an allele frequency of 0.02% in the 1000 Genome Project database, and a further 690 synonomous variants that did not change the genetic code. Excluding variants present in HHT patients where a likely pathogenic variant was already identified through the Genomic Medicine Centres left a residual 501,702 variants. Subsequent stages required novel machine learning algorithms focusing on endothelial cell-expressed variants (defined if present in one of the 11,488 genes with alignments in our RNASeq experiments in primary normal human microvascular endothelial cells); in-house RNASeq changes following BMP9 or TGF-β1 stimulation; and absence or very low frequency in non HHT Participants in the 100,000 Genomes project. Selected variants are being prioritised based on expert input from the HHT PAVM GeCIP Pathway Analyses Subgroup's knowledge of gene coding and untranslated regulatory regions, and detailed functional pathways.

Conclusions We have already identified multiple genes with putative damaging variants in patients with unexplained HHT, and are next to focus on variants in genes expressed by other cell types. Similar approaches could also be implemented in other rare diseases.

S96 IDENTIFYING GENETIC MODIFIERS OF DISEASE SEVERITY USING WHOLE GENOME ANALYSES OF FAMILIES WITH HEREDITARY HAEMORRHAGIC TELANGIECTASIA RECRUITED TO THE 100,000 GENOMES PROJECT

[1]RT Slade, [1]S Xiao, [2]D Brown, [2]HHT/PAVM GeCIP, [2]Genomics England Research Consortium, [1]CL Shovlin. *[1]Imperial College, London, UK; [2]Genomics England, London, UK*

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Introduction Why individuals with the same disease-causing DNA variant can have very different phenotypes is a puzzle in many conditions inherited as autosomal dominant traits. To explore, we focussed on hereditary haemorrhagic telangiectasia (HHT) in which approximately 50% of patients develop pulmonary arteriovenous malformations (PAVMs). In turn, these PAVMs can vary in severity dramatically within the same HHT family. With the rare opportunity for whole genome analysis of many HHT families recruited to the 100,000 Genomes Project[1], examination of potential phenotypic modifiers within families with the same HHT pathogenic variant was a relevant and unique question.

Methods Data were analysed within the 100,000 Genomes Project Research Data Embassy, following Illumina pipeline alignments and variant calling. Customised Python script was used to identify families with the same pathogenic HHT variant and extract each affected individual's DNA variants. Comparisons between affected family members differing markedly in disease severity were then performed using 3 separate methods: comparison of clinical tiered DNA variants, analysis of newly released copy number variants, and comparison of all single nucleotide variants and small indels in patients' variant call files (vcfs).

Results From the initial data set of 193 fully sequenced HHT families taken from Data Release 7 of the 100,000 Genomes Project, we selected those in which one family member had noticeably more severe symptoms recorded by the recruiting Genomic Medicine Centre. In one typical nuclear family with 3 affected members including one with severe PAVMs, within tiered genes of known function, 111 variants were only present in the PAVM-affected patient. Extending to copy number variants identified a further 363 variants that differed between this patient and the less severely affected relatives. Extending to vcf analyses using python script identified 490,225 variants that were only present in the PAVM-affected patient. The combined variant list is being cross-referenced to genomic locations of known gene coding regions and untranslated regulatory regions using *in silico* prediction tools.

Conclusions Whilst HHT is an autosomal dominant trait, these data emphasise the potential extent to which an unaffected parent may affect the disease severity through the influence of other inherited gene variants.

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S97 HAEMOGLOBIN CHALLENGE INDUCES DYSFUNCTION IN HUMAN PULMONARY ARTERY ENDOTHELIAL CELLS: POTENTIAL RELEVANCE TO PULMONARY ARTERY HYPERTENSION

[1]MS Bukhari, [2]M Mohd-Ghazaly, [1]QK Toe, [1]GJ Quinlan, [1]SJW Wort. *[1]Imperial College London, London, UK; [2]Universiti Malaysia Terengganu, Kuala Nerus, Malaysia*

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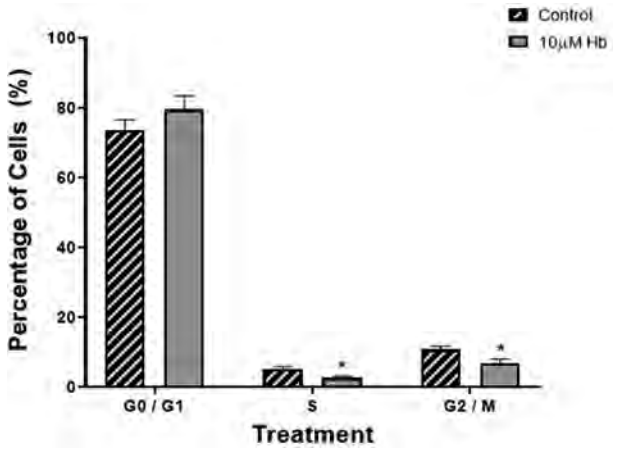
Background The link between pulmonary arterial hypertension (PAH) and haemolytic anaemias, such as sickle-cell disease and thalassaemia, is well established. Recent studies have implicated sub-clinical haemolysis and the release of cell free haemoglobin (CFH) in idiopathic PAH. The interaction between CFH and pulmonary artery endothelial cells (PAECs) could induce endothelial dysfunction, a key component of the pathophysiology of PAH.

Objectives This study aims to investigate the role of CFH in PAEC dysfunction, defined in terms of intracellular and mitochondrial reactive oxygen species (ROS) generation, altered cell proliferation indices and changes in gene transcription of the ROS-generating enzyme NADPH oxidase-2 (Nox2).

Methods Cultured human PAECs (hPAECs) were challenged with 10 μM haemoglobin (Hb) or no treatment (control) for 24 hours. Flow cytometry was used to measure total intracellular ROS (dihydroethidium assay), mitochondrial ROS (MitoSOX assay) and cell cycle profile using propidium iodide. Nox2 gene expression was measured using RT-qPCR. Cell proliferation was measured using the BrdU assay.



Abstract S97 Figure 1 Change in cell proliferation

Results Total intracellular and mitochondrial ROS production in HPAECs increased (~3-fold) following Hb challenge compared to control. Additionally, Nox2 mRNA expression was greater in hPAECs treated with Hb for durations of 1 or 2 hours compared to control. Hb-treated hPAECs displayed a significant decrease ($*p<0.05$) in the percentage of cells in S and G2/M phases compared to control (see figure). In contrast, the BrdU results indicated a significant increase (~1.8 fold) in proliferation in response to Hb treatment ($**p<0.005$).

Conclusions These findings suggest that hPAECs exposed to Hb undergo an increase in intracellular and mitochondrial ROS production, which is also associated with an upregulation in Nox2 gene expression. Results from the cell cycle and BrdU assays suggest contrasting proliferative responses to Hb exposure, but warrant further investigation into possible changes in apoptotic or cell repair processes. Further studies are warranted to investigate the role of these processes in the PAH disease setting.

S98 THE EFFECTS OF BMPRII LOSS ON ENDOTHELIAL SHEAR ADAPTATION IN THE PULMONARY VASCULAR ENDOTHELIUM

[1]AS Mahomed, [1]A Burke-Gaffney, [2]S Moledina, [1]SJ Wort. *[1]National Heart and Lung Institute, Imperial College London, London, UK; [2]National Paediatric Pulmonary Hypertension Service, Great Ormond Street Hospital, London, UK*

10.1136/thorax-2019-BTSabstracts2019.104

Introduction Abnormal endothelial morphological adaptation to shear stress is a feature of pulmonary arterial hypertension (PAH) but the mechanisms responsible are poorly understood. In this study, we explored whether BMPRII loss mediates abnormal human pulmonary artery endothelial cell (HPAEC) adaptation to laminar shear stress and investigate gene expression of shear-sensitive Rho GTPases (RhoA, Rac1 and CDC42), known for their involvement in cytoskeletal reorganisation.

Methods HPAECs were transfected with BMPRII siRNA (siBMPRII) or control siRNA (siControl). Laminar shear stress acting on HPAECs was modelled using a parallel-plate fluid flow chamber (ibdi). siControl and siBMPRII-transfected HPAECs were exposed to unidirectional shear stress (15 dyn/cm^2) for 72 hours. Phase-contrast and confocal microscopy were used to assess cell morphology and orientation. Gene expression of RhoA, Rac1 and CDC42 were quantified using qPCR.

Results siControl-transfected HPAECs subjected to shear stress significantly elongated (length-to-width ratio 1.90 ±0.227 versus 4.12±0.133, $p<0.001$) and aligned within the direction of flow (31.7±4.82% versus 62.9±5.83%, $p<0.05$) compared with static siControl cultures, whereas that of BMPRII-silenced HPAECs exposed to flow failed to significantly elongate (1.79±0.173 versus 2.45±0.136) and align (29.6±1.97% versus 42.1±5.49%), relative to static siBMPRII HPAECs. Shear stress significantly induced the upregulation of RhoA and not Rac1 and CDC42 in siControl-transfected HPAECs, while siBMPRII-treated HPAECs subjected to flow did not exhibit significant increases in RhoA, Rac1 and CDC42 mRNA, in comparison with static counterparts, respectively.

Conclusion Inactivating mutations in the BMPRII gene may contribute to PAH by engendering abnormal pulmonary artery endothelial shear adaptation.

S99 HEPCIDIN DOWN REGULATES BMPRII IN PULMONARY ARTERY ENDOTHELIAL CELLS MIMICKING PULMONARY ARTERY HYPERTENSION PHENOTYPES

[1]QK Toe, [1]H Ying, [1]T Issitt, [2]M Mohd-Ghazaly, [1]GJ Quinlan, [1]SJ Wort. *[1]Imperial College London, London, UK; [2]Universiti Malaysia Terengganu, Kuala Nerus, Malaysia*

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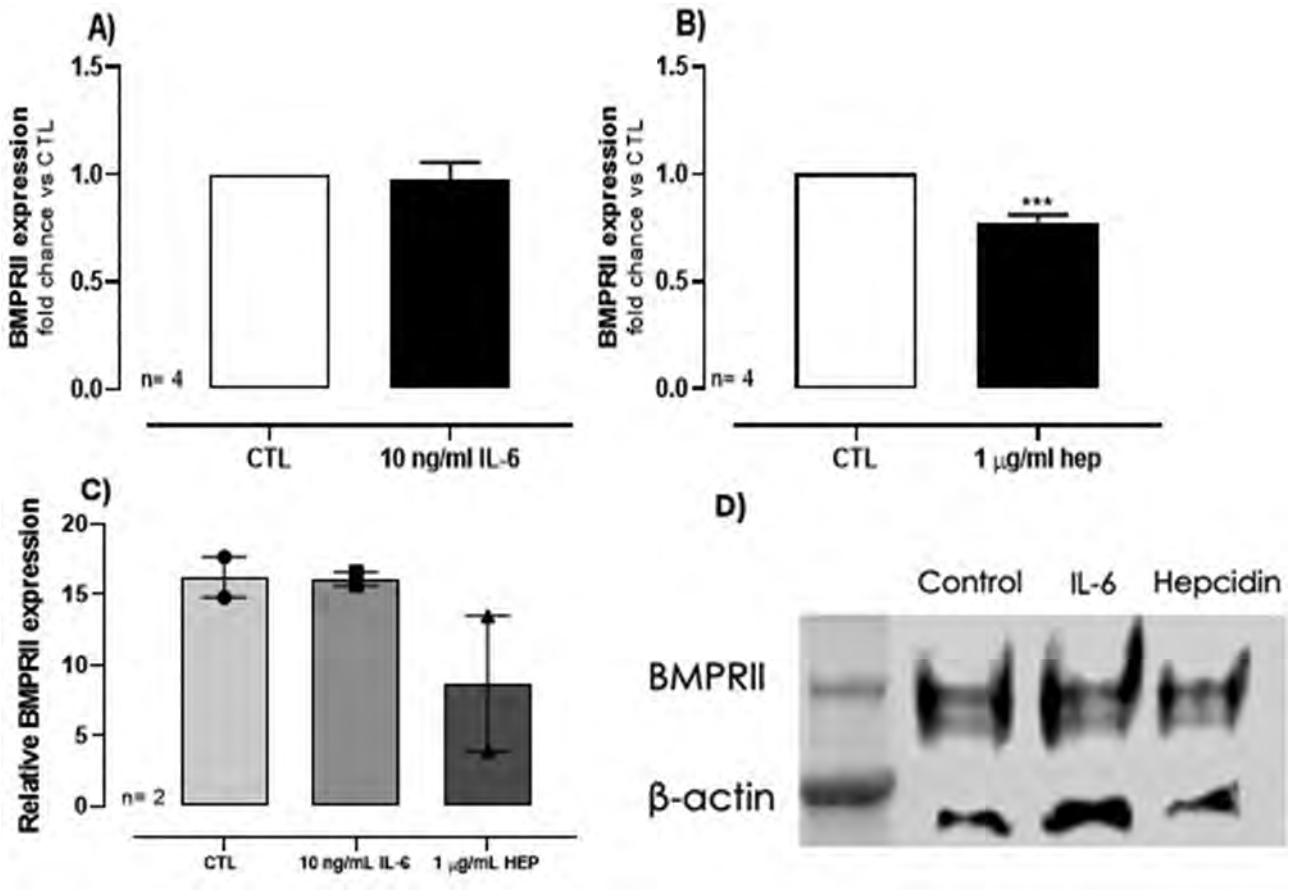
Introduction Pulmonary arterial hypertension (PAH) is characterised by vascular remodelling of pulmonary arterioles. Disrupted iron homeostasis linked to elevated hepcidin levels has been observed in PAH patients, and disruption of the hepcidin/ferroportin axis at the level of the pulmonary vasculature cells has been shown to contribute to proliferation of pulmonary artery smooth muscle cells. A role for Pulmonary artery endothelial cells (PAECs) linked to hepcidin has not been investigated.

Objectives In this study we explored the influences of hepcidin-25 on PAEC gene expression targeting BMPRII, known to be dysfunctional in PAH.

Methods Cells were challenged with Hepcidin-25 (1 μg/mL) or for comparison IL-6 (10 ng/mL). Transcriptional regulation was analysed by RT-PCR, protein expression by immunocytochemistry.

Results Novel findings demonstrate that BMPRII mRNA expression is significantly down regulated in PAECs challenged with hepcidin-25 over a time course from 1 hour to 5 hours; figure 1 illustrates findings at 3 hours. IL-6 challenge was not able to replicate this response over the same time frame. In addition, Western blot analysis of cell lysates (n=2) showed an obvious loss of BMPRII protein expression in Hepcidin-25 challenged cells when compared to control and IL-6 challenged cell lysates.

Conclusion This is the first report linking hepcidin-25 activity to potentially dysfunctional BMPRII responses in PAECs. Given the established role of hepcidin as regulator of cellular iron levels, a role for downstream signaling linked to iron accumulation in PAECs may offer a plausible mechanism for these observations and warrants further investigation. These



Abstract S99 Figure 1 Hepeidin treatment of hPAEC downregulates BMPRII expression. A) BMPRII mRNA expression in hPAECs after 3h treatment with IL-6 (10 ng/mL). B) BMPRII mRNA expression in hPAECs after 3h treatment with hepcidin-25 peptide (1 ug/mL). C) BMPRII western blot quantification of hPAECs treated with IL-6 (10 ng/mL) and hepcidin-25 peptide (1 ug/mL). D) Western blot image of BMPRII expression on hPAECs treated with with IL-6 (10 ng/mL) and hepcidin-25 peptide (1 ug/mL). ***p<0.005. Student t-test. Data shown as ± SEM

studies may provide novel insights regarding emerging concepts of hepcidin driven proliferative and second messenger responses of relevance to PAH.

COPD: inflammation, smoking and exacerbations

S100 REDUCTION OF INFLAMMATORY CYTOKINE PRODUCTION IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) EPITHELIAL CELLS BY PROTEASE ACTIVATED RECEPTOR 2 (PAR2) ANTAGONISM

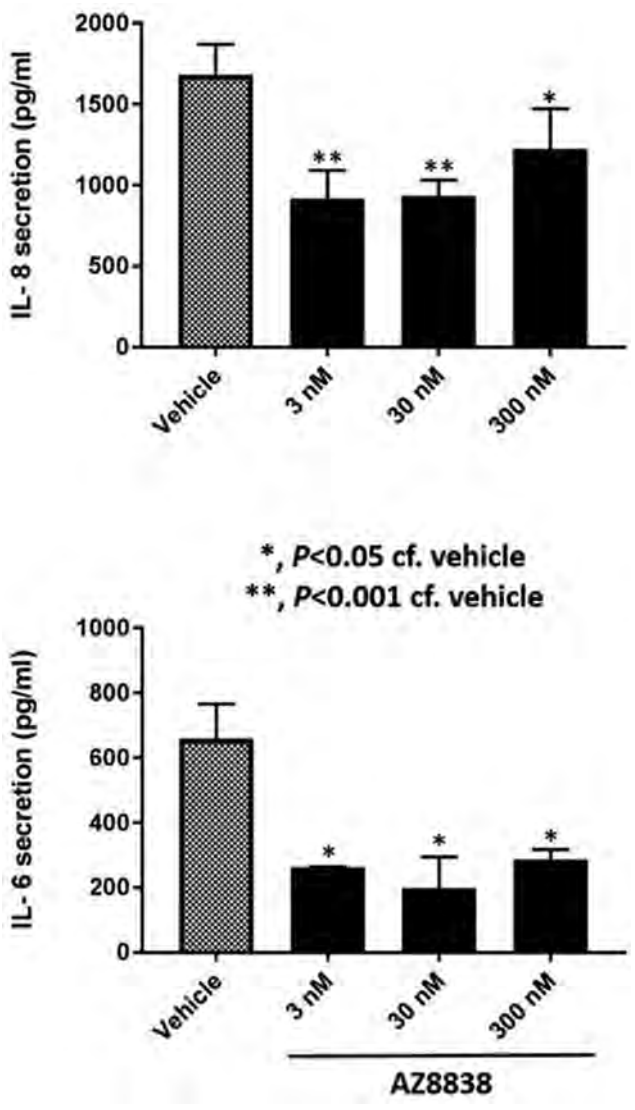
[1]M Bailo, [1]L Dunning, [1]J Brzeszczynska, [2]K McIntosh, [2]R Plevin, [3]SL Martin, [4]GP Sergeant, [5]CS Goodyear, [1]GJ Litherland, [1]JC Lockhart, [1]A Crilly. *[1]Institute of Biomedical and Environmental Health Research, Health and Life Science, University of the West of Scotland, Paisley, UK; [2]Strathclyde Institute of Pharmacy and Biomedical Sciences, Glasgow, UK; [3]School of Pharmacy, Queen's University, Belfast, UK; [4]Smooth Muscle Research Centre, Dundalk Institute of Technology, Dundalk, Ireland; [5]Institute of Infection, Immunity and Inflammation, University of Glasgow, Glasgow, UK*

10.1136/thorax-2019-BTSabstracts2019.106

Inflammatory cytokine production is a hallmark of COPD. PAR2 activation, via the transmembrane serine protease matriptase, results in the regulation of pro-inflammatory cytokines, including IL-6 and IL-8 (Seitz *et al.*, 2007). The aim of this study was to investigate a putative role for PAR2 in COPD.

PAR2 and matriptase expression was determined by immunofluorescence in primary human bronchial epithelial cells derived from healthy controls and COPD patients (HBECs & DHBECs respectively). Levels of secreted IL-6 and IL-8 were evaluated by ELISA. The role of PAR2 in the DHBEC-associated inflammatory response was investigated using the PAR2 antagonist AZ8838 (Cheng *et al.*, 2017).

Immunofluorescent microscopy showed both HBECs and DHBECs express PAR2, whereas only DHBECs express matriptase. Evaluation of spontaneous cytokine secretion revealed that both IL-6 and IL-8 were significantly increased ($P<0.01$) in DHBECs compared to HBECs. Importantly, inhibition of PAR2 activation in DHBECs by AZ8838 significantly reduced IL-8 (48 h) and IL-6 (72 h) secretion, figure 1.



Abstract S100 Figure 1 Pro-inflammatory cytokines secretion in COPD-HBECs. IL-6 and IL-8 levels in the supernatant of diseased cells after 48h and 72h of culture with AZ8838 (3 nM — 300 nM) were determined by ELISA. Results are expressed as mean±SEM of 3 different replicates. One way ANOVA corrected with Dunnett's test for multiple comparison was performed to analyse the difference in secretion (IL-8: **p=0.01; IL-6: *p<0.05).

This study used a recently developed antagonist to demonstrate a role for PAR2 in the regulation of pro-inflammatory cytokine release from COPD bronchial epithelial cells. Since increased protease activity is a feature of COPD, elevated expression of matriptase may contribute to PAR2 activation in this disease.

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S101 THE IMPACT OF SMOKING ON IMPROVING COPD OUTCOMES WITH UMECLIDINIUM/VILANTEROL: A PRE-SPECIFIED ANALYSIS OF THE EMAX TRIAL

[1]L Bjermer, [2]IH Boucot, [3]CF Vogelmeier, [2]P Jones, [4]F Maltais, [2]IP Naya, [5]L Tombs, [2]C Compton, [6]DA Lipson, [7]EM Kerwin. *[1]Respiratory Medicine and Allergology, Lund University, Lund, Sweden; [2]Global Respiratory Franchise, GSK, Brentford, UK; [3]Department of Medicine, Pulmonary and Critical Care Medicine, University Medical Center Giessen and Marburg, Philipps-Universität Marburg, Member of the German Center for Lung Research (DZL), Marburg, Germany; [4]Université Laval, Québec, Canada; [5]Precise Approach Ltd, contingent worker on assignment at GSK, Stockley Park West, Uxbridge, UK; [6]Respiratory Research and Development, GSK, Collegeville, USA; [7]Clinical Research Institute of Southern Oregon, Medford, USA*

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Objectives Many patients with chronic obstructive pulmonary disease (COPD) continue to smoke; however, the impact of smoking on bronchodilator responses is not well understood. This pre-specified analysis of the Early MAXimisation of bronchodilation for improving COPD stability (EMAX) trial compared umeclidinium/vilanterol (UMEC/VI) with UMEC and salmeterol (SAL) in current and former smokers.

Methods This 24-week, double-blind, parallel-group trial randomised symptomatic patients at low exacerbation risk not receiving inhaled corticosteroids (ICS) to UMEC/VI 62.5/25 µg once-daily, UMEC 62.5 µg once-daily, or SAL 50 µg twice-daily. Outcomes included: lung function, patient-reported outcomes, moderate/severe exacerbation risk and clinically important deterioration (CID). Safety was also assessed.

Results Overall, 1203 and 1221 patients were current and former smokers, with a mean (standard deviation [SD]) of 48.0 (25.5) and 48.8 (27.5) pack years, respectively. For current and former smokers respectively, mean (SD) age was 61.7 (7.7) and 67.5 (8.2) years, 47% and 35% were female, and 14% and 19% had experienced a moderate exacerbation in the prior year. At screening, mean (SD) post-bronchodilator forced expiratory volume in 1 second (FEV_1) was 1647 (515) mL and 1545 (502) mL and mean (SD) COPD Assessment Test (CAT) score was 20.0 (6.2) and 18.3 (5.6).

Change from baseline in trough FEV_1 at Week 24 (primary endpoint) was statistically significantly greater with UMEC/VI versus UMEC and SAL for both current and former smokers (all $p<0.01$) (**table 1**). Significantly higher proportions of responders were observed with UMEC/VI versus monotherapy for self-administered Transition Dyspnoea Index (TDI) ($p<0.05$; except versus UMEC in former smokers: $p=0.055$) and Evaluating Respiratory Symptoms (E-RS) total score ($p<0.01$) (**table 1**). UMEC/VI demonstrated significant improvements in mean rescue medication inhalations/day over 24 weeks versus UMEC and SAL in both smoking subgroups ($p<0.05$) (**table 1**). In current and former smokers, UMEC/VI statistically significantly reduced the risk of a first moderate/severe exacerbation or CID versus SAL ($p<0.05$); however, these benefits were only observed versus UMEC for former smokers ($p\leq0.05$) (**table 1**). Safety profiles were similar for current and former smokers.

Abstract S101 Table 1 COPD outcomes by smoking status

	Current smokers (N=1203) (UMEC/VI: 394, UMEC: 396, SAL: 413)		Former smokers (N=1221) (UMEC/VI: 418, UMEC: 407, SAL: 396)	
	UMEC/VI vs UMEC	**UMEC/VI vs SAL**	**UMEC/VI vs UMEC**	**UMEC/VI vs SAL**
Lung function at Week 24, mean difference (95% CI)				
Trough FEV_1, mL	**84 (50, 117), p<0.001**	**165 (132, 198), p<0.001**	**49 (18, 80), p=0.002**	**117 (86, 148), p<0.001**
Trough FVC, mL	**111 (58, 164), p<0.001**	**211 (160, 263), p<0.001**	48 (-3, 99), p=0.066	**166 (115, 217), p<0.001**
Trough IC, mL	43 (-10, 97), p=0.112	**118 (66, 171), p<0.001**	35 (-13, 84), p=0.155	**113 (64, 162), p<0.001**
PROs at Week 24, mean difference from baseline (95% CI)				
TDI focal score[a]	0.41 (-0.05, 0.87), p=0.081	0.40 (-0.05, 0.85), p=0.079	0.32 (- 0.10, 0.73), p=0.132	**0.50 (0.09, 0.91) p=0.018**
E-RS total score[b]	-0.47 (-1.07, 0.13), p=0.122	**-0.67 (-1.26, -0.08), p=0.025**	-0.57 (-1.15, 0.01), p=0.055	**-0.98 (-1.56, -0.40), p=0.001**
SGRQ total score	0.30 (-1.55, 2.15), p=0.753	**-1.98 (-3.79, -0.17), p=0.032**	0.43 (-1.45, 2.30), p=0.656	-1.30 (-3.18, 0.57), p=0.173
CAT total score	-0.1 (-0.9, 0.7), p=0.832	-0.7 (-1.6, 0.1), p=0.075	0.0 (-0.8, 0.9), p=0.927	-0.3 (-1.1, 0.6), p=0.534
Rescue medication[c], mean inhalations/day	**-0.42 (-0.63, -0.20), p<0.001**	**-0.28 (-0.49, -0.06), p=0.011**	**-0.25 (-0.44, -0.05), p=0.014**	**-0.29 (-0.49, -0.09), p=0.004**
Rescue medication-free days[c],%	**8.09 (3.64, 12.54), p<0.001**	**6.59 (2.19, 11.00), p=0.003**	3.53 (-0.51, 7.57), p=0.087	2.83 (-1.24, 6.90), p=0.172
Responder analyses[d] at Week 24, odds ratio (95% CI)				
TDI focal score	**1.54 (1.16, 2.06), p=0.003**	**1.37 (1.03, 1.82), p=0.030**	1.32 (0.99, 1.75), p=0.055	**1.60 (1.20, 2.13), p=0.001**
E-RS total score[b]	**1.54 (1.13, 2.09), p=0.006**	**1.53 (1.13, 2.08), p=0.006**	**1.50 (1.11, 2.04), p=0.009**	**1.53 (1.12, 2.08), p=0.007**
SGRQ total score	1.23 (0.92, 1.63), p=0.162	**1.70 (1.27, 2.27), p<0.001**	1.18 (0.89, 1.57), p=0.255	1.30 (0.98, 1.74), p=0.072
CAT total score	1.20 (0.90, 1.59), p=0.214	1.26 (0.95, 1.67), p=0.102	**1.52 (1.15, 2.01), p=0.003**	1.19 (0.89, 1.57), p=0.239
Global assessment of disease severity[e]	**1.48 (1.12, 1.95), p=0.006**	1.22 (0.93, 1.60), p=0.154	1.28 (0.98, 1.68), p=0.074	**1.55 (1.18, 2.04), p=0.002**
Risk of deterioration up to Day 168, hazard ratio (95% CI)				
First moderate/severe exacerbation	0.98 (0.65, 1.49), p=0.938	**0.68 (0.46, 0.99), p=0.045**	**0.70 (0.50, 1.00), p=0.050**	**0.60 (0.43, 0.85), p=0.004**
First CID[f]	0.94 (0.77, 1.15), p=0.564	**0.63 (0.52, 0.75), p<0.001**	**0.75 (0.63, 0.90), p=0.002**	**0.63 (0.53, 0.75), p<0.001**

[a]Mean difference; [b]at Weeks 21–24; [c]at Weeks 1–24 using an e-Diary; [d]Responders were defined as: ≥1-unit improvement from baseline (TDI), ≥2-point reduction from baseline (E-RS); ≥4-point reduction from baseline (SGRQ), ≥2-unit improvement from baseline (CAT);[e]Overall assessment of change in COPD severity was rated using a seven-point Likert scale ('Much Better', 'Slightly Better', 'Better', 'No Change', 'Slightly Worse', 'Worse', 'Much Worse'), ordered response ratios were reported as odds of better response category; [f]defined as a ≥100 mL decrease from baseline in FEV1, ≥4-unit decrease from baseline in SGRQ, or a moderate/severe exacerbation.
CAT, COPD Assessment Test; CI, confidence interval; CID, clinically important deterioration; COPD, chronic obstructive pulmonary disease; E-RS, Evaluating Respiratory Symptoms; FEV1, forced expiratory volume in 1 second; FVC, forced vital capacity; IC, inspiratory capacity; PRO, patient-reported outcomes; TDI, Transition Dyspnoea Index (self-administered); SAL, salmeterol; SGRQ, St George's Respiratory Questionnaire; UMEC, umeclidinium; UMEC/VI, umeclidinium/vilanterol; VI, vilanterol.

Conclusions Smoking status does not appear to have a major impact on the efficacy or safety of UMEC/VI.
Funding GSK (201749; NCT03034915).

S102 EOSINOPHIL COUNTS AS A PREDICTOR OF FUTURE COPD EXACERBATIONS IN THE DYNAGITO TRIAL

[1]PMA Calverley, [2]C Jenkins, [3]JA Wedzicha, [4]A de la Hoz, [5]F Voß, [6]KF Rabe, [7]A Anzueto. [1]*Clinical Science Centre, Institute of Ageing and Chronic Disease, University of Liverpool, Liverpool, UK*; [2]*The George Institute for Global Health, Concord Clinical School, The University of Sydney, Sydney, Australia*; [3]*Respiratory Division, National Heart and Lung Institute, Imperial College London, London, UK*; [4]*Boehringer Ingelheim International GmbH, Ingelheim am Rhein, Germany*; [5]*Boehringer Ingelheim Pharma GmbH and Co. KG, Ingelheim am Rhein, Germany*; [6]*LungClinic Grosshansdorf, Grosshansdorf, Germany*; [7]*Department of Pulmonary Medicine and Critical Care, University of Texas Health Sciences Center and South Texas Veterans Health Care System, San Antonio, USA*

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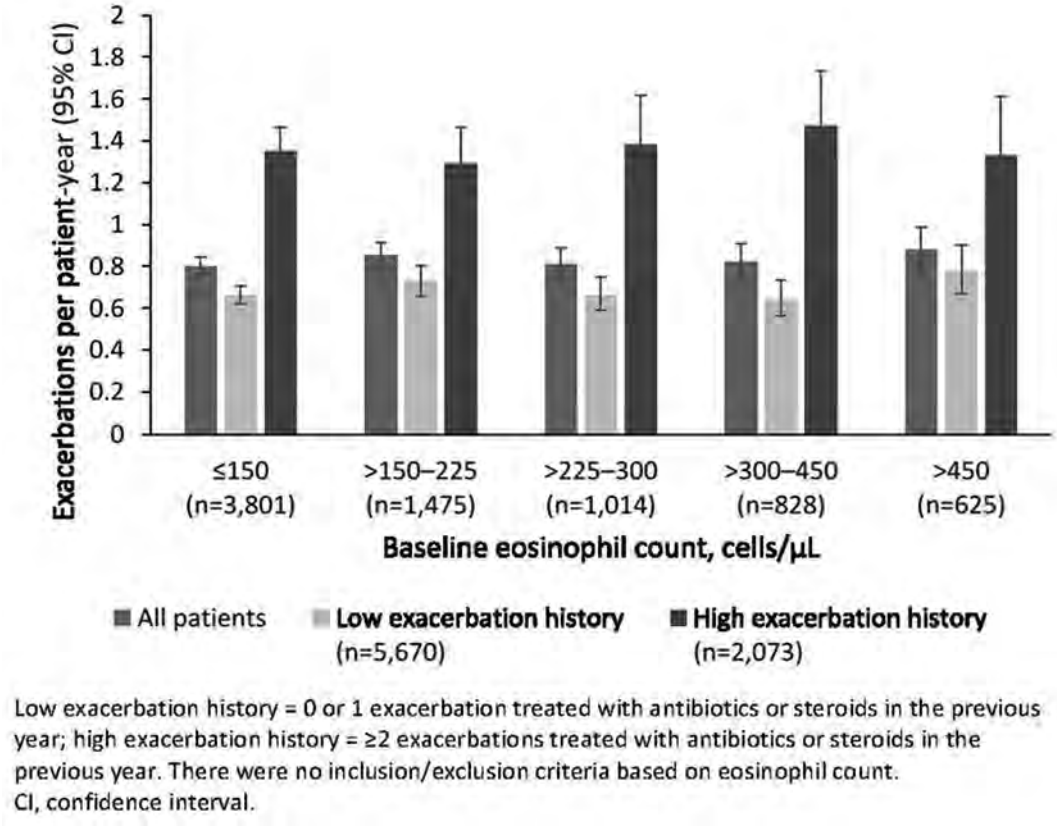
Background There is conflicting evidence from previous studies as to whether eosinophil counts predict the risk of future exacerbations in COPD.
Aims In this post hoc analysis, we investigated the link between baseline eosinophil count and moderate/severe exacerbation rates during the DYNAGITO trial.
Methods DYNAGITO was a 52-week, double-blind, randomised trial in patients with COPD with FEV_1 <60% predicted, at least 1 moderate/severe exacerbation in the previous year and no diagnosis of asthma (NCT02296138). Exacerbation rates were analysed using a negative binomial model adjusting for prognostic factors such as region and exacerbation history.
Results At baseline, 81% of patients had an eosinophil count ≤300 cells/μL and 49% had an eosinophil count ≤150 cells/μL. 65–76% of patients were receiving ICS across eosinophil subgroups. Similar rates of moderate/severe exacerbations were observed across eosinophil subgroups (figure). Rates were similar across eosinophil counts in patient subgroups with low or high exacerbation history.
Conclusions Relatively few patients had an eosinophil count >300 cells/μL, and there was no increase in exacerbation rates with increasing baseline eosinophil count in the total population, or in patients with low or high exacerbation history. In this population, many of whom were receiving ICS, exacerbation history, but not blood eosinophil count, was an important determinant of exacerbation risk.



Abstract S102 Figure 1 Adjusted rate of moderate-to-severe exacerbations by baseline eosinophil count (tiotropium and tiotropium/olodaterol treatment arms pooled)

S103 **USING SALIVARY PEPSIN AND THE REFLUX SYMPTOM INDEX AS OBJECTIVES MARKERS OF GASTRO-OESOPHAGEAL REFLUX TO PREDICT EXACERBATIONS OF COPD**

MS Nootigattu, RA Evans, MC Steiner, NJ Greening. *University of Leicester, Leicester, UK*

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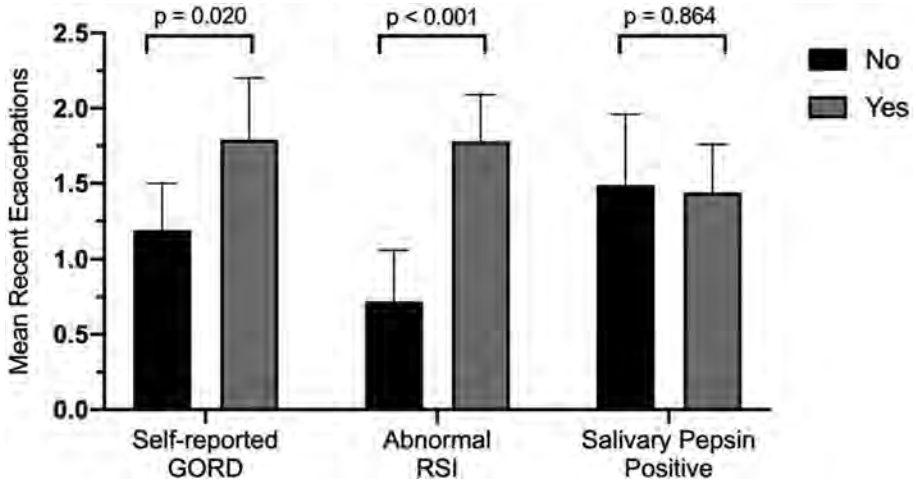
Introduction Self-reported gastro-oesophageal reflux disease (GORD) and associated laryngopharyngeal reflux (LPR) are common co-morbidities in patients with COPD and associated with an increased risk of exacerbations.[1 2] However, history of GORD or LPR are not routinely collected in these patients. Furthermore, silent reflux may predispose patients to exacerbations despite being asymptomatic.

We aimed to determine the prevalence of objectively assessed measures of GORD and LPR, using salivary pepsin (a non-invasive biomarker of GORD, including silent disease) and the Reflux Symptom Index (RSI) respectively, and whether these were associated with exacerbations of COPD.



Abstract S103 Figure 1 Number of exacerbations in the last three months in groups with and without self-reported GORD, abnormal RSI score (score >13) and salivary pepsin at baseline. Data shown are mean. Error bars are 95% CI. Comparison with independent t-test

Methods Patients were recruited to a prospective cohort study from a complex COPD clinic in a tertiary centre. At baseline, patients completed the RSI questionnaire and provided saliva samples to be tested for salivary pepsin (Peptest). Patient demographics and exacerbation history in the previous three months were also collected.

Results 96 patients were recruited (mean [SD] age 66.5 [9.1] yrs., FEV_1%predicted 42.2 [18.6]%, CAT score 21 [8]). Self-reported GORD was present in 43 (45%) patients, abnormal RSI in 67 (70%) patients and positive salivary pepsin in 59 (62%) patients. A greater proportion of patients had at least one exacerbation in the previous three months if they had an abnormal RSI (84% vs 48%, $p<0.001$) but not if they were positive for salivary pepsin (75% vs 70%, $p=0.644$). Mean number of exacerbations was significantly greater in groups with self-reported GORD and an abnormal RSI (Figure 1).

In a multivariate regression model, RSI was independently associated with an increased risk of having had an exacerbation in the last 3 months (OR: 5.01, $p=0.004$). No difference was seen with presence of salivary pepsin (OR:1.20, $p=0.739$) or self-reported GORD (OR: 2.39, $p=0.147$).

Conclusions Objectively measured GORD is common in patients with advanced COPD. Identification of LPR, using the RSI, is significantly associated with an increased risk of a previous exacerbation. Presence of salivary pepsin is not associated with increased risk of exacerbation. This observation needs to be validated for future exacerbation risk.

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S104 HOME BASED RESPIRATORY POINT OF CARE TESTING (R-POCTC) TO IMPROVE THE DIAGNOSIS AND MANAGEMENT OF COPD EXACERBATIONS IN THE COMMUNITY

[1]K Roy, [2]A Marau, [2]G Esmond, [2]M Buxton, [3]C Ciobanu, [4]C Cucciniello, [5]S Mengoni, [5]D Wellsted. *[1]West Hertfordshire NHS Trust, Hemel Hempstead, UK; [2]Central London Community Healthcare NHS Trust, Hemel Hempstead, UK; [3]Herts Valley Clinical Commissioning Group, Hemel Hempstead, UK; [4]Health Psychology; Herts Partnership University Foundation Trust, Hertford, UK; [5]University of Hertfordshire, Hatfield, UK*

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Introduction COPD exacerbations impose a major burden on patients and the NHS. They are often treated empirically with antibiotics and steroids, despite a large proportion being viral induced or non-infective.

We hypothesised that incorporation of R-POCTc within our integrated hospital at home service would improve quality of patient care by ensuring delivery of a more personalised management plan whereby treatment was guided by clinical testing.

Objectives To investigate whether Home R-POCTc for COPD facilitated:

1. Reduced antibiotic prescribing
2. Avoidance of hospital admission and ED attendance
3. Improved patient experience and quality of life (QOL).

Methods 42 patients underwent R-POCTc: CRP, procalcitonin (PCT) *(Finecare)* and a panel of 12 respiratory viruses and 4 atypical bacteria*(BioFire Film Array, Biomerieux Inc.)* were testedusing samples taken by nurses in patients' homes and then analyzed by them in a community hub.

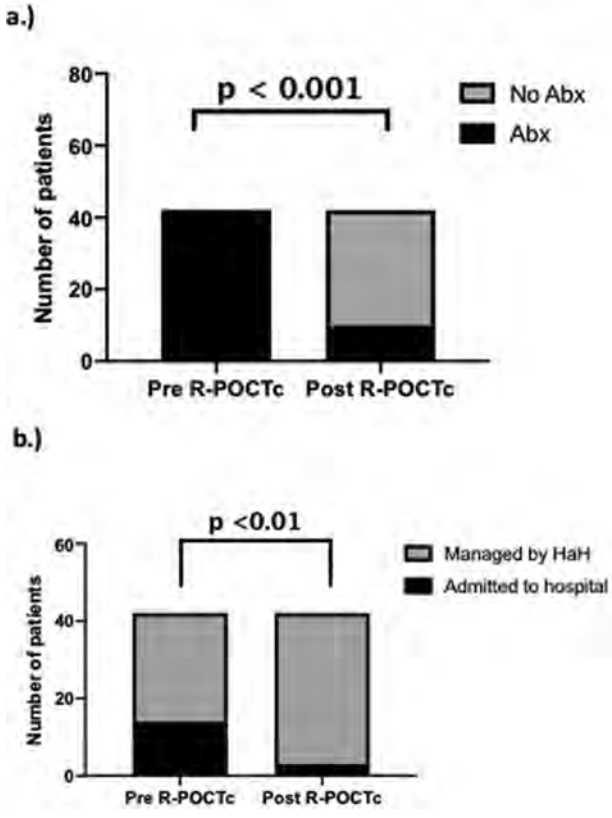
Outcomes in this patient cohort were compared before and after the implementation of R-POCTc. Patient reported experience measures (PREMs), health anxiety and QOL questionnaires were collected longitudinally.

Results Patients were COPD Gold stage C/D, MRC 3, mean FEV1 less than 50% with a mean of 4 exacerbations and 1 hospitalisation in the last year.

1. RPOCTc allowed antibiotics to be withheld in 32 patients who would have received this treatment at their previous exacerbation (figure 1a).
2. A significantly larger number of patients avoided hospital admission (figure 1b).
3. COPD assessment tool (CAT) scores showed that quality of life was significantly higher in the same group of patients after service implementation (mean difference -2.2, $p=0.002$).

Conclusion

- R-POCTc improves quality of care in severe COPD by delivering a safe, personalised approach, enhancing the patient experience and journey, by home testing and by reducing risks of inappropriate antibiotic prescribing, thereby **improving antimicrobial stewardship.**
- QOL was objectively better using R-POCTc. Patients found the **support and care provided at home (without recourse to hospital admission)** enhanced recovery from the exacerbation.
- Personalised decision-making gave **reassurance to patients and staff.**
- Patient involvement provided **empowerment, education and understanding about their condition.** This should help address the frequently high levels of anxiety within this group, which can precipitate exacerbations.



Abstract S104 Figure 1

S105 PARACRINE-MEDIATED TRANSFER OF MITOCHONDRIA BETWEEN AIRWAY SMOOTH MUSCLE CELLS

[1]A dela Cruz, [2]J Frankenberg Garcia, [2]C Michaeloudes, [2]P Bhavsar. [1]*Imperial College London, London, UK*; [2]*National Heart and Lung Institute, London, UK*

10.1136/thorax-2019-BTSabstracts2019.111

Background Mitochondria are cytoplasmic organelles which produce energy in the form of adenosine triphosphate (ATP) through oxidative phosphorylation. There is evidence of mitochondrial dysfunction in the airway smooth muscle cells (ASMCs) of patients with Chronic Obstructive Pulmonary Disease (COPD). This may contribute to the ASMC hypertrophy and/or hyperplasia observed in COPD lungs. Mitochondrial dysfunction includes decreased ATP production and increased production of mitochondrial reactive oxygen species. Transfer of mitochondria through tunnelling nanotubules (TNTs) and extracellular vesicles (EVs) has been demonstrated between various cell types and has beneficial effects including reducing aspects of mitochondrial dysfunction. Previously, our group reported mitochondrial transfer between ASMCs through TNTs. Therefore, I hypothesised that paracrine-mediated mitochondrial transfer also occurs between ASMCs via EVs.

Methods Primary human ASMCs from healthy ex-smokers were cultured. Donor cell mitochondria were either stained with MitoTracker Green or transfected with Cell-Light™ Mitochondria-green fluorescent protein and left to secrete mitochondria into the culture medium overnight. The conditioned media (CdM) was collected and transferred onto the recipient cells. The percentage of MitoTracker-positive recipient cells was quantified using flow cytometry. The recipient cells which received CdM from Cell-Light™-transfected donor cells were fixed and imaged with widefield microscopy.

Results A higher percentage of recipient cells were MitoTracker-positive when incubated overnight with CdM from donor cells compared to control (cells that did not receive CdM; 19.17% ± 7.08 vs 0.74% ± 0.36). Decreasing the donor cell secretion time to four hours led to a decrease in transfer (6.25% ± 4.10) compared to donors which secreted overnight (19.17% ± 7.08). However, decreasing the recipient uptake time to 4 hours did not affect the percentage of MitoTracker-positive cells (18.16% ± 6.02 vs 19.17% ± 7.08).

The recipient cells showed green fluorescence after incubation with CdM from Cell-Light™-transfected donor cells, demonstrating genuine transfer of mitochondria from the CdM.

Conclusion Paracrine-mediated mitochondrial transfer was demonstrated between ASMCs and was affected by donor cell secretion time. Transfection of donor cells with Cell-Light™ further confirmed paracrine-mediated transfer of mitochondria between ASMCs. Further work to characterise the EVs in the CdM is required to fully accept the hypothesis.

Improving outcomes in community acquired pneumonia

S106 REDUCING THE USE OF BROAD SPECTRUM ANTIBIOTICS IN COMMUNITY-ACQUIRED PNEUMONIA USING POINT-OF-CARE TESTING

O Burbidge, H Staniforth, S Ali, L Hollingshead, V Payne, G Cresswell, T Bewick. *United Hospitals of Derby and Burton, Derby, UK*

10.1136/thorax-2019-BTSabstracts2019.112

Background Antimicrobial resistance (AMR) is a matter of international importance. The UK government launched a 5 year plan to tackle AMR in 2019, aiming to reduce antibiotic use by 15%. NICE guidelines advocate routine microbiological testing only in patients admitted to hospital with community-acquired pneumonia (CAP) with a CURB65 score $\geq$2. We hypothesise that by introducing front-door comprehensive microbiological testing that a higher proportion of patients will get a microbiological diagnosis, enabling better streamlining of antibiotic regimens.

Methods Patients admitted with CAP at Royal Derby Hospital were prospectively reviewed over a 38 month period from February 2016. Comprehensive microbiological testing was attempted where possible within the first 24 hours of admission, comprising point-of-care urinary legionella and pneumococcal antigens, blood and sputum cultures. Influenza PCR was performed during influenza season.

All antibiotics prescribed during the admission (including discharge) were recorded. Narrow spectrum (NS) antibiotics were defined as beta-lactam, tetracycline or 1st generation cephalosporin monotherapy; broad spectrum (BS) antibiotics included co-amoxiclav, macrolides and fluoroquinolones. Days were recorded separately in cases where dual antibiotic therapy was used.

Results Of 1336 patients admitted with CAP, 375 (28.0%) received a positive microbiological diagnosis, compared with 37/324 (11.4%) in a pre-intervention cohort. Prior to comprehensive screening patients with CAP received a median of 9.5 days (IQR 4.9–13.0) of BS antibiotics compared with 7.8 days (3.3–12.2) after. Within the intervention group, patients with a positive pneumococcal diagnosis (n=265, 19.8%) received a median of 4.0 (IQR 1.5–7.8) days of BS antibiotic and 5.5 days (IQR 2.0–7.0) of NS antibiotic, compared with 8.8 (4.7–12.8) and 0.0 (0–4.3) days respectively for those with no positive microbiology. CURB65 scores were similar between the two groups (pneumococcal group, low severity 132/265 (49.8%); no diagnosis group 480/961 (49.9%)). Median co-amoxiclav use was 1.0 day (0–2.3) in the pneumococcal group compared with 3.3 days (0–6.3) in the group with no positive microbiology.

Conclusion Comprehensive microbiological testing results in a higher proportion of patients with a positive microbiological diagnosis, and is associated with lower prescribing of BS antibiotics.

S107 PREDICTORS OF 30 DAY READMISSION FOLLOWING HOSPITALIZATION WITH COMMUNITY ACQUIRED PNEUMONIA

[1]B Chakrabarti, [2]T Jenks, [3]S Lane, [2]J Higgins, [2]E Kanwar, [1]DG Wootton. *[1]University Hospital Aintree, Liverpool, UK; [2]Advancing Quality Alliance, Manchester, UK; [3]University of Liverpool, Liverpool, UK*

10.1136/thorax-2019-BTSabstracts2019.113

Background Patients admitted to hospital with Community Acquired Pneumonia (CAP) are at risk of readmission within 30 days of discharge. There is little UK evidence aiding healthcare professionals predict which CAP patients are at greatest risk of readmission.

Methodology This study analyzed the Advancing Quality Alliance (AQuA) Pneumonia database. (https://www.aquanw.nhs.uk/events/advancing-quality-pneumonia/80258.), a CAP Quality Improvement program in the Northwest of England from October 2016 to March 2019. 30-day readmission was defined as any admission for the same patient within 30 days of discharge following the index admission. Patient comorbidities were identified using ICD10 diagnosis codes in the patient spell.

Results A total of 12,144 adults (mean age 73 (SD16) years; 47% male) admitted with CAP were submitted to the AQ database during the study period. The in-hospital mortality was 14.7% (1791/12,144). Of the 10,353 cases discharged from hospital, 26% (2691) were readmitted within 30 days of discharge with 34% (913/2691) of readmissions being coded specifically due to Pneumonia. After applying multivariate analysis, the following factors emerged as significant predictors of 30 day readmission: a history of Chronic Kidney Disease (15.9% in those readmitted v 13.1% in those not readmitted), Congestive Cardiac Failure (16.8% v 13.9%), Cancer (16.2% v 9.7%), Ischaemic Heart Disease (12.7% v 11%), Diabetes with complications (1.4% v 0.9%) and Severe Liver Disease (0.4%v 0.2%). A longer index hospital stay was also associated with increased likelihood of 30 day readmission (median 6 (IQR 10) v 5 (9) days; $p<0.01$) whilst a background of Dementia was less likely to be associated with 30 day readmission being present in 5% of those readmitted at 30 days compared with 13.1% of those not readmitted ($p=0.01$).

Conclusion Over a quarter of those patients admitted to hospital with a diagnosis of Community Acquired Pneumonia are readmitted within 30 days of discharge. Key comorbidities such as Cardiac and Renal Disease appear to be significant drivers for readmission. Further studies are required to determine whether optimization of such comorbidity following hospitalization with CAP results in a reduction in readmission rates and improved clinical outcomes.

S108 PRIMARY CARE RE-CONSULTATION AFTER COMMUNITY ACQUIRED PNEUMONIA: A LARGE POPULATION-BASED COHORT STUDY

[1]V Baskaran, [2]WS Lim, [1]T McKeever. *[1]University of Nottingham, Nottingham, UK; [2]Nottingham University Hospitals NHS Trust, Nottingham, UK*

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Introduction There is paucity of information on the burden of disease during recovery from community acquired pneumonia (CAP). This study aims to describe healthcare re-consultation episodes within 30 days after a diagnosis of CAP.

Methods Adults aged ≥18 with the first CAP Read code recorded in Clinical Practice Research Datalink (CPRD) GOLD between July 2002 and June 2017 were included. Patients were followed up to 30 days from date on which CAP Read code was recorded (index date). Re-consultation was defined as recording of any medical Read codes (excluding admin-related codes) after the index date; re-consultation was counted as a single episode if there were multiple Read codes recorded in a day per patient. Statistical analyses were performed using Stata/MP15.

Results There were 135232 patients with CAP. Thirty-day mortality was 6.7% (n=9004). Excluding patients who died, 41.7% (n=52689) had re-consulted primary care at 30 days for any reason. In comparison to the 18–49 age group, the 50–64 (OR 1.35, 95% CI 1.30–1.40) and 65–74 (OR 1.32, 95% CI 1.27–1.37) age groups were more likely to re-consult whilst those ≥ 85 (OR 0.65, 95% CI 0.64–0.68) were less likely to re-consult. Females were less likely to re-consult (OR 0.95, 95% CI 0.93–0.98). Compared to never smokers, current smokers (OR 1.14, 95% CI 1.11–1.18) and ex-smokers (OR 1.19, 95% CI 1.16–1.23) were more likely to re-consult.

Of those who re-consulted, 43.7% (n=23036) re-consulted primary care twice or more. Forty-one percent (n=21533) of these patients re-consulted for a respiratory reason whilst a low proportion re-consulted for a cardiac reason (8.3%, n=4359). At re-consultation, 26.8% (n=14138) received a further course of antibiotics. Most of these patients (77.5%, n=10955) received one course of antibiotics within 30 days of CAP. Penicillins (39.7%, n=7820) and macrolides (25.9%, n=5088) were the commonest antibiotics prescribed.

Conclusion A significant proportion of patients, particularly those aged 50–75 years re-consult primary care after CAP. More than one re-consultation is common, highlighting the burden on primary care. When re-consultation occurs, >25% patients are prescribed a further course of antibiotics, therefore emphasizing the importance of promoting antibiotic stewardship.

S109 HUMAN METAPNEUMOVIRUS LOWER RESPIRATORY TRACT INFECTION IN ADULTS: CHEST CT IMAGING FEATURES AND CORRELATION WITH CLINICAL OUTCOMES

[1]LA Marinari, [2]MA Danny, [3]WT Miller Jr. *[1]The Bryn Mawr Hospital, Bryn Mawr, Pennsylvania, USA; [2]Bryn Mawr College, Bryn Mawr, Pennsylvania, USA; [3]University of Pennsylvania, Philadelphia, Pennsylvania, USA*

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Human metapneumovirus (hMPV) has increasingly been identified as an important, worldwide cause of lower respiratory tract infections (LRTI) in adults. Our goals were to determine the chest CT imaging features of LRTI due to hMPV and to correlate chest CT imaging features with clinical outcomes. We retrospectively reviewed the medical records and chest CT images of 100 adults collected over 33 months at 4 community hospitals in the northeast US. Chest CT images were reviewed by an experienced thoracic radiologist. Study subjects satisfied 4 criteria: 1. acute lower respiratory tract symptoms, 2. positive reverse-transcriptase polymerase chain reaction (RT-PCR) assay of nasopharyngeal swab for hMPV, 3. chest CT within 7 days of positive RT-PCR assay for hMPV, 4. no other pulmonary infection or other pulmonary disease that

might interfere with chest CT interpretation. On review, 16/100 had focal lung consolidation, 30/100 had multifocal lung consolidation, 31/100 had bronchial wall thickening, 44/100 had ground glass opacities and 62/100 had tree-in-bud opacities. Multifocal lung consolidation was associated with increased frequency (9/30, 30%) of treatment with invasive or non-invasive ventilatory support ($p<.01$). No other chest CT finding was associated with any studied clinical outcome ie., hypoxemia requiring supplementary oxygen at discharge, discharge to skilled nursing facility or hospital re-admission within 30 days of discharge. Review of follow-up chest CT exams in 30 patients (7 with multifocal consolidation) revealed resolution of the initial findings. Healthcare providers should be aware that hMPV can cause severe LRTI manifest on chest CT as multifocal lung consolidation which frequently requires treatment with invasive or non-invasive ventilatory support.

TB: from diagnosis to treatment

S110 CONCISE WHOLE BLOOD TRANSCRIPTIONAL SIGNATURES FOR INCIPIENT TUBERCULOSIS: A SYSTEMATIC REVIEW AND INDIVIDUAL PARTICIPANT DATA META-ANALYSIS

[1]RK Gupta, [2]CT Turner, [2]C Venturini, [1]H Esmail, [1]MX Rangaka, [1]A Copas, [3]M Lipman, [1]I Abubakar, [2]M Noursadeghi. *[1]UCL Institute for Global Health, London, UK; [2]UCL Division of Infection and Immunity, London, UK; [3]Royal Free Hospital NHS Trust, London, UK*

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Background Blood transcriptional signatures may predict risk of tuberculosis (TB). While multiple candidate signatures for active and incipient TB have been identified, it is not known which signature performs best, or whether any meets World Health Organization target product profile (WHO TPP) benchmarks, for incipient TB biomarkers.

Methods We performed a systematic review to identify candidate mRNA signatures for incipient TB, along with genome-wide transcriptomic datasets with sampling prior to TB diagnosis. We reconstructed each signature model and directly compared signature performance for diagnosis of incipient TB in the pooled RNAseq dataset, stratified by interval to disease, in a one-stage individual participant data meta-analysis (IPD-MA).

Results We tested 17 candidate mRNA signatures in a pooled dataset from four studies conducted in South Africa, Ethiopia, The Gambia and the UK. We included 1,126 samples, with 183 samples from 127 incipient TB cases, Eight signatures (comprising 1–25 transcripts), predominantly reflecting interferon-inducible gene expression, had equivalent diagnostic accuracy for incipient TB over a two-year period with areas under the receiver operating characteristic curves ranging from 0.70 (95% confidence interval 0.64–0.76) to 0.77 (0.71–0.82). The sensitivity of all eight signatures declined with increasing disease-free time interval. Using a threshold derived from two standard deviations above the mean of uninfected controls, giving specificities of >90%, the eight signatures achieved sensitivities of 24.7–39.9% over 24 months, rising to 47.1–81.0% over 3 months. Based on pre-test probability of 2%, the eight signatures achieved positive predictive values from 6.8–9.4% over 24 months, rising to 11.1–14.3% over 3 months. When using biomarker thresholds maximising sensitivity and specificity with equal weighting to both, no signature met the minimum WHO TPP parameters for incipient TB biomarkers over a two-year period. Sensitivity analyses using two-stage IPD-MA with random effects produced similar AUC, sensitivity and specificity estimates.

Conclusions Multiple transcriptional signatures perform with equivalent diagnostic accuracy for incipient TB. These biomarkers reflect short-term risk of TB and only exceed WHO benchmarks if applied to 3–6 month intervals. A screening strategy that incorporates serial testing on a 3–6 monthly basis among carefully selected target groups may be required for optimal implementation of these biomarkers.

S111 FDG-PET/CT APPEARANCES IN MDR-TB PATIENTS WITH RESIDUAL CT ABNORMALITIES

[1]M Park, [1]D Dave, [1]G Russell, [1]L Martin, [2]A Lalvani, [1]T Barwick, [1]OM Kon. *[1]Imperial College Healthcare NHS Trust, London, UK; [2]Tuberculosis Research Centre, NIHR Health Protection Research Unit, Imperial College London, London, UK*

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Introduction Patients with MDR-TB may have residual imaging abnormalities after treatment and we have used FDG-PET/CT scanning nearing end of treatment to guide clinical treatment. A previous study reported the presence of MTB mRNA correlates to FDG-PET/CT avid lesions in TB at the end of treatment and in another study FDG-PET/CT has been shown to be a useful biomarker at 2 months of MDR-TB treatment.

Aims To describe near end of MDR-TB treatment FDG-PET/CT appearances performed 2010–2019 in a MDR-TB centre and correlate treatment outcomes.

Methods Retrospective observational study of 53 MDR-TB patients treated at a tertiary MDR-TB centre of which 21 patients had FDG-PET/CT scans pre-treatment completion to assess persistent CT abnormalities. A FDG-PET/CT analysis was performed visually (6 point visual score) and quantitatively (SUVmax) by a single experienced observer. The CT component of the FDG-PET/CT was compared to the baseline CT scan. Outcome was documented from clinical, microbiological and bronchoalveolar lavage (BAL) data.

Abstract S111 Table 1 Results summary for visual score on FDG-PET/CT

Visual Score on FDG-PET/CT	Lung Parenchyma	Thoracic Nodes	Extra-Pulmonary
None	3	12	19
Minimal (> background lung but <MBP*)	4	0	0
Mild (>MBP but < background liver)	2	0	0
Moderate (similar to background liver)	4	0	0
High (>background liver but < 2× background liver)	6	5	1 (Cervical lymph node)
Very High (>2 x background liver)	3	3	1 (Bone, cerebral, abdominal lymph node)
Total	21	21	21

*MBP=mediastinal blood pool

Results The FDG-PET/CT cohort (n=21, 15 male, average age of 38 years) all had pulmonary TB with 4 having additional extra-pulmonary disease. Initial CT scans showed nodules (95%), cavities (74%), tree-in-bud (90%), and mediastinal/hilar lymphadenopathy (85%). One case had cervical nodal disease, another had bone and cerebral involvement and two further cases had cerebral involvement.

Compared to baseline CT scans available all repeat studies showed improvement. Nine cases (43%) had high or very high visual FDG-PET/CT scores (table 1).

7 of the 9 patients with high or very high visual scores had FDG-PET/CT directed BALs and all were AFB and culture negative. 3 patients had a positive non-mycobacterial microbiological result. All patients completed treatment and none had disease recurrence with an average follow-up period of 17 months in those still being followed up.

Conclusion There is a mixed FDG-PET/CT pattern near end of MDR-TB treatment despite overall improvement in the CT appearances. 43% cases had high or very high residual FDG-PET/CT visual scores, but none of our patients relapsed during their follow-up period. In a subset of patient with FDG-PET/CT directed BALs none grew MTB but 3 had a positive non-mycobacterial microbiological results.

S112 DIAGNOSTIC ACCURACY OF XPERT ULTRA FOR THE DETECTION OF MTB IN BRONCHOALVEOLAR LAVAGE SAMPLES FOR PULMONARY TUBERCULOSIS IN A TERTIARY TB CENTRE

M Park, G Satta, M Coleman, L Martin, G Russell, OM Kon. *Imperial College Healthcare NHS Trust, London, UK*

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Introduction The emergence of the new rapid polymerase chain reaction (PCR) test Xpert Ultra (Cepheid, Sunnyvale, CA, USA) has been shown to be more sensitive compared to smear microscopy as well as to the previous Xpert MTB/RIF for the detection of *Mycobacterium tuberculosis* (MTB) in sputum. This has not been validated in bronchoalveolar lavage (BAL) samples for pulmonary TB.

Aims To analyse the diagnostic accuracy of Xpert Ultra for the detection of MTB in BAL samples for pulmonary tuberculosis against conventional modalities and against a clinical diagnosis of TB in a tertiary centre.

Method A retrospective data analysis of 213 BAL samples collected from January 2018 to 2019 from a tertiary TB centre of which the results for Xpert Ultra, smear microscopy, culture and clinical outcomes were reviewed. Patient demographics and clinical phenotypes were collected from patient records and the London TB Registry. This was correlated to clinical diagnosis and treatment outcomes.

Results A total of 1008 Xpert Ultra were performed for possible TB of which 213 were in BAL samples. For these, the mean age was 53 years (range 8 to 91), with 132 males, 81 females. There were 15 patients with HIV and 4 with previous TB in this cohort.

The diagnostic accuracy tests are summarised in table 1.

A total of 19 patients were culture positive with the mean day to culture being 17.4 days (IQR 12–21) of which 14 were positive for Xpert Ultra whereas only 10 were positive for smear. 2 'trace' patient results were ultimately culture positive, one being smear negative and the other being smear positive but with isoniazid mono-resistance. 1 had MDR-TB which was Xpert Ultra positive but smear negative hence Xpert Ultra allowed a substantive lead time to MDR-TB treatment prior to culture positivity and subsequent sensitivities.

Conclusion Xpert Ultra offers a point-of-care diagnostic test for MTB as well as rifampicin resistance in sputum samples but it also appears to offer a rapid and significant diagnostic advantage over smear in BAL samples in both culture proven and clinically defined pulmonary TB.

Abstract S112 Table 1 Summary of the Diagnostic Accuracy Results

	Sensitivity%	Specificity%	Positive Predictive Value	Negative Predictive Value
Xpert Ultra vs culture	77.7	100	100	98.5
	95% CI 52.4 to 93.6	95% CI 98.1 to 100		95% CI 98.0 to 99.1
Smear vs culture	58.0	99.0	84.6	96.0
	95% CI 33.5 to 79.8	95% CI 96.3 to 99.9	95% CI 56.8 to 95.8	95% CI 91.5 to 97.7
Xpert Ultra vs clinical diagnosis	60.9	100	100	95.3
	95% CI 38.5 to 80.3	95% CI 98.0 to 100		95% CI 92.5 to 97.2
Smear vs clinical diagnosis	50.0	99.5	92.3	99.5
	95% CI 29.1 to 70.9	95% CI 97.0 to 100	95% CI 62.0 to 98.9	95% CI 91.0 to 95.8
Culture vs clinical diagnosis	72.0	100	100	96.3
	95% CI 50.6 to 87.9	95% CI 98.0 to 100		95% CI 93.3 to 98.0

*95% Confidence Interval (CI) was calculated using Clopper-Pearson method

S113 PULMONARY DRUG-RESISTANT TUBERCULOSIS AND SURGERY: REPORT OF 39 PATIENTS TREATED IN A TERTIARY CARE HOSPITAL IN MUMBAI

[1]E Intini, [2]J Mullerpattan, [2]G Kishore, [2]K Malu, [2]D Rana, [2]T Sarkar, [2]H Wagh, [2]S Ganatra, [2]R Amale, [2]ZF Udwadia. *[1]Catholic University of Sacred Heart, Gemelli Hospital Foundation, Rome, Italy; [2]P.D. Hinduja Hospital and Medical Research Centre, Mumbai, India*

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Background Drug resistant pulmonary TB has poor outcomes despite prolonged treatment. Surgery is an option in DR-PTB patients with localized cavitary disease having adequate pulmonary reserve.[1]

Methods This is a retrospective analysis of patients with pulmonary DR-TB who underwent lung resection surgery between

2007 and 2018 at a single private tertiary care hospital in Mumbai. All patients received chemotherapy preoperatively and postoperatively. The indications for surgery included failure of medical treatment or persistent cavity with high probability of relapse. Patient demographic data, clinical characteristics, surgical procedures and surgical outcomes were studied.

Results A total of 39 patients were enrolled from a single private hospital in Mumbai. Of these, there were 26 female and 13 males, with a mean age of 31 years and a mean BMI of 17 kg/m2. DR-TB was diagnosed on culture and drug susceptible test, showing 13 had XDR-TB, 19 had MDR-TB + fluoroquinolone resistance and 7 had MDR-TB. The lung involvement was evaluated on Chest CT scan, using the Timika Score. 61% of patients presented a left lung involvement, 35% right involvement and 69% had cavities. The type of surgery performed is given in the table 1. For outcome evaluation, culture status post-surgery and at the end of treatment were considered. A positive outcome was shown in 58% of patients, in particular 46% among XDR- TB cases, 68% in pre-XDR group and 71% in MDR-TB. Postoperative complications were observed in 4 patients only; 2 showed surgical wound infection and 1 patient had the left vocal cord palsy. One patient had a bronchopleural fistula post left pneumonectomy for which he required thoracoplasty.

Abstract S113 Table 1 Type of Pulmonary Resection

Type of lung surgery	MDR TB 7 (17%)	Pre-XDR TB 19 (49%)	XDR TB No 13 (34%)
Right upper lobectomy	1 (14%)	3 (15%)	3 (23%)
Right lower lobectomy		2 (10%)	1 (7%)
Right pneumonectomy		2 (10%)	1 (7%)
Left upper lobectomy	1 (14%)	6 (31%)	1 (7%)
Left lower lobectomy		1 (5%)	1 (7%)
Left pneumonectomy	3 (42%)	5 (26%)	5 (38%)
Right upper and medium lobectomy			1 (7%)
Left Pneumonectomy and Thoracoplasty	1 (14%)		
Left Upper lobectomy and Thoracoplasty	1(14%)		

MDR TB: multidrug-resistant tuberculosis; pre-XDR TB: MDR-TB associated with resistance to FQ or a second-line injectable; XDR TB: extensive drug-resistant tuberculosis.

Conclusions As the numbers of drugs need to treat DR-TB are limited, surgery has an important adjunctive role. Pulmonary resection in combination with appropriate chemotherapy in carefully selected patients appears to be an effective measure with improved outcomes.

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Clinical care in COPD

S114 NON-INVASIVE ASSESSMENT OF LUNG INHOMOGENEITY FOR EARLY IDENTIFICATION OF COPD

[1]NMJ Smith, [2]S Magor-Elliot, [1]J Redmond, [1]GAD Ritchie, [2]PA Robbins, [3]N Petousi, [3]NP Talbot. *[1]Department of Chemistry, Physical and Theoretical Chemistry Laboratory, University of Oxford, Oxford, UK; [2]Department of Physiology, Anatomy and Genetics, University of Oxford, Oxford, UK; [3]Nuffield Department of Clinical Medicine, University of Oxford, Oxford, UK*

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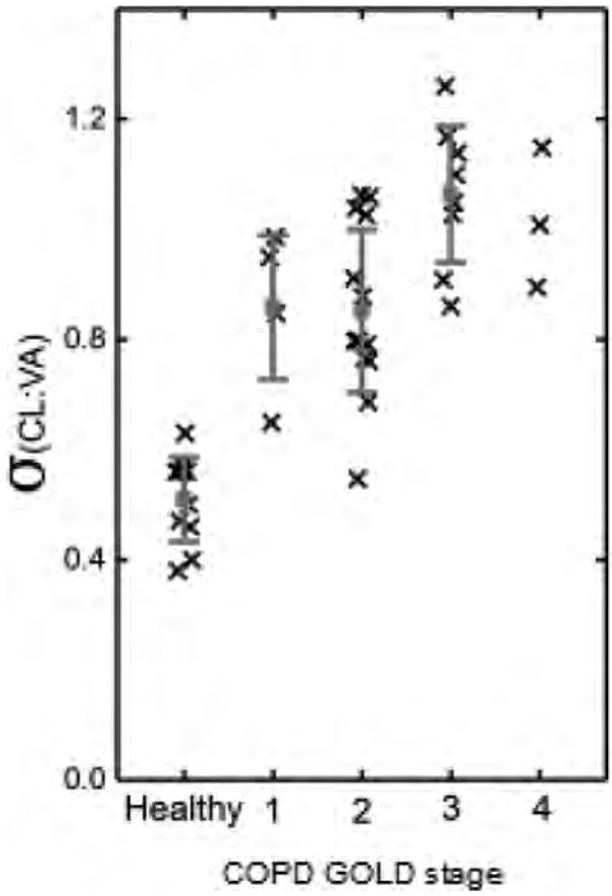
Background The current Global Initiative for Chronic Obstructive Lung Disease (GOLD) classification of COPD is based upon FEV1. However, FEV1 reflects predominantly large airway dysfunction, whereas COPD is primarily a disease of the small airways. FEV1 is therefore relatively insensitive to early disease, making early diagnosis and intervention difficult. In contrast, lung inhomogeneity is an early feature of obstructive lung disease. We assessed a novel non-invasive method for estimating lung inhomogeneity in patients with COPD.

Methods Thirty patients with COPD (age 67±8 years, mean ±SD) and ten healthy controls (70±4 years) each underwent at least one nitrogen multi-breath washout test (10 min breathing air, 5 min breathing O_2) during normal relaxed



Abstract S114 Figure 1 Non-invasive assessment of lung inhomogeneity for early identification of COPD

breathing. Respired gas composition was measured every 10 msec using a highly-accurate in-airway gas analyser based on laser absorption spectroscopy. A mathematical model of the lung was subsequently fitted to the entire respiratory gas profile to estimate the distribution of lung compliance, relative to lung volume, across 125 theoretical lung units. The standard deviation of this distribution (σCL:VA) is a measure of regional variation in lung compliance.

Results The test was well-tolerated. Figure 1 demonstrates the relationship between GOLD stage, defined by FEV1, and our novel index of inhomogeneity, σCL:VA. Compared with healthy controls, σCL:VA was elevated 29 of the 30 patients with COPD. Importantly, σCL:VA was significantly elevated in patients with GOLD stage 1 (0.86±0.13 vs. 0.51±0.08; $p<0.0001$, unpaired t-test), despite the FEV1 being within the normal range (>80% predicted) in this group.

Conclusion These data confirm that a novel non-invasive method for assessing lung inhomogeneity is well-tolerated in patients with COPD across a wide range of disease severity, and that it is feasible in an outpatient setting. The parameter σCL:VA shows promise as an early marker of small airways dysfunction in COPD, which may identify disease earlier than spirometry. Future work will assess the relationship between σCL:VA and clinical measures of disease severity in COPD, and study changes with interventions.

S115 HOW DO THE UK COUNTRIES COMPARE FOR CHRONIC OBSTRUCTIVE PULMONARY DISEASE PRIMARY CARE?

[1]PW Stone, [1]JR Feary, [2]CM Roberts, [1]JK Quint. *[1]Imperial College London, London, UK; [2]UCLPartners, London, UK*

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Background The four UK devolved governments are responsible for healthcare in their respective countries, meaning that healthcare commissioning and incentivisation can differ between them. Wales is the only country to receive national

Abstract S115 Table 1 Odds ratios for receipt of element of COPD care in each UK country relative to Wales

	Odds Ratio (95% confidence interval)								
	Crude			Age and sex adjusted			Age, sex, and comorbidities* adjusted		
Confirmation of airway obstruction[1]									
Wales	1			1			1		
England	0.52	(0.44	- 0.60)	0.52	(0.44	- 0.60)	**0.51**	**(0.44**	**- 0.60)**
Scotland	0.30	(0.24	- 0.37)	0.30	(0.24	- 0.37)	**0.29**	**(0.23**	**- 0.36)**
Northern Ireland	0.42	(0.31	- 0.58)	0.41	(0.30	- 0.57)	**0.42**	**(0.31**	**- 0.58)**
Chest X-ray confirmation of diagnosis [2]									
Wales	1			1			1		
England	1.07	(0.97	- 1.18)	1.08	(0.98	- 1.19)	1.08	(0.98	- 1.19)
Scotland	0.50	(0.44	- 0.56)	0.50	(0.44	- 0.56)	**0.49**	**(0.43**	**- 0.55)**
Northern Ireland	1.23	(1.04	- 1.46)	1.23	(1.04	- 1.45)	1.18	(0.99	- 1.39)
Record of MRC grade in the past year									
Wales	1			1			1		
England	1.41	(1.35	- 1.48)	1.44	(1.37	- 1.51)	**1.43**	**(1.37**	**- 1.50)**
Scotland	0.68	(0.65	- 0.72)	0.70	(0.67	- 0.74)	**0.68**	**(0.65**	**- 0.72)**
Northern Ireland	1.98	(1.81	- 2.16)	2.06	(1.88	- 2.25)	**2.02**	**(1.84**	**- 2.21)**
Record of smoking status in the past year									
Wales	1			1			1		
England	1.27	(1.20	- 1.35)	1.29	(1.21	- 1.37)	**1.31**	**(1.23**	**- 1.39)**
Scotland	0.81	(0.76	- 0.86)	0.80	(0.75	- 0.85)	**0.81**	**(0.76**	**- 0.87)**
Northern Ireland	1.20	(1.08	- 1.33)	1.17	(1.05	- 1.30)	**1.18**	**(1.06**	**- 1.31)**
Receipt of the seasonal influenza immunisation in the last year									
Wales	1			1			1		
England	1.22	(1.16	- 1.28)	1.25	(1.19	- 1.31)	**1.28**	**(1.22**	**- 1.34)**
Scotland	1.02	(0.96	- 1.07)	1.11	(1.05	- 1.17)	**1.17**	**(1.11**	**- 1.24)**
Northern Ireland	1.07	(0.99	- 1.17)	1.19	(1.09	- 1.29)	**1.19**	**(1.09**	**- 1.30)**
Smoking cessation treatment									
Wales	1			1			1		
England	0.89	(0.82	- 0.97)	0.90	(0.83	- 0.99)	**0.91**	**(0.83**	**- 0.99)**
Scotland	0.65	(0.58	- 0.72)	0.64	(0.57	- 0.71)	**0.62**	**(0.56**	**- 0.69)**
Northern Ireland	1.46	(1.28	- 1.66)	1.40	(1.23	- 1.60)	**1.33**	**(1.16**	**- 1.52)**
Referral to pulmonary rehabilitation									
Wales	1			1			1		
England	0.10	(0.09	- 0.11)	0.10	(0.09	- 0.12)	**0.10**	**(0.09**	**- 0.11)**
Scotland	0.12	(0.11	- 0.14)	0.12	(0.11	- 0.14)	**0.12**	**(0.11**	**- 0.14)**
Northern Ireland	0.23	(0.20	- 0.26)	0.22	(0.19	- 0.25)	**0.22**	**(0.19**	**- 0.25)**

[1]Confirmation of airway obstruction defined as record of post-bronchodilator $FEV_1/FVC < 0.7$

[2]Chest X-ray confirmation of diagnosis defined as record of a chest X-ray 6 months prior to or after COPD diagnosis

*Comorbidities: diabetes, hypertension, coronary heart disease, stroke, heart failure, painful condition, lung cancer, asthma, bronchiectasis, depression, anxiety, severe mental illness, and osteoporosis

audits of COPD primary care. Although desired, a COPD primary care audit has not been possible in other UK countries because of patient confidentiality concerns. This study aimed to use a large UK primary care database to investigate how the three UK countries without audits compare to Wales for COPD primary care.

Methods The 2017 Welsh COPD Primary Care Audit was replicated in the Clinical Practice Research Datalink (CPRD), generating a COPD cohort for the period 01/04/2015 to 31/03/2017. Logistic regression was used to explore association between country and seven outcomes (**table 1**). Logistic regression models were adjusted for age, sex, and comorbidities (diabetes, hypertension, coronary heart disease, stroke, heart failure, painful condition [repeat analgesic prescriptions], lung cancer, asthma, bronchiectasis, depression, anxiety, severe mental illness [psychotic disorders], and osteoporosis).

Results Results of audit analyses in Welsh CPRD practices were comparable to the 2017 Primary Care Audit. Results of logistic regression are presented as odds ratios relative to Wales (**table 1**). English, Scottish, and Northern Irish (NI) COPD patients were significantly less likely to have confirmation of airway obstruction and a pulmonary rehabilitation (PR) referral, but were significantly more likely to have the influenza immunisation. Scottish patients were significantly less likely to have chest X-ray confirmation of diagnosis, an MRC grade, or record of smoking status. English and NI patients were significantly more likely to have a record of MRC grade and smoking status. English and Scottish patients were significantly less likely to receive smoking cessation treatment, whereas NI patients were significantly more likely to receive it.

Conclusion There is a shortfall in all UK countries in delivering aspects of COPD care, and this seems to be particularly pronounced in Scotland. More favourable results from Wales may reflect better adherence to national guidelines or better recording of data in response to participation in national audits. Low levels of PR referral from UK countries other than Wales should be investigated and addressed.

S116 THE QUALITY OF COPD PATIENT CARE – OUTCOMES FROM THE BRITISH LUNG FOUNDATION PATIENT PASSPORT

[1]KEJ Philip, [2]S Gaduzo, [3]J Rogers, [3]M Laffan, [1]NS Hopkinson. *[1]National Heart and Lung Institute, Imperial College London, London, UK; [2]Primary Care Respiratory Society, Solihull, UK; [3]British Lung Foundation, London, UK*

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Aim The British Lung Foundation COPD Patient Passport www.blf.org.uk/passport was developed as a resource to help patients with the condition and clinicians to consider the care they had received and to identify essential omissions. We aimed to use the online data collected to evaluate the delivery of COPD care in the UK from a patient perspective.

Abstract S116 Table 1 Question Responses

	Yes (%)	No (%)	Not sure (%)	No answer (%)
Q1: My diagnosis of COPD was confirmed with a breathing test called spirometry.	81.0% (n=33,845)	8.2% (n=3,442)	10.3% (n=4302)	0.4%
Q2: I understand my COPD. My doctor or nurse has explained where to find information, advice and emotional support	41.2% (n=17,211)	37.5% (n=12,664)	20.5% (n=8,575)	0.8% (n=319)
Q3: I get support to manage my care, and have agreed a written plan with my doctor or nurse about how I will manage my COPD.	24.1% (n=10,048)	61.4% (n=25,650)	13.8% (n=5,750)	0.8% (321)
Q4: I contact my GP, nurse or pharmacist to get a free flu vaccination each year. I have also had the one-off pneumonia jab	75.7% (n=32,628)	19.2% (n=8,005)	4.3% (n=1,802)	0.8% (n=334)
Q5: If I smoke, I am offered support and treatment to stop every time I meet my doctor or nurse about my COPD (n=14,395 after removal of non-smokers	67.2% (n=10,043)	21.4% (n=3,200)	9.3% (n=1,387)	2.1% (n=310)
Q6: I know the importance of keeping active and eating well.	82.5% (n=34,438)	6.4% (n=2,671)	10.3% (n=4,315)	0.8% (n=345)
Q7: I have discussed pulmonary rehabilitation.	33.6% (n=14,012)	56.8% (n=23,742)	8.8% (n=3,693)	0.8% (n=322)
Q8: I have received advice about ongoing exercise and nutrition.	37.9% (n=15,831)	52.7% (n=22,024)	8.4% (n=3,514)	1.0% (n=400)
Q9: I know what all my medicines and inhalers are for and when to take them. I ask my doctor, nurse or pharmacist if I'm not sure.	78.8% (n=32,915)	10.4% (n=4,338)	9.8% (n=4098)	1.0% (n=418)
Q10: My health care professional reviews how I use my inhaler at least once a year. I ask my pharmacist if I have questions.	58.8% (n=24,572)	30.8% (n=12,883)	9.4% (n=3,913)	1.0% (n=401)
Q11: I can spot the signs of a flare-up. This is sometimes called an exacerbation and can be the start of a chest infection	53.0% (n=22,137)	24.3% (n=10.147)	21.8% (n=9,112)	0.9 (n=373)
Q12: If I have a flare-up, I know who to contact at any time and what medicines to take. I have these medicines at home	48.1% (n=20,064)	35.3% (n=14,742)	15.6% (n=6513)	1.1% (n=450)
Q13: I see my nurse or doctor at least once a year to review my health, my care and my treatment, and have time to discuss all the points mentioned previously.	69.5% (n=29,046)	18.0% (n=7,496)	11.3% (n=4,734)	1.2% (n=493)
Composite total score (mean percentage positive response)	57.9%			

Method Each patient passport consists of 13 questions relating to key aspects of COPD care including: spirometry confirmation of diagnosis, understanding their diagnosis, support and a written management plan, vaccinations, smoking cessation, physical activity, exercise, eating well, pulmonary rehabilitation, exacerbations, medications, and yearly reviews. Data were presented as proportions with an answer correspond to good care, and plotted over time to identify trends.

Results After removing duplicates, data from 41,769 entries, completed online between November 2014 and April 2019, were available (table 1). Only 24% reported receiving support to manage their care and a written action plan; only 53% could spot the signs of an acute exacerbation; only 34% had discussed pulmonary rehabilitation; and only 41% stated they understand their COPD, and their doctor or nurse has explained where to find information, advice and emotional support. A quarter reported not receiving flu vaccination and a third of people with COPD who smoke were not offered support to quit smoking. Even the strongest areas including a spirometry-confirmed diagnosis, and knowing the importance of being active and eating well, achieved only around 80%. Most responses remained stable over time or got slightly worse.

Conclusion Analysis of response to the BLF COPD Patient Passport identifies substantial gaps in the delivery of care. There is little evidence that there has been improvement over the 5 years covered by the data. These patient perspective data provide a unique yet commonly overlooked perspective on care quality, and highlight the need for new approaches if the ambitions set out in the NHS Long Term Plan are to be met.

S117 CHRONIC OBSTRUCTIVE PULMONARY DISEASE EXACERBATIONS – CHARACTERISING THE RELATIONSHIP BETWEEN SYMPTOM SEVERITY AND AIRWAY INFLAMMATION

[1]A Halner, [2]C Brightling, [1]M Bafadhel. *[1]Respiratory Medicine Unit, Nuffield Department of Medicine, University of Oxford, Oxford, UK; [2]Institute for Lung Health, University of Leicester, Leicester, UK*

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Background Exacerbations of COPD are heterogeneous, with respect to symptoms and inflammation. We investigate the relationship between patient symptom profiles and inflammatory profiles at exacerbation.

Methods Visual Analogue Scale (VAS)-based symptom data were collected at exacerbation along with inflammatory cell data from a previous study.[1] Spearman's rho for the correlation between VAS symptoms and airways inflammation was performed. Principal components analysis (PCA) and K-means cluster analysis were performed on selected symptom variables to identify patient subgroups based on symptoms.

Results VAS sputum production, VAS sputum purulence and VAS cough at exacerbation correlated with sputum CCL17 (r_s= -0.39, -0.34 and -0.28 respectively) and sputum CCL13 (r_s= -0.28, -0.27 and -0.28 respectively) at exacerbation. VAS sputum production and purulence correlated with sputum IL5 (r_s= -0.30 and -0.29) and correlated with sputum% neutrophils (r_s= +0.31 in both). VAS sputum purulence correlated with sputum IL1B, TNFα, TNFR1/R2 (r_s= +0.30, +0.30, +0.31 and +0.29 respectively).

Two principal components described most of the variation in the symptoms data. The highest loading for these components were VAS sputum production and dyspnoea. Two clusters based on VAS sputum production and VAS dyspnoea were identified (table 1). Cluster 1 was characterised by a trend to more neutrophilic inflammatory profile (e.g. higher sputum% neutrophil) and less eosinophilic inflammatory profile (e.g. lower sputum IL5) compared to cluster 2.

Abstracs S117 Table 1 Examples of differing sputum inflammatory profiles between exacerbations in the two VAS symptom-based clusters

Symptoms and Inflammatory Cell or Cytokine	Cluster 1 Median (Interquartile Range), n=87	Cluster 2 Median (Interquartile Range). n=79	P Value*
VAS cough	76 (22)	54 (36)	8.4e-10
VAS dyspnoea	84 (19)	61 (28)	5.8e-14
VAS sputum production	82 (20)	35 (35)	3.6e-23
VAS sputum purulence	73 (29)	35 (41)	2.6e-12
Sputum % neutrophil	86.8 (24.8)	75.3 (38.1)	6.3e-02
Sputum IL5, pg/ml	0.0 (2.4)	1.6 (5.9)	7.0e-02

*Benjamini-Hochberg correction for multiple comparisons.

Conclusions Exacerbations of COPD patients fall into two symptom-based severity groups, those with more severe symptoms measured by VAS and more neutrophilic and less eosinophilic airways inflammation than exacerbations with less severe symptoms. VAS could be used to identify treatment algorithms for patients with an exacerbation of COPD. Future studies which capture a greater number of exacerbations are required to assess whether the findings of our analysis are reproducible.

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S118 RISK FACTORS FOR ALL-CAUSE COPD READMISSION: A SYSTEMATIC REVIEW AND META-ANALYSIS

[1]J Alqahtani, [2]C Njoku, [2]B Bereznicki, [2]B Wimmer, [2]G Peterson, [3]L Kinsman, [1]Y Aldabayan, [1]A Alrajeh, [1]A Aldhahir, [1]S Mandal, [1]J Hurst. *[1]UCL Respiratory, University College London, London, UK; [2]School of Medicine, College of Health and Medicine, University of Tasmania, Tasmania, Australia; [3]School of Nursing and Midwifery, University of Newcastle, Port Macquarie, New South Wales, Australia*

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Introduction and objectives Readmission rates following hospitalization for COPD exacerbations are unacceptably high, and the contributing factors are poorly understood. Our objective is to summarise and evaluate the factors associated with 30- and 90-day all-cause readmission following hospitalisation for an exacerbation of COPD.

Methods We systematically searched four electronic databases: MEDLINE, Embase, CINAHL and Scopus from inception date to June 10, 2019. We included quantitative studies that investigated all-cause COPD readmissions and analysed the contribution of risk factors or predictors associated with readmission. Two independent authors in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines extracted data. Study quality was assessed using a modified version of the Newcastle-Ottawa Scale. We synthesized a narrative from eligible studies and conducted a meta-analysis where this was possible using a random-effects model.

Abstract S118 Table 1

Risk/predictive factors	Number of studies in which there was a significant finding	Number of studies in which there was NOT a significant finding
Comorbidities	22	11
Previous exacerbations and hospitalizations	13	1
Length of stay	12	8
Sex	11	8
COPD severity	9	2
Discharge location	9	5
Behavioral and social risk factors (low socioeconomic status, alcohol use, former smoking, living alone)	9	7
Age	8	9
ICU admission	6	0
Corticosteroid use (oral or inhaled)	4	3
Different ethnicity group	4	5
Physical activity	4	1
Supplementary oxygen	4	3
Type of insurance	4	6
Hospital size and type	2	1
Pseudomonas aeruginosa	1	0
Acidosis (pH< 7.35 before discharge)	1	0
Weather	1	1

Results In total, 3533 abstracts were screened and 208 full-text manuscripts were reviewed. Thirty-two studies met the inclusion criteria, and 14 studies were included in the meta-analysis. Among the 32 studies, three were rated as 'fair' in the quality assessment. The remaining papers were ranked as 'good' quality. The readmission rate ranged from 8.8% to 26.0% at 30 days and from 17.5% to 39.0% at 90 days. Our narrative analysis showed that comorbidities, previous exacerbations and hospitalizations, and increased length of initial hospital stay were major risk factors for readmission at 30 and 90 days (see table 1). Pooled adjusted ORs (95% CIs) revealed that heart failure 1.29 (1.22–1.37), renal failure 1.26 (1.19–1.33), depression 1.19 (1.05–1.34) and alcohol use 1.11 (1.07–1.16) were all independently associated with an increased risk of 30-day all-cause readmission, whereas being female was a protective factor 0.91 (0.88–0.93).

Conclusions In this systematic review and meta-analysis of 32 studies including more than 3.5 million patients with COPD, comorbidities, previous exacerbations and hospitalisations, and increased length of initial hospital stay were the major risk factors for all-cause readmission at 30 and 90 days. Holistic interventions with careful attention to the optimal management of comorbidities are likely to be the most successful strategies to reduce the risk of readmission.

S119 IMPACT OF PATIENT ACTIVATION MEASURE (PAM®) AND TAILORED INTERVENTIONS ON RESPIRATORY PATIENTS

MS Wood, J Belcher, J Haines, B Kane. *Manchester University Hospital Foundation NHS Trust, Manchester, UK*

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Introduction The Patient Activation Measure (PAM) is a validated, licensed survey that measures patients' knowledge, skills and confidence (referred to as 'patient activation') in managing their own health and wellbeing (Insignia 2016). PAM scores lie between 1 and 100, but are sub-divided into 4 groups from low activation (level 1) to high activation (level 4). Tailored support can be given to increase patient activation level, which has been shown to result in better healthcare outcomes (Deeny, 2018)

Aim To evaluate the impact of PAM-based interventions on patient activation and hospital healthcare utilisation in a secondary care asthma and community COPD service.

Methodology

Fifty-four patients 32 COPD and 22 asthma, were assessed using the 13 statement PAM survey to determine baseline levels of activation.

Patients underwent a year of interventions tailored to their PAM score, either over the telephone or face-to-face in varying frequencies depending on the assessment activation level; level 1 weekly, level 2 bi-weekly, level 3 monthly and level 4 six-monthly. This included motivational interviewing, coaching, goal setting, and action planning. PAM was delivered in addition to usual care with the aim of increasing patients' activation and improving their self-management capabilities.

Hospital healthcare utilisation was evaluated in the year prior to PAM intervention and during the twelve months of PAM input.

Results Comparing hospital healthcare utilisation in the 12 months pre- and during-intervention; all-cause emergency admissions decreased in 24/54 patients, were no different in 15/54 and increased in 15/54. Overall there was a 24% within-patient reduction in emergency admissions and a 47% reduction in re-admissions, but these did not reach statistical significance (table 1). A significant reduction in overall outpatient attendances and DNA rates were observed (49% $p<0.001$ and 44% $p<0.001$ respectively). Overall PAM scores were significantly greater post intervention ($p<0.001$).

Conclusion PAM-tailored intervention in addition to usual care, increased COPD and asthma patients' activation levels and was associated with a trend in decreasing hospital admissions, with a significant reduction in outpatient clinic utilisation and DNA rates.

Abstract S119 Table 1

	Pre-PAM® intervention (2016–2017)	PAM® directed intervention year (2017–2018)	Aggregate percentage change	Paired Median change (95%CI)*
Total Emergency admissions	125	95	24% decrease	0 (0, 1), p=0.182
Total Re-admissions at 28 days	49	26	47% decrease	1 (-1, 1) p=0.281
Total Out-patient appointment utilisation	821	422	49% decrease	6.5 (4, 9.5), p<0.001
Total DNA out-patient appointments	79	44	44% decrease	1 (0, 1) p<0.001
Mean (SD) PAM® survey points scored	58.96 (16.16)	73.64 (14.22)	25% increase	14.4 (7.8, 19.61), p<0.001

*Wilcoxon Signed Rank Test using a significance level of 5%.
Associated 95% Confidence Intervals summarise the degree of individual change.

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Occupational lung disease – 'danger at work'

S120 CAUSES OF NEGATIVE SPECIFIC INHALATIONAL CHALLENGE (SIC) IN PATIENTS WITH OCCUPATIONAL ASTHMA; THE EXPERIENCE OF TWO UK CENTRES

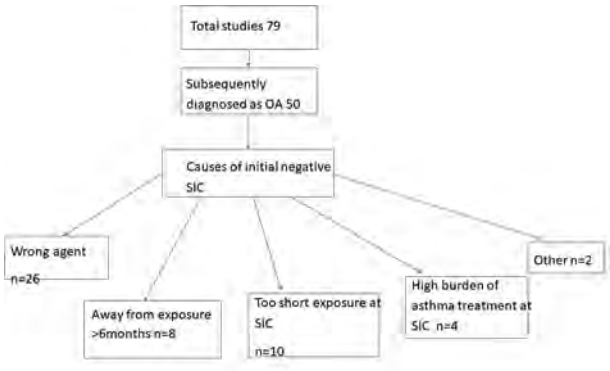
[1]H Badri, [2]VC Moore, [2]GI Walters, [2]PS Burge. [1]*University of Manchester and North Manchester General Hospital, Manchester, UK*; [2]*Birmingham Heartlands Hospital, Birmingham, UK*

10.1136/thorax-2019-BTSabstracts2019.126

Introduction and objectives Occupational causes are thought to account for 20% of the global burden of asthma. The gold standard test for identifying occupational asthma (OA) is specific inhalational challenge to the suspected occupational agent.[1] However, a negative SIC does not always exclude a diagnosis of OA. We investigated the reasons why challenge tests may be negative and associated outcomes from two UK centres.

Methods We performed a retrospective review of the outcomes of 79 consecutive negative SICs carried out between 2008 and 2019 in North Manchester General Hospital (NMGH) and Birmingham Heartlands Hospital (BHH). Repeat negative SICs for the same patient were also included. Demographic data, serial peak flow analysis, occupation, current exposures, and progress post SIC were reviewed. Patients were followed up post SIC and further testing (either repeat SIC or other) were performed if ongoing symptoms were present.

Results Of the79 negative SICs reviewed, 23 were at NMGH and 56 at BHH. Thirty-six workers (45%) were female, median age 51 years (IQR 41–55.5). Ten workers (13%) had a history of previous asthma. Sixty five percent of SICs had an OASYS score of $\geq$2.51 i.e. positive for work effect prior to testing. Of the 79 SICs carried out, 50 were subsequently diagnosed with occupational asthma with diagnostic serial PEF records and/or repeat testing. The most common reason for a negative SIC was testing to the wrong agent (figure 1).



Abstract S120 Figure 1 Break down of negative SICs and causes

Conclusions This data suggests that there is a high rate of negative SICs in patients who have a diagnosis of occupational asthma, which is mainly due to exposures to the wrong agent in the SIC. It is crucial that patients are followed up post negative SIC and re investigated early if experiencing ongoing symptoms.

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S121 BTS STANDARDS OF CARE FOR OCCUPATIONAL ASTHMA

HA Norman, PS Burge, GI Walters, AS Robertson, VC Moore. *Birmingham Occupational Lung Disease Service, University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK*

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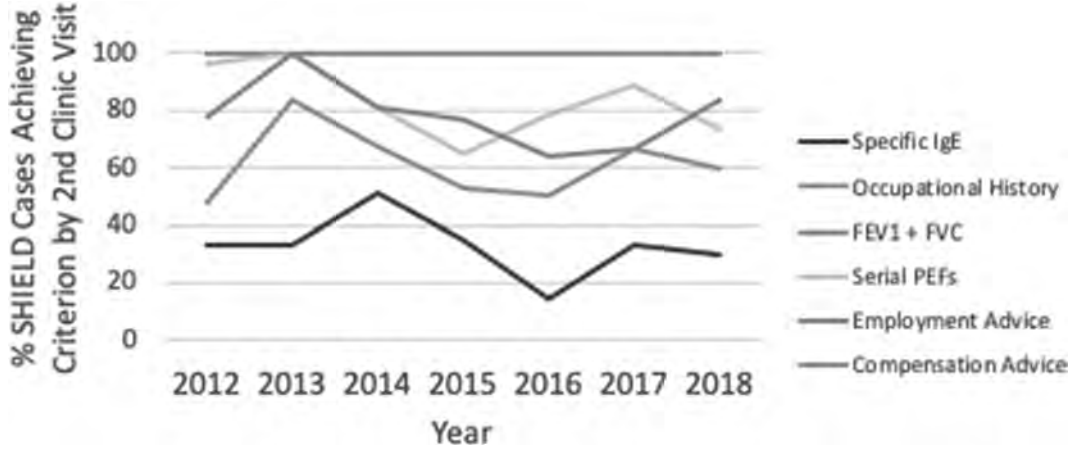
Occupational asthma (OA) is variable airways obstruction caused by exposure to an inhaled agent in the workplace. Swift detection and management of OA improves prognosis. The BTS Standards of Care for Occupational Asthma (2008) recommends that all patients with suspected OA should receive a full occupational history, spirometry for FEV1/FVC,



Abstract S121 Figure 1 OLDS fulfillment of BTS guideline criteria 2012–2018

serial PEFs, specific IgE bloods, employment advice and compensation advice by their second outpatient appointment. We compared the Birmingham Occupational Lung Disease Service's (OLDS) adherence to the BTS Standards of Care for OA to highlight areas of the service requiring improvement. The Midlands Thoracic Society surveillance scheme database of all Regional OA patients (known as Shield), was utilised to identify all workers notified with OA between 2012 and 2018 (n=146).

Results A comprehensive occupational history and spirometry were carried out in all patients. The completion of serial PEF recording and Oasys analysis (the principal method of objective confirmation of occupational asthma) dipped to 63% in 2015, exacerbated by referral after removal from employment. Provision of compensation and employment advice was lower at the time of notification, as employment advice requires the identification of the cause of occupational asthma, which often took longer. Specific IgE measurement was the lowest as not generally available for most agents. The OLDS performed the best in 2013, with 86% fulfilment of the guidelines. There was a subsequent steady decline to 67% in 2016 when the service was without a lead. Since the appointment of a service lead, performance has improved (See figure).

Recommendations for service improvement include the production of an instructional video for ideal PEF technique, text reminders for patients to record PEF data, and investment into smartphone-compatible digital PEF meters for easy recording and sharing of data. Computer alerts for clinicians reminding them to complete and record fulfilment of BTS criteria as well as the production of local standards of care may improve service provision for the future.

S122 POSITIVE VS NEGATIVE SPECIFIC INHALATIONAL CHALLENGES IN OCCUPATIONAL ASTHMA; REVIEW OF 9 YEARS OF TESTING IN A SINGLE UK CENTRE

[1]H Badri, [2]P Whittemore, [2]JL Hoyle. *[1]University of Manchester and North Manchester General Hospital, Manchester, UK; [2]North Manchester General Hospital, Manchester, UK*

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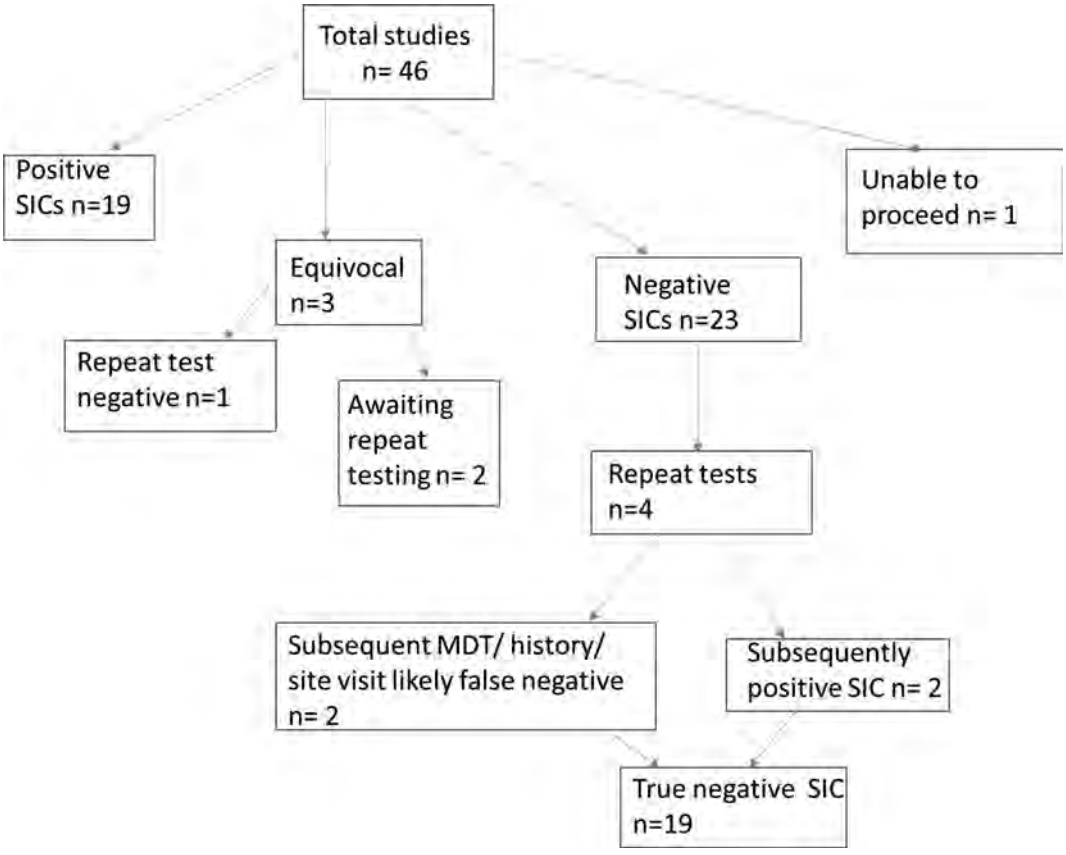
Introduction and objectives Occupational causes are thought to account for 20% of the global burden of asthma.[1] The gold standard test for identifying occupational asthma is a specific inhalational challenge (SIC) to the suspected occupational agent. However, there is little published data on real life outcomes of these challenges. We present the outcome of data from such challenges collected in one UK centre.

Methods We performed a retrospective review of 46 consecutive SICs carried at the Occupational Lung Disease service between September 2010 and June 2019. Data was collected on demographics, occupation, OASYS score pre SIC, history



Abstract S122 Figure 1 Outcomes of studies

of previous asthma, challenge agent tested, outcome of SIC and ongoing symptoms post SIC.

Results Of the 46 SICs carried out during this period, 23 were negative, 19 were positive, 3 were equivocal and 1 test could not be completed (see figure 1). Median age of patients was 49.5yrs (IQR 42–58), 18 patients were female (39%). Fifty nine percent of SICs were carried out whilst patients were currently exposed at work. Fifty three percent of negative SICs had an OASYS score of > 2.52 i.e. positive peak flow charts for work effect. The most common occupations were food industry work 11 (23%) and healthcare 9 (20%).In the positive SIC group 16% of patients had a prior history of asthma compared to none in the negative SIC group. Almost twice as many patients with negative SICs had ongoing symptoms compared to those with positive SICs (43 vs 26%).

Conclusions Our data suggests that patients with a positive SIC were more likely to have a prior history of asthma documented and even when patients have a negative SIC a high proportion have ongoing symptoms.

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S123 OCCUPATIONAL EXPOSURES TO WOOD, METAL, AND STONE IN IPF; FINDINGS FROM THE IDIOPATHIC PULMONARY FIBROSIS JOB EXPOSURES STUDY (IPFJES)

[1]C Reynolds, [1]R Sisodia, [2]C Barber, [1]P Cullinan. *[1]National Heart and Lung Institute, Imperial College London, London, UK; [2]Centre for Workplace Health, University of Sheffield, Sheffield, UK*

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Introduction and objectives Case-control studies investigating occupational exposures in idiopathic pulmonary fibrosis (IPF) have found associations with wood, metal, and stone dust. A recent meta-analysis of these studies found pooled odds ratios of 1.7 (1.3–2.2), 2.0 (1.3–3.0), and 1.7 (1.2–2.4) respectively. The majority of studies relied on self-reported exposure histories and used community controls; approaches vulnerable to bias. Our aim was to investigate wood, metal, and stone dust associations by means of a lifetime occupational history, which included details of job tasks, in a hospital based case-control study.

Methods Participants (488 cases, 368 controls; all men) from a UK based multicentre hospital-based case-control study, the idiopathic pulmonary fibrosis job exposures study (IPFJES), were asked to recall details of their occupational history including describing job tasks within each job. They were not asked directly about specific exposures. Participants who described working with wood, metal or stone (or silica) were labelled as exposed and (unadjusted) odds ratios for associations between exposure and IPF were calculated.

Results 45 cases (9%) and 28 controls (8%) were exposed to wood (OR 0.81 p=0.5), 86 cases (18%) and 48 controls (13%) were exposed to metal (OR 1.43 p=0.07), and 23 cases (5%) and 8 controls (2%) were exposed to stone (OR 2.23 p=0.06). Conclusions: Unprompted reports of wood, metal, and stone dust exposure from job task descriptions are not significantly statistically associated with IPF risk in IPFJES. Our exposure measures may lack sensitivity or estimates of association in previous studies may be an artefact of study-design.

'Under your skin' – imaging in lung disease

S124 MULTI-CENTRE REPRODUCIBILITY OF 19F-MR VENTILATION IMAGING IN HEALTHY VOLUNTEERS

[1]B Pippard, [1]M Neal, [2]A Maunder, [3]R Lawson, [1]AJ Simpson, [2]J Wild, [1]P Thelwall. *[1]Newcastle University, Newcastle upon Tyne, UK; [2]University of Sheffield, Sheffield, UK; [3]Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK*

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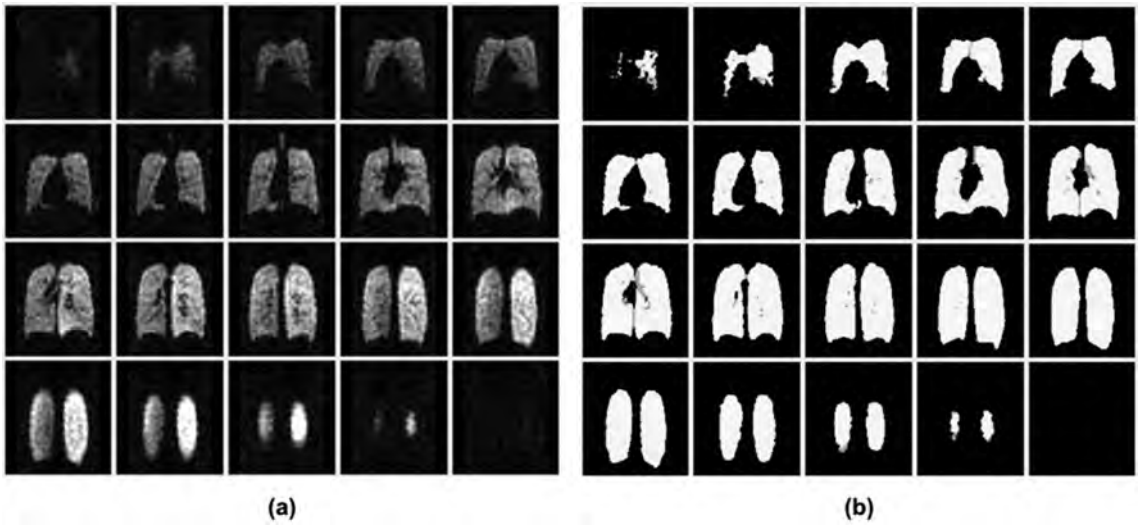
Introduction ^{19}F-MRI of inhaled perfluoropropane (PFP) is a relatively new approach to ventilation imaging, enabling assessment of regional gas distribution without the requirement for hyperpolarization.[1] While quantitative measures of pulmonary ventilation (e.g. the percent ventilated lung volume,%VV) are well established for hyperpolarized-gas MRI,[2] their utility in ^{19}F-MR ventilation imaging is less clear. Determining the



Abstract S124 Figure 1 (a) Representative 19F-MR ventilation images (coronal slices) from one healthy volunteer; and (b) corresponding image segmentations showing agreement (yellow) and discrepancies (green) of ventilated regions between the two raters

reproducibility of such measures is paramount in developing future clinical application of this technique.

Aim We assessed the reproducibility of%VV measurements in healthy volunteers using ^{19}F-MRI of inhaled PFP across two UK study sites.

Methods 38 healthy volunteers (20M, 18F; aged 23–67) provided written informed consent and were screened for eligibility at one of two UK study sites. Participants underwent a single MRI scan session on a 3T scanner, involving periodic inhalation of a 79% PFP/21% oxygen gas mixture. Each gas inhalation lasted <1 min, comprising three deep breaths of gas followed by a breath-hold (~13.5s), during which ^{19}F-MR images were acquired. Participants underwent four ^{19}F-MRI acquisitions in total, each separated by a 5 min interval.%VV values were determined by registering ventilation images to anatomical ^{1}H images (acquired separately for each participant) and semi-automated image segmentation performed by two independent raters. Intra-volunteer%VV reproducibility was assessed using a two-way random measures Intraclass Correlation Coefficient, ICC(2,1). Inter-rater reliability was evaluated using the Dice Similarity Coefficient (DSC).

Results MRI scans were well tolerated throughout with no adverse events. Assessment of intra-volunteer%VV reproducibility revealed an ICC_{rater1}=0.682 (95% CI=0.529–0.785) and ICC_{rater2}=0.614 (0.443–0.736). Assessment of inter-rater reliability of%VV measurements showed a high mean DSC(±SD) of 0.97±0.2, with only minor discrepancies between the two raters (figure 1).

Conclusions We have demonstrated good reproducibility of% VV measurements in healthy volunteers using ^{19}F-MRI of inhaled PFP. Importantly, our methods have been successfully implemented across two UK study sites, confirming suitability for multi-centre use and the development of larger clinical trials. Current studies will apply these techniques to quantify ventilation impairment in patients with asthma and COPD, including assessing response to bronchodilator therapy.

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S125 QUANTITATIVE CT AND HYPERPOLARISED 129-XENON DIFFUSION-WEIGHTED MRI IN INTERSTITIAL LUNG DISEASE

[1]JA Eaden, [1]H-F Chan, [1]PJC Hughes, [1]ND Weatherly, [1]M Austin, [1]LJ Smith, [1]J Lithgow, [2]S Rajaram, [2]AJ Swift, [2]SA Renshaw, [3]RA Karwoski, [3]BJ Bartholmai, [4]CT Leonard, [5]S Skeoch, [4]N Chaudhuri, [6]GJM Parker, [2]SM Bianchi, [1]JM Wild. *[1]POLARIS, Academic Radiology, Department of Infection, Immunity and Cardiovascular Disease, The University of Sheffield, Sheffield, UK; [2]Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK; [3]Mayo Clinic, Rochester, Minnesota, USA; [4]The University of Manchester NHS Foundation Trust, Manchester, UK; [5]The University of Manchester, Manchester, UK; [6]Bioxydyn Ltd, Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.131

Introduction Apparent diffusion coefficient (ADC) is a diffusion-weighted (DW) MRI measure of Brownian gas diffusion in the airspaces, where restrictions by tissue boundaries provide information about lung microstructure. The mean diffusive length scale (Lm_D) is another DW-MRI lung microstructure measurement calculated using a stretched exponential fit method. Computer-Aided Lung Informatics for Pathology Evaluation and Rating (CALIPER) quantifies various radiological parenchymal features based on histogram signature mapping techniques and is the most widely used quantitative CT image texture analysis software in interstitial lung disease (ILD).

Aim To evaluate the ability of hyperpolarised 129-xenon (^{129}Xe) DW-MRI and high resolution CT (HRCT) to distinguish between ILD subtypes.

Methods A prospective, multicentre study of patients with ILD including drug induced ILD (DI-ILD), hypersensitivity pneumonitis (HP), idiopathic pulmonary fibrosis (IPF) and connective tissue disease ILD (CTD-ILD). Hyperpolarised ^{129}Xe DW-MRI was performed on a 1.5 T scanner. The HRCT scan was performed within a year prior to the MRI scan. Quantitative CT analysis was performed using CALIPER. Semi-quantitative visual CT analysis was performed by two consultant chest radiologists using a scoring system (table 1).

Results To date, 36 patients (8 DI-ILD, 8 HP, 15 IPF, 5 CTD-ILD) have undergone baseline ^{129}Xe DW-MRI and CT analysis. There was a significant difference between the IPF and HP groups in ADC (p=0.031) and Lm_D (p=0.007). Quantitative CT analysis demonstrated a significant difference between the ILD subtypes in ground glass (GG) percent (p=0.031) and honeycombing (HC) percent (p=0.021) but not reticulation percent (p=0.14). The difference in GG% occurred between the IPF and HP groups (p=0.018), whereas the difference in HC% occurred between the IPF and DI-ILD groups (p=0.027). Semi-quantitative visual CT analysis showed a significant difference between the ILD subtypes in GG score (p=0.001), with the difference occurring between the IPF and HP groups (p<0.001). There was no significant difference between the ILD subtypes in the reticulation score (p=0.050) or the honeycombing score (p=0.064).

Conclusions Our findings suggest significant differences in ADC, Lm_D, GG score and CALIPER GG% between IPF and HP patients. ^{129}Xe DW-MRI and quantitative CT could potentially have a role in differentiating between these ILD subtypes.

Abstract 125 Table 1 Semi-quantitative visual CT analysis scoring system (modified from Ooi et al and Rossi et al).

Abnormality	Grading for each abnormality		Anatomical regions scored
	Percentage disease extent	Score	
-GGO alone	0	0	Lobes are scored independently
-GGO and septal lines	1–25%	1	Lingula is considered a separate lobe
-Mixed ground glass	26–50%	2	6 total lobes
and reticular disease	51–75%	3	Global score: summation of scores for
-Reticular fibrosis	>75%	4	each abnormality, in all lobes
alone			
-Honeycombing			
-Nodular opacity			
-Haemorrhage			
-Consolidation			

S126 EVALUATING BRAIN STRUCTURE AND CEREBROVASCULAR FUNCTION IN IDIOPATHIC PULMONARY FIBROSIS USING MRI

KL Hett, E Patitucci, H Chandler, BDM Hope-Gill, RG Wise. *Cardiff University Brain Research Imaging Centre, Cardiff, UK*

10.1136/thorax-2019-BTSabstracts2019.132

Introduction Idiopathic Pulmonary Fibrosis (IPF) is a life-limiting condition with a poor prognosis. Whilst current treatments slow disease progression, relief from symptoms such as shortness of breath and cough, remains paramount to improving quality of life. The exact pathogenesis of cough is not known but there is evidence of altered cough neurophysiology and sensitisation[1]. Functional Magnetic Resonance Imaging (fMRI) of the brain is increasingly used to investigate respiratory symptoms, which can be discordant with markers of disease severity[2]. fMRI could be a valuable modality to evaluate neural networks in IPF and to our knowledge, no MRI brain imaging has been performed in patients with IPF.

We aim to (i) evaluate the feasibility of brain MRI at 3T in patients with IPF and (ii) investigate brain structure and cerebrovascular function in patients with IPF.

Methods 10 stable non-hypoxaemic patients with IPF (62–82 years) and 7 healthy volunteers matched for age (52–74 years) and sex were assessed for demographic characteristics, disease severity and comorbidities. All participants underwent MRI session including structural T1 weighted image (MPRAGE) and pseudo-continuous arterial spin labelling (pCASL) sequence to assess resting grey matter cerebral blood flow (CBF).

Results No group differences in brain structure (grey matter volume, GMV ($t_{(14.98)}$=1.24; p=0.24); white matter volume, WMV ($t_{(10.47)}$=0.64; p=0.54)) and in whole-brain grey matter perfusion (CBF ($t_{(10.82)}$=0.9651; p=0.36)) were observed but a trend towards reduced GM and lower perfusion in IPF was noticed. (See table 1).

Abstract S126 Table 1 Demographics, brain structure and function in IPF compared to controls

	IPF	Control	p
N	10	7	
Age, years	70 (±5.6)	65 (±8.7)	0.19
Sex (m, f)	9, 1	6, 1	0.79
BMI, kg/m^2	29 (±3.5)	23 (±2.2)	
Smoking, pack year history	8.6 (±8.5)	0.1 (±0.4)	0.01
Charlson Comorbidity Index	1.9 (±1.0)	0.6 (±0.8)	0.01
Oxygen saturations,%	97 (±1.1)	97 (±1.3)	0.61
Time since IPF diagnosis, months	22.2 (±10.8)	-	
FVC% predicted	79 (±17.2)	-	
TLCO% predicted	45 (±10.4)	-	
Currently using antifibrotic therapy*	7 (70%)	-	
Cough severity, VAS mm	43 (±25.2)	-	
Normalised GMV, mm^3	735902 (±49774)	760648 (±32744)	0.24
Normalised WMV, mm^3	678546 (±38069)	693131.7 (±51390)	0.54
CBF (arbitrary units)	155.2 (±27.8)	169.8 (±26.7)	0.36

Data are n (%), mean (±SD) *pirfenidone or nintedanib, FVC=forced vital capacity, TLCO=-transfer factor of the lung for carbon monoxide, VAS=visual analogue scale, GMV=grey matter volume, WMV=white matter volume, CBF=cerebral blood flow

Conclusions These results show a trend towards atrophy and reduced brain perfusion in IPF. Resting oxygen saturations did not differ significantly between groups but changes could be due to intermittent hypoxaemia on exertion or differences in comorbidities and smoking status. Brain MRI was well tolerated in patients with IPF supporting more detailed research in a larger cohort and more complex testing of the neural pathways of respiratory sensations.

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S127 A COMPARISON OF CT AND MRI VOLUMETRIC ASSESSMENT OF MALIGNANT PLEURAL MESOTHELIOMA

[1]S Tsim, [2]GW Cowell, [1]A Kidd, [3]R Woodward, [4]L Alexander, [4]C Kelly, [3]JE Foster, [1]KG Blyth. *[1]Glasgow Pleural Disease Unit, Queen Elizabeth University Hospital, Glasgow, UK; [2]Department of Radiology, Queen Elizabeth University Hospital, Glasgow, UK; [3]Glasgow Clinical Research Imaging Facility, Queen Elizabeth University Hospital, Glasgow, UK; [4]Cancer Research UK Clinical Trials Unit Glasgow, University of Glasgow, Glasgow, UK*

10.1136/thorax-2019-BTSabstracts2019.133

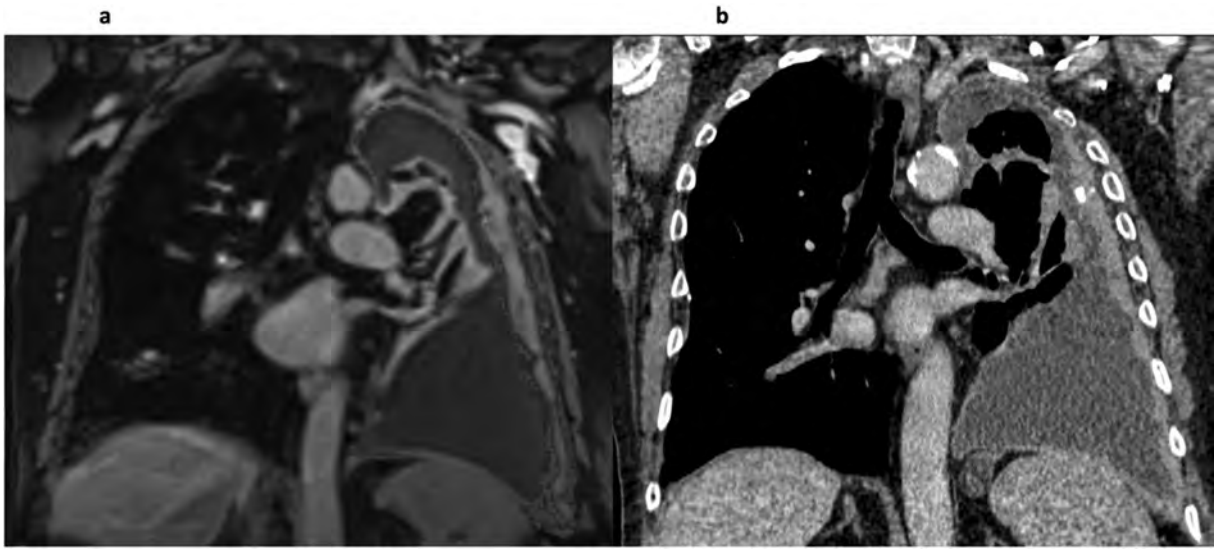
Introduction Primary tumour (T-) staging in malignant pleural mesothelioma (MPM) is difficult due to complex tumour morphology. Volumetric assessment is a potential alternative to current T-staging. Computed Tomography (CT) volumetry has been limited by laborious manual segmentation methods or high inter-observer variability, frequently due to perception error or insufficient contrast between tumour and adjacent tissues. Magnetic Resonance Imaging (MRI) offers naturally high contrast between effusion and pleura and functional elements of MRI (e.g. perfusion) could offer additional advantages.

Methods T1-weighted, isotropic, gadobutrol-enhanced 3-Tesla MRI and iodinated contrast-enhanced CT scans were acquired in patients with MPM. CT images were acquired as part of routine clinical activity. Non-contrast or pulmonary arterial-phase CT examinations were excluded. Images were acquired prior to biopsy in all cases.

MRI analysis involved semi-automated generation of a contour mask, followed by perfusion-tuned tumour segmentation using Mryian® segmentation software (figure 1). This utilised signal intensity limits for region-growing derived from previous MRI perfusion studies in the same cohort. CT volume analysis involved manual segmentation using Myrian® software (figure 1).

Inter-observer agreement was compared and the relationship between overall survival (OS) and MRI and CT T-volume was examined.

Results 31/31 and 28/31 patients had MRI and CT volume analyses respectively. Using MRI, mean analysis time was 16 minutes, mean T-volume was 370 (SD 137) cm^3 and inter-observer agreement was excellent (ICC 0.962). Patients with high MRI-derived T-volume (≥300cm^3) had a poorer median OS (20 months versus 8.5 months, p=0.009). MRI T-volume was an independent predictor of OS at multi-variable analysis (HR 2.11 (95% CI 1.05 – 4.3).



Abstract S127 Figure 1 Segmented primary tumour volume in a patient with Malignant Pleural Mesothelioma at contrast-enhanced MRI (figure la, segmented volume highlighted in blue) and at contrast-enhanced CT (figure lb, segmented volume highlighted in green)

Using CT, mean analysis time was 151 minutes, mean T-volume was 302 (SD 102) cm^3 and inter-observer agreement was moderate (ICC 0.72). There was no significant relationship between CT T-volume and OS (20 versus 12 months in patients with high ($\geq$300cm^3) and low T-volume (<300cm^3) respectively, p=0.13). CT T-volume was not predictive of OS at univariable (HR 1.91 (95% CI 0.77 – 4.7), p=0.17 or multi-variable analysis.

Conclusion MRI-derived T-volume appears to have superior reproducibility and shorter analysis time than segmentation using CT. MRI T-volume is an independent predictor of OS in patients with MPM.

Advances in asthma science and treatment

S128 CYTOF AND IN VITRO ANALYSIS OF THE ROLE OF IL-17A IN ASTHMA

GM Hynes, TL Downs, ST Thulborn, C Connolly, C Borg, A Gittins, R Shrimanker, A Moran, MA Brown, TJ Powell, SB Morgan, ID Pavord, TSC Hinks. *Respiratory Medicine Unit and National Institute for Health Research (NIHR) Oxford Biomedical Research Centre (BRC), Experimental Medicine Unit, Nuffield Department of Medicine, University of Oxford, Oxford, UK*

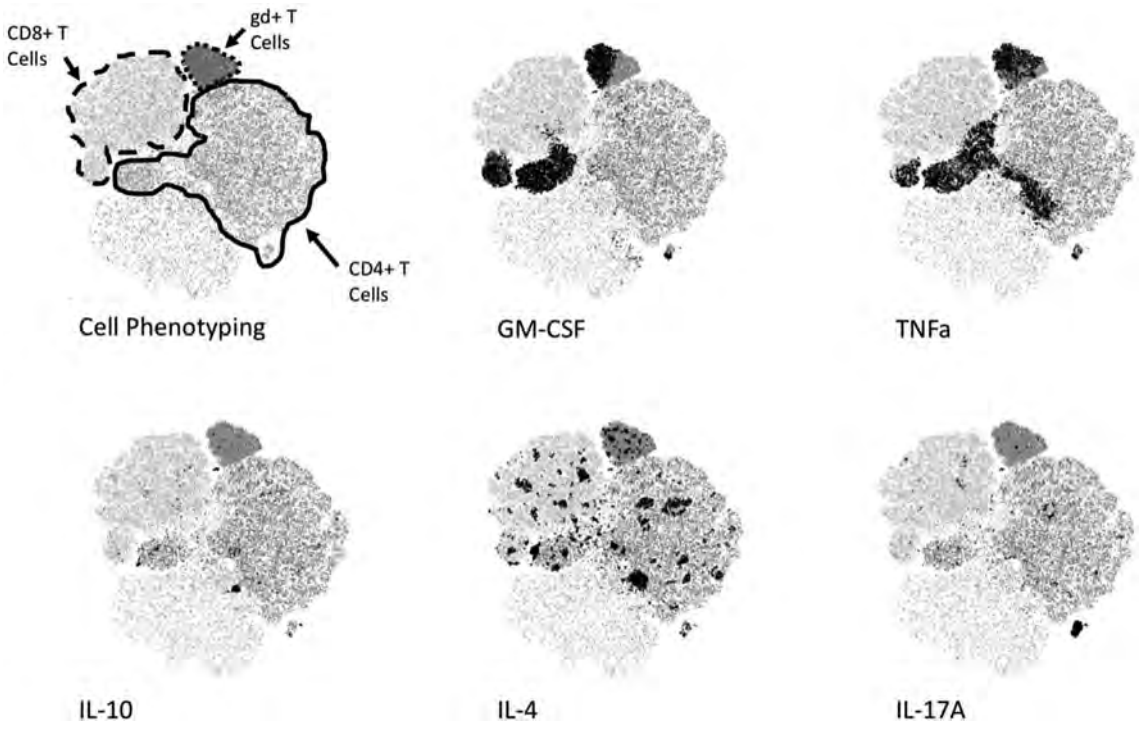
10.1136/thorax-2019-BTSabstracts2019.134

Introduction Many patients with asthma have type-2 low, neutrophilic asthma, and this has been linked to elevated IL-17A levels. We aimed to explore the role of IL-17A in asthma using two approaches: i) mass cytometry by time of flight (CyTOF) profiling of blood and sputum for IL-17A-expressing cells; and ii) *in vitro* modelling of the effects of IL-17A in epithelial inflammation and the modulatory effects of this produced by major asthma therapies, namely corticosteroids and macrolides.

Methods We collected blood and sputum from patients with well-phenotyped severe asthma. Sputum cells and peripheral blood mononuclear cells were stimulated and stained for intracellular cytokines and extracellular markers using metal-conjugated antibodies. Samples were analysed using the Helios CyTOF 3, and results analysed using FlowJo. We used the bronchial epithelial cell line BEAS-2B to determine whether IL-17A can induce an inflammatory response in epithelial cells, both acting alone and in synergy with different toll-like receptor (TLR) agonists. We investigated Fluticasone and Azithromycin in modulating IL-17A-induced effects.

Results We were able to identify the major IL-17A-expressing cell subsets in severe neutrophilic asthma (figure 1), and showed the predominant source was the distinct CD4+ IL-17A+ (Th17) cell population. By contrast expression of other intracellular cytokines was more widespread across diverse T cell subsets. *In vitro* modelling demonstrated that IL-17A alone induces the release of IL-8 and IL-6 from BEAS-2B cells at low levels, but in synergy with the different TLR agonists had a pleiotropic effect whereby low concentrations of IL-17A reduced the TLR-induced cytokine expression, while higher concentrations of IL-17A had synergistic effects. Fluticasone and Azithromycin both suppressed epithelial cytokine release. This suppression was independent of IL-17A.

Conclusions We have demonstrated the applicability of CyTOF to samples from respiratory patients and confirmed the predominant IL-17A producing cell-type is CD4+ IL-17A + T cells in asthma. IL-17A appears to have a pleotropic role in regulating epithelial inflammation with low concentrations providing a suppressive, presumed homeostatic effect on epithelial cytokine release and higher concentrations inducing epithelial release of inflammatory cytokines associated with neutrophilic inflammation. Our data suggests that



Abstract S128 Figure 1 Peripheral blood mononuclear cells from a patient with severe neutrophilic asthma. Metal-conjugated antibody staining was run on CyTOF and analysed using tSNE. Cytokine positive cells are highlighted in black

commonly used treatments for asthma had no effect on this pathway.

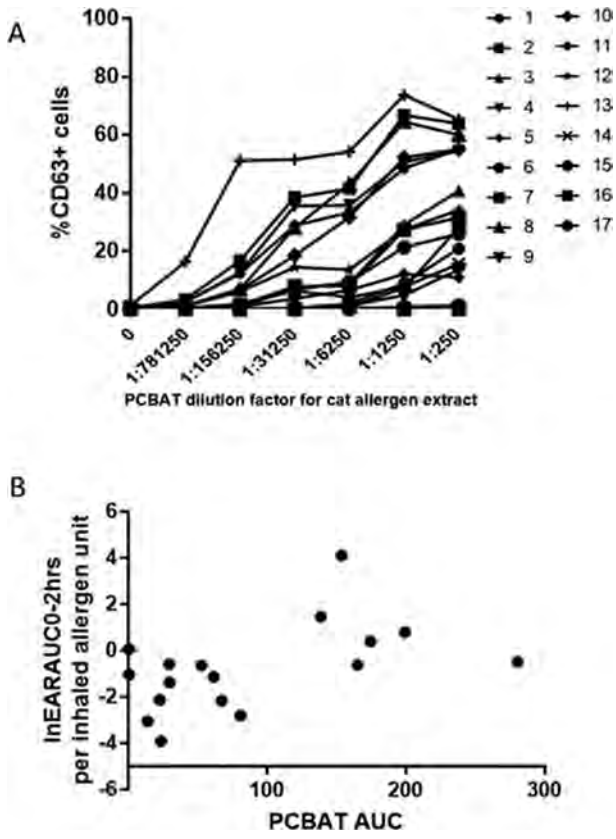
S129 PROGENITOR CELL-DERIVED BASOPHIL ACTIVATION TEST (PCBAT) PREDICTS CLINICAL REACTIVITY IN CAT ALLERGIC ASTHMATICS- A PROOF OF CONCEPT STUDY

[1]M Bennett, [1]J Wu, [1]CS Murray, [2]G Gauvreau, [2]R Cusack, [2]S Bulfone-Paus, [1]A Simpson.
[1]University of Manchester, Manchester, UK; [2]McMaster University, Ontario, Canada

10.1136/thorax-2019-BTSabstracts2019.135

Many allergic asthmatics who are sensitized to cat (on skin prick or IgE testing) deny symptoms of asthma or allergy on contact with cats. Clinical reactivity to cat can be measured using inhaled allergen challenge, but this is not widely available in clinical practice and is not appropriate in poorly controlled asthma. We are investigating whether we can predict clinical reactivity to cat allergen using an *in vitro* high throughput effector cell assay (progenitor cell-derived basophil activation test -PCBAT).

Methods We performed inhaled allergen challenge on 17 adults who were skin prick positive to cat. Participants inhaled cat allergen (McMaster, Ontario) at increasing concentrations until forced expiratory volume in 1 second (FEV_1) dropped $\geq$20% from baseline. The early airway response 0–2 hours after allergen exposure was measured as a percentage drop from baseline FEV_1 against time ($EARAUC_{0\text{-}2hrs}$). We divided the maximum percentage drop in FEV_1 and also the $EARAUC_{0\text{-}2hrs}$ by the cumulative dose of inhaled allergen to give a dose response slope (DRS) and $EARAUC_{0\text{-}2hrs}$ per allergen unit.



Abstract S129 Figure 1 Dose dependent increase in basophil activation using in vitro PCBAT assay (Panel A). Correlation between the early airway response per inhaled allergen unit (1nEARAUCO-2hrs) and the PCBAT area under the curve (r=0.51, p=0.038) (Panel B).

We developed PCBAT using well characterized human CD34+ progenitor cell-derived basophils, which were passively sensitized with sera from the 17 adults. The cultures were stimulated with increasing concentrations of cat allergen. Degranulation was quantified by flow cytometry using CD63 to mark activation. Results presented as area under the curve (PCBATAUC).

Results In PCBAT we saw a dose-dependent increase in CD63 expression on flow cytometry with a range of AUC (>600 fold, Panel A). On cat allergen challenge, the cumulative dose inhaled to cause a 20% drop in FEV_1 and subsequent airway recovery also varied. We saw a significant correlation between PCBATAUC and the total cumulative dose of inhaled allergen (r=-0.56, p=0.019), the DRS (r=0.54, p=0.026) and also the $EARAUC_{0\text{-}2hrs}$ per allergen unit (r=0.51, p=0.038) (Panel B).

Conclusions Our novel *in vitro* high throughput effector cell assay (PCBAT), predicted clinical responsiveness to inhaled cat allergen in multiple clinical measures. PCBAT may provide a safe alternative to inhaled allergen challenge in asthma. Further work is required to confirm these findings and to determine the place of this test in clinical practice.

S130 MATERNAL ALLERGIC AIRWAY INFLAMMATION DURING PREGNANCY ALTERS OFFSPRING'S AIRWAY HYPERRESPONSIVENESS DEPENDENT ON MUSCARINIC RECEPTOR AND ADAM33 MEDIATED MECHANISMS

[1]M Wandel, [1]ER Davies, [1]JFC Kelly, [2]ST Holgate, [3]JA Whitsett, [4]DE Davies, [4]HM Haitchi. [1]*Brooke Laboratories, Clinical and Experimental Sciences, Faculty of Medicine, University of Southampton, Southampton, UK*; [2]*Institute for Life Sciences, Southampton, UK*; [3]*Division of Pulmonary Biology, Cincinnati Childrens Hospital Medical Center, Cincinnati, USA*; [4]*National Institute for Health Research (NIHR) Southampton Respiratory Biomedical Research Unit, University Hospital Southampton NHS Foundation Trust, Southampton, UK*

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Background Maternal allergic asthma is a strong risk factor for the development of asthma and airway hyperresponsiveness (AHR) in children. *ADAM33*, an asthma susceptibility gene, has been associated with AHR and impaired lung function in early life. Our aim was to investigate how the maternal allergic environment during pregnancy interacts with the ADAM33 status of their offspring, and the effects this has on the lungs of offspring after birth. We hypothesised that the effects of maternal allergy will be different in *Adam33* knock-out (KO) compared to wild-type (WT) offspring

Methods Allergic airway inflammation (AAI) during pregnancy was induced in heterozygous *($Adam33^{\pm}$)* mice through intranasal house dust mite (HDM) challenges. Control mice were challenged with saline. WT and KO *($Adam33^{-/-}$)* offspring from the same litters were studied 4 weeks *post partum (pp)*. Lung function was measured in response to increasing doses of methacholine. Bronchoalveolar lavage fluid (BALF) and lung tissue were obtained for RTqPCR, Western Blots and immunostainings. Precision-cut lung slices (PCLS) from 4-weeks old offspring were investigated for airway contraction in response to different agonists and antagonists *in vitro*.

Results Allergen-naïve WT offspring of allergic mothers showed AHR 4 weeks *pp* compared to those of control mothers, whereas KO offspring from the same litter were protected. Expression of the muscarinic M1 receptor was elevated in both KO and WT offspring lungs of HDM-challenged dams. Experiments using muscarinic receptor antagonists and methacholine in PCLS confirmed that maternal AAI causes increased bronchoconstriction through vagal reflexes in WT offspring. KO offspring were protected from this effect due to decreased sensitivity of airway smooth muscle, suggested by a delayed response to a thromboxane-receptor agonist in PCLS.

Conclusions Our studies show how gene-environment interactions between *Adam33* and maternal AAI determine development of AHR in early life. While the AAI of the mother leads to an increased pulmonary muscarinic M1 receptor expression, the absence of *Adam33* alters the airway smooth muscle function in the offspring. Together these changes manifest in AHR only in WT offspring, but not in KO offspring. Further studies are needed to determine how ADAM33 KO changes smooth muscle function in the lungs.

S131 DIETARY INTAKE OF LONG-CHAIN N-3 POLYUNSATURATED FATTY ACIDS AND RISK OF CHILDHOOD ASTHMA

[1]M Talaei, [2]PC Calder, [1]S Shaheen. [1]*Queen Mary University of London, London, UK*; [2]*University of Southampton, Southampton, UK*

10.1136/thorax-2019-BTSabstracts2019.137

Introduction and objectives There is evidence of a protective effect of prenatal long-chain (LC) n-3 polyunsaturated fatty acids (PUFA) on asthma risk, but longitudinal data on the relation between dietary intake in childhood and asthma risk are scarce. We aimed to investigate whether a higher intake of LC n-3 PUFA from fish in childhood is associated with a lower risk of incident asthma.

Methods In the Avon Longitudinal Study of Parents and Children, dietary intake of LC n-3 PUFA from fish, comprised of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), was estimated by food frequency questionnaire at 7 years of age. Amongst children free of doctor-diagnosed asthma at 7 years, we defined incident asthma as new doctor-diagnosed cases occurring between 7 and 14 years of age. We used logistic regression to test the association between quartiles of LC n-3 PUFA intake and incident asthma, adjusted for potential confounders. We stratified the analyses by fatty acid desaturase (FADS) genotype to explore potential

Abstract S131 Table 1 Adjusted odds ratio and 95% CI for incident asthma up to 14 years according to quartiles of long chain n-3 polyunsaturated fatty acid intake from fish at 7 years of age

	Q1	Q2	Q3	Q4	P-trend
Whole cohort	1.00	0.85 (0.63–1.15)	0.88 (0.65–1.19)	0.83 (0.61–1.14)	0.37
Stratified by rs1535					
AA (n=1608)	1.00	1.06 (0.61–1.85)	1.37 (0.80–2.36)	1.27 (0.73–2.21)	0.33
GA, GG (n=2025)	1.00	0.92 (0.60–1.42)	0.61 (0.38–0.98)	0.50 (0.30–0.83)	0.002

effect modification; a single nucleotide polymorphism, rs1535, predicts plasma levels of LC n-3 PUFA (G allele carriers having lower levels).

Results We identified 393 (8.64%) new cases of doctor-diagnosed asthma in 4,551 children included in this analysis. There was no statistically significant association between intake of LC n-3 PUFA from fish and incident asthma overall (table). However, when stratified by FADS genotype, a strong inverse association was seen amongst children who carried the minor G allele, with evidence of a dose-response (P=0.002), but no inverse association was observed amongst those who were homozygous for the major A allele (P-interaction=0.007). Similar effect modification was observed for intake of EPA (P-interaction=0.04) and DHA (P-interaction=0.008).

Conclusions Higher intake of LC n-3 PUFA from fish in childhood is associated with a lower risk of incident asthma, but only in children with a FADS gene variant associated with the poorer endogenous synthesis of EPA and DHA.

S132 TEN-YEAR EFFICACY AND SAFETY FOLLOWING BRONCHIAL THERMOPLASTY FOR ASTHMA – THE BT10 + STUDY

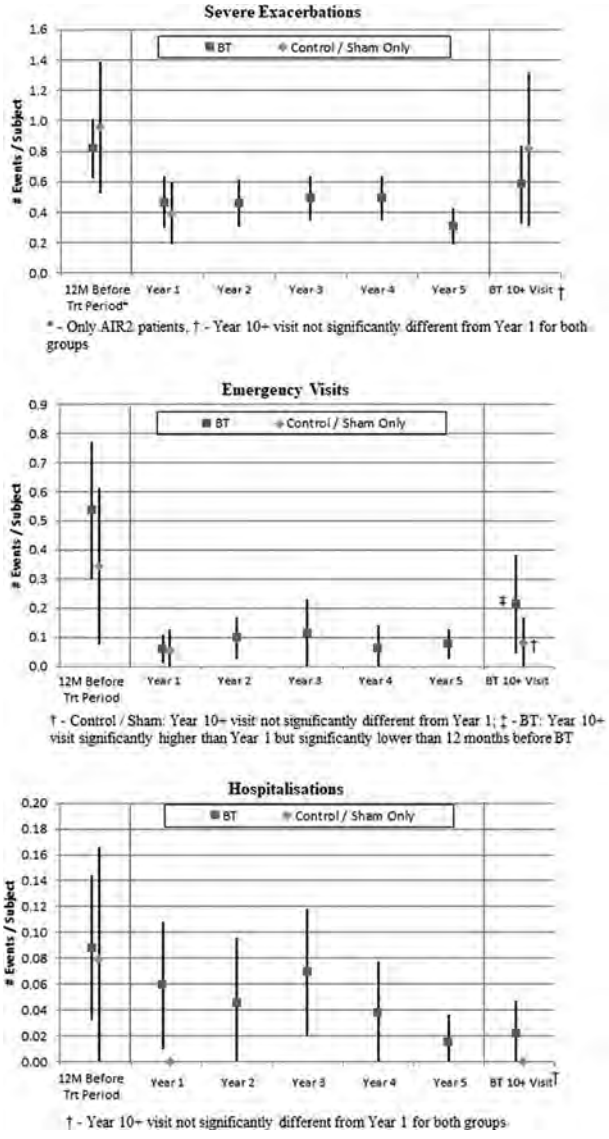
[1]R Chaudhuri, [2]A Rubin, [3]J Fiterman, [4]K Sumino, [5]J Lapa e Silva, [6]R Niven, [7]S Siddiqui, [8]K Klooster, [9]P Shah, [10]D Duhamel, [11]S Khatri, [12]R Barbers, [13]GM Grubb, [14]M Laviolette. *[1]Gartnavel General Hospital, Glasgow, UK; [2]Imandade Santa Casa de Misericordia, Porto Alegre, Brazil; [3]Maimonides Research Center, Porto Alegre, Brazil; [4]Washington University School of Medicine, St. Louis, Missouri, USA; [5]Hospital Universiario Clememtino Fraga Filho, Rio de Janeiro, Brazil; [6]MAHSC, The University of Manchester and Manchester Foundation Trust, Manchester, UK; [7]University of Leicester, College of Life Sciences, Department of Respiratory Sciences, NIHR Biomedical Research Centre (respiratory theme), Leicester, UK; [8]Groningen Research Institute for Asthma and COPD, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands; [9]Chelsea and Westminster Hospital, London, UK; [10]Virginia Hospital Center, Arlington, Virginia, USA; [11]Cleveland Clinic Foundation, Cleveland, Ohio, USA; [12]University of Southern California Hospital, Los Angeles, California, USA; [13]Boston Scientific Corporation, Marlborough, Massachusetts, USA; [14]Université Laval, Quebec, Canada*

10.1136/thorax-2019-BTSabstracts2019.138

Background Bronchial thermoplasty (BT) is a non-pharmacologic, endoscopic treatment for asthma not well controlled with long-acting b-agonists and inhaled corticosteroids. Long-term efficacy and safety of BT beyond 5 years is unknown. The BT10+ study was designed to evaluate the efficacy and safety of BT at 10+ years follow-up.

Methods BT10+ is an international, multi-center, ≥10yrs follow-up study on subjects who were enrolled in the AIR, RISA and AIR2 BT trials. Demographics, quality of life, lung function, severe exacerbations (SE, defined as asthma exacerbations requiring systemic corticosteroids) and healthcare utilisation for the previous year were collected at the BT10+ study visit. Additionally, AIR2 subjects who received a pulmonary high-resolution CT (HRCT) at baseline had a second scan at the BT10+ study visit to determine if clinically relevant changes, such as bronchiectasis, occur after BT.

Results Of 429 subjects enrolled AIR, RISA, and AIR2, 192 were followed-up at 10.6–15.8 years (12.1 median) post-treatment at 16 centers; of these, 136 were treated with BT and 38 were control/sham subjects in previous studies.



Abstract S132 Figure 1 Severe Exacerbations, Emergency Visits, and Hospitalisations in Control/Sham and BT Subjects

Baseline characteristics between subjects enrolled and not enrolled in BT10+ did not show meaningful differences. For BT subjects, no increases in the rate of hospitalisations or ER visits were observed compared to baseline and rates of SE were stable compared to Year 1 (figure 1). While both groups experienced fewer SE after treatment, BT subjects had fewer SE than control/sham subjects at the BT10 + visit; this was not significant. Quality of life (AQLQ, ACQ) and spirometry results were comparable between Years 1, 5, and 10+ for both groups. Pulmonary HRCT scans from AIR2 subjects at the BT10+ study visit showed 9.5% (2/21) of control/sham subjects and 13.4% (13/97) of BT subjects had bronchiectasis; however, when these were compared with baseline HRCT scans, only 5.3% (5/94) of BT subjects had developed bronchiectasis after their baseline visit.

Conclusion The BT10+ study suggests that efficacy of BT is sustained over 10 years and that BT has an acceptable safety profile.

Fuelling the fire: inflammation and infection in lung disease

S133 HYPOXIA DRIVES A HYPERINFLAMMATORY NEUTROPHIL PHENOTYPE IN THE LUNG

[1]ER Watts, [2]AJM Howden, [2]J Hukelmann, [3]A von Kriegsheim, [4]B Ghesquiere, [1]P Sadiku, [1]F Murphy, [1]AS Mirchandani, [1]DC Humphries, [1]TM Plant, [1]R Grecian, [1]EM Ryan, [1]P Coelho, [1]RS Dickinson, [3]A Finch, [4]W Vermaelen, [2]DA Cantrell, [1]MK Whyte, [1]SR Walmsley. *[1]Centre for Inflammation Research, University of Edinburgh, Edinburgh, UK; [2]Division of Cell Signalling and Immunology, University of Dundee, Dundee, UK; [3]Edinburgh Cancer Research Centre, IGMM, Edinburgh, UK; [4]Vesalius Research Centre, Leuven, Belgium*

10.1136/thorax-2019-BTSabstracts2019.139

Introduction and objectives Acute Respiratory Distress Syndrome (ARDS) is characterised by neutrophil driven alveolar and vascular injury. Alveolar damage is associated with worsening hypoxia and increased mortality. Specific therapies targeting neutrophilic inflammation are lacking, in part due to the challenge of limiting pathological inflammation while preserving immunity. We sought to characterise the effect of hypoxia on neutrophil driven ARDS and to define the mechanisms underlying the hypoxic phenotype.

Methods We used a mouse model of lipopolysaccharide (LPS)-induced ARDS with mice subsequently housed in either room air or in a hypoxic chamber (FiO2 10%). High resolution mass spectrometry was used to define the proteome of normoxic and hypoxic inflammatory lung neutrophils.

Results Exposure to hypoxia in the ARDS model resulted in increased morbidity with significant hypothermia and increased lung injury. Lung damage was associated with enhanced neutrophil degranulation, with elevated levels of elastase and MMP9 in the bronchoalveolar lavage (BAL) of hypoxic mice. Tissue injury was independent of neutrophil number suggesting that hypoxia results in a fundamental change in neutrophil phenotype and, indeed, a distinct and hyperinflammatory hypoxic proteomic signature was observed. More specifically, upregulation of inflammatory receptors including GM-CSF, TNF-alpha and formylated peptide receptors were identified as drivers of enhanced *in-vivo* neutrophil degranulation in hypoxia.

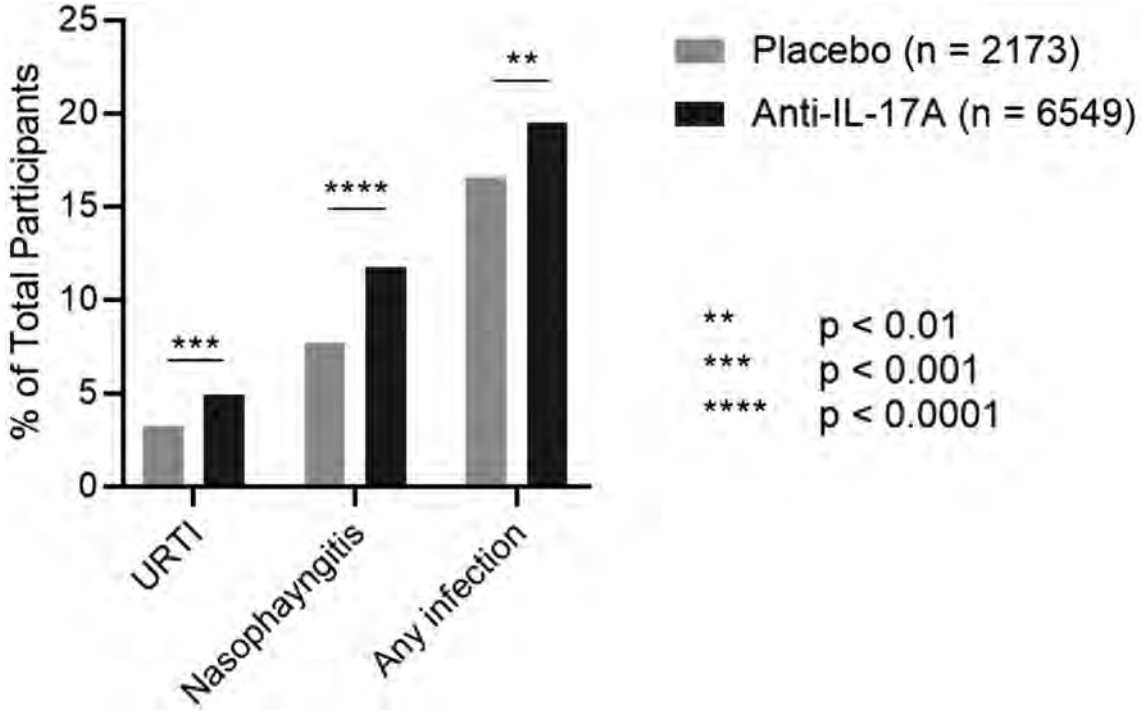
Analysis of the proteome of these inflammatory tissue neutrophils also provided insights into the processes and pathways which are active, highlighting the critical role of metabolic pathways in neutrophil function. Hypoxia was shown to drive metabolic adaptations with enhanced biosynthesis of inflammatory mediators further contributing to the hyperinflammatory phenotype. Upregulation of the lysosome and suppression of the nutrient sensing complex mTORC1 were shown to regulate these pathways in hypoxic neutrophils.

Conclusions Neutrophilic inflammation and hypoxia frequently co-exist, and we have demonstrated that hypoxia results in a damaging, hyperinflammatory phenotype in tissue neutrophils. Proteomic analysis identifies upregulation of inflammatory receptors and metabolic adaptations in hypoxic neutrophils as key drivers of this phenotype. Characterisation of these pathways driving harmful inflammation in the hypoxic lung identify new potential therapeutic targets in ARDS.

S134 A RETROSPECTIVE ANALYSIS OF RESPIRATORY INFECTIONS AND NASOPHARYNGITIS RATES IN TRIALS OF ANTI-IL-17A THERAPIES

GM Hynes, ID Pavord, TSC Hinks. *Respiratory Medicine Unit and National Institute for Health Research (NIHR) Oxford Biomedical Research Centre (BRC), Experimental Medicine Unit, Nuffield Department of Medicine, University of Oxford, Oxford, UK*

10.1136/thorax-2019-BTSabstracts2019.140



Abstract S134 Figure 1

Introduction Type-17 immunity, mediated by the cytokine IL-17A, is important in maintaining epithelial barrier integrity and also in host response to extracellular bacterial and fungal infections. However, dysregulation of this pathway is associated with IL-17A-driven diseases such as psoriasis. There is a significant body of literature linking IL-17A with severe forms of asthma, and at least one anti-IL-17A therapy has been trialled in patients with asthma, while another is in development. Therefore it is important to know the effect on host immunity.

Aim To determine whether infection rates are augmented or decreased in clinical trial participants commencing anti-IL-17A therapy for psoriasis in comparison with those receiving placebo.

Methods We performed a retrospective analysis of rates of respiratory infection, nasopharyngitis, and all infections across eight trials of anti-IL-17A therapies (Secukinumab, Ixekinumab and Bimekizumab) for patients with psoriasis. Brodalumab, a biologic targeting the IL-17 receptor, was not included as this also antagonises IL-17C, a cytokine with a different mechanism of action to IL-17A. We pooled data on infection rates, where reported, for analysis using GraphPad Prism 8. Fungal infections, such as candida, were reported inconsistently and events too few for meaningful statistical analysis.

Results Presented in figure 1. There were statistically significant increases in infection rates for those on anti-IL-17A therapy versus placebo for upper respiratory tract infections, nasopharyngitis and all infections. The relative risks (95% confidence intervals) for anti-IL-17A versus placebo were 1.57 (1.19 to 1.97), 1.52 (1.29 to 1.77) and 1.15 (1.04 to 1.28) and the absolute risk increases were 1.79%, 4.12% and 3.44% respectively. The number needed to harm was 56, 24 and 29 for URTI, nasopharyngitis and all infections respectively.

Conclusions Anti-IL-17A therapy appears to be linked to a small but significant increase in infection rates, which is likely due to the beneficial effects of IL-17A in maintaining mucosal immunity. This may contribute to the negative findings of trials of antagonists of this pathway in patients with asthma to date, and moreover challenges the assumption that elevated IL-17A is a driver of severe asthma rather than a beneficial and protective response to airway epithelial injury.

S135 THE CLINICAL IMPACT OF STREPTOCOCCUS PNEUMONIAE SEROTYPE SHIFT TO NON-PCV13 VACCINE SEROTYPES

[1]C Hyams, [2]Z Amin, [2]S Ladhani, [3]A Malin, [1]NA Maskell, [4]A Finn, [5]OM Williams. *[1]Academic Respiratory Unit, University of Bristol, Bristol, UK; [2]National Infection Service, Public Health England, London, UK; [3]Department of Respiratory Medicine, The Royal United Hospital, Bath, UK; [4]Schools of Cellular and Molecular Medicine and of Population Health Sciences, University of Bristol, Bristol, UK; [5]Department of Microbiology, Bristol Royal Infirmary, Bristol, UK*

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Introduction Conjugate vaccines reduce *Streptococcus pneumoniae* vaccine serotype circulation with replacement with non-vaccine serotypes. The clinical impact of this remains uncertain, in particular how adult pneumococcal disease may have changed following the replacement of PCV7 with PCV13 in the UK universal childhood programme in 2010.

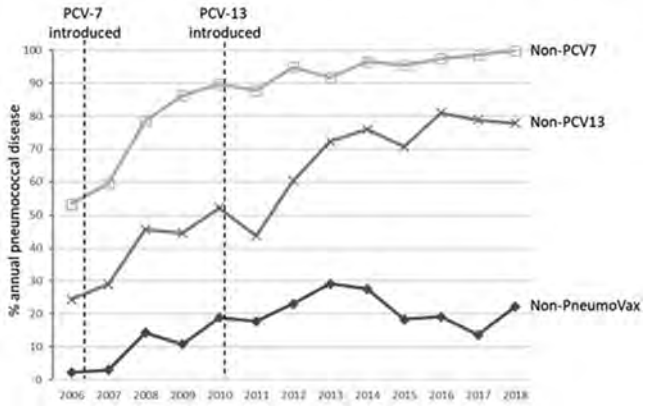
Objectives To define characteristics of adults hospitalised with pneumococcal disease in Bristol and Bath over a 10 year period spanning 2010 and to investigate disease trends following PCV13 introduction.

Methodology A retrospective cohort analysis of hospitalised patients with pneumococcal infection confirmed by blood culture and/or urinary antigen between January 2006 and December 2017. Clinical records, blood results, microbiological and radiological investigations were examined to identify patient characteristics associated with adverse outcomes including complications, ITU admissions and mortality. Mann-Whitney U and Chi-square were applied as appropriate.

Results 2114 admissions with pneumococcal disease were identified; (50% male, median age 66yr (IQR 51–79), 42% current smokers, 32% ex-smokers, 43% with chronic respiratory and 49% with cardiovascular disease). 92% (n=1948) admissions were pneumonia, 4% (n=82) meningitis, 1% (n=14) ENT-disease, 1% septic arthritis and 2% (n=41) other infections. Median length of stay was 7 days (IQR 5–10); all-cause inpatient mortality 16% (n=331); 1-year mortality 25% (n=521).

976 cases had causative serotype identified. Progressive serotype shift to non-PCV13 serotypes occurred (44% isolates pre-PCV13 versus 79% post-PCV13) (figure 1). Non-PCV13 serotype pneumonia increased from 47% pre-PCV13 to 98% post-PCV13 and meningitis from 65% to 100%. Total yearly patient admissions increased throughout the study ($P<0.05$). Patient age, gender or smoking status was unchanged (P-values>0.05).

Median admission CURB65-score decreased throughout the study: 2 (IQR1–4) pre-PCV13 versus 2 (IQR1–4) post-PCV13 ($P<0.01$). The proportion of patients with complications also decreased from 60% pre-PCV13 to 46% post-PCV13 ($P<0.01$). ITU admissions increasing throughout the study ($P<0.01$), but all-cause inpatient mortality decreased from 25% pre-PCV13 to 12% post-PCV13. However all-cause 1-year mortality remained 26% ($P>0.05$).



Abstract S135 Figure 1 Pneumococcal disease attributable to non-vaccine serotypes

Conclusions Serotype shift leading to increased disease from non-PCV13 serotypes occurred but disease severity may be decreasing. This may be due to serotype shift away from more invasive pneumococcal serotypes. Further investigation of the clinical impact of conjugate pneumococcal vaccination should be undertaken.

S136 RELATIONSHIP BETWEEN INFLAMMATORY TYPE OF OBSTRUCTIVE AIRWAYS DISEASE AND LUNG FUNCTION IN A COHORT OF THE OXFORD SPECIAL AIRWAYS CLINIC

A Moran, G Hynes, L Lehtimaki, R Shrimanker, S Thulborn, C Borg, C Connolly, A Gittins, T Downs, R Russell, C Brightling, J Cane, I Pavord, M Bafadhel, T Hinks. *Respiratory Medicine Unit and National Institute for Health Research (NIHR) Oxford Biomedical Research Centre (BRC), Nuffield Department of Medicine Experimental Medicine, University of Oxford, Oxford, UK*

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Background Asthma and COPD have different diagnostic labels but share underlying sputum inflammatory types in common. Whilst eosinophilic inflammation is best understood, neutrophilic and mixed inflammation have not been well characterised to date.

Aims We aimed to compare clinical characteristics and lung function in the different sputum inflammatory groups in a heterogeneous group of patients with obstructive airway disease.

Methods Patients of the Special Airways Clinic were invited to participate in this study. Those who consented were

Abstract S136 Figure 1 Demographics, comorbidities, biomarkers and lung function in sputum inflammatory groups

	Pauci-granulocytic	Neutrophilic	Eosinophilic	Mixed	p
N (% of total)	34 (17%)	69 (34%)	69 (34%)	31 (15%)	
Asthma	29 (85.3%)	48 (69.6%)	66 (95.7%)	25 (80.6%)	
COPD	5 (14.7%)	21 (30.4%)	3 (4.3%)	6 (19.4%)	
Age†	50 (38-59)	63 (53-72)	52 (41-66)	61 (50-68)	<0.001
Females	20 (58.8%)	34 (49.3%)	36 (52.2%)	17 (54.8%)	0.8
First degree relative with asthma	14 (41.2%)	21 (30.4%)	32 (46.4%)	15 (48.4%)	0.2
Smoking					0.047
-never	24 (70.5%)	25 (36.2%)	39 (56.5%)	16 (51.6%)	
-ex	6 (17.6%)	39 (56.5%)	22 (31.9%)	12 (38.7%)	
-current	3 (8.8%)	4 (5.8%)	6 (8.7%)	2 (6.5%)	
-pack years†	22 (3-29)	15 (3-38)	8 (3-14)	10 (2-53)	0.3
Seasonal rhinitis	7 (20.6%)	6 (8.7%)	11 (15.9%)	4 (12.9%)	0.4
Perennial rhinitis	12 (35.3%)	21 (30.4%)	22 (31.9%)	8 (25.8%)	0.9
Chronic rhinosinusitis	0 (0.0%)	1 (1.4%)	1 (1.4%)	0 (0.0%)	0.8
Nasal polyps	4 (11.8%)	11 (15.9%)	20 (29.0%)	6 (19.4%)	0.1
Dermatitis /eczema	5 (14.7%)	11 (15.9%)	12 (17.4%)	7 (22.6%)	0.8
GORD	1 (2.9%)	5 (7.2%)	3 (4.3%)	0 (0.0%)	0.4
Osteoporosis	3 (8.8%)	4 (5.8%)	5 (7.2%)	1 (3.2%)	0.8
Depression	1 (2.9%)	3 (4.3%)	2 (2.9%)	1 (3.2%)	1.0
Vasculitis	1 (2.9%)	0 (0.0%)	2 (2.9%)	0 (0.0%)	0.4
Total IgE (kU/L)†	64.9 (41.3-319.5)	69.7 (30.2-222.0)	210.5 (53.2-476.5)	98.1 (33.1-205.6)	0.022
FeNO (ppb)†	23 (14-41)	24 (17-35)	47 (27-97)	32 (18-71)	<0.001
Blood eosinophil count ($x10^9$/L)†	0.20 (0.13-0.38)	0.16 (0.12-0.29)	0.48 (0.33-0.68)	0.36 (0.19-0.47)	<0.001
FEV1 % predicted‡	83 (76-90)	72 (67-77)	74 (68-79)	64 (56-72)	0.005
FVC % predicted‡	95 (90-101)	93 (89-97)	94 (89-98)	86 (80-93)	0.205
FEV1/FVC ratio‡	0.72 (0.68-0.76)	0.61 (0.58-0.65)	0.64 (0.61-0.67)	0.60 (0.56-0.65)	<0.001
FEV1 % reversibility‡	4.2 (2.6-5.8)	3.2 (1.9-4.4)	6.0 (4.7-7.3)	6.4 (4.5-8.3)	0.006

†Median, interquartile range. ‡Mean, 95% confidence interval. All other results are expressed as number and percentage of the sputum inflammatory group, unless otherwise stated.

assessed at baseline and follow up visits using ACQ-5, AQLQ, Euroqol, HADS questionnaires and VAS symptoms. Lung function was assessed by spirometry and exhaled nitric oxide, and blood and sputum profiling were undertaken. Participants were divided into four sputum inflammatory groups: paucigranulocytic (sputum eosinophils <3% and neutrophils ≤61%), neutrophilic (eosinophils <3% and neutrophils >61%), eosinophilic (eosinophils ≥3% and neutrophils ≤61%) and mixed (eosinophils ≥3% and neutrophils >61%). Data were pooled across all visits and analysed by sputum inflammatory group, using a mixed model, for lung function analysis.

Results We analysed data from 203 patients (Table 1). The paucigranulocytic group was youngest and the neutrophilic oldest. There were no significant differences among groups for ethnicity, BMI, family history, comorbidities or respiratory sensitisations. The paucigranulocytic group had a predominance of never smokers, the neutrophilic group were 56.5% ex-smokers and the highest proportion of current smokers was in the mixed group. Total IgE was highest in eosinophilics. There were no significant differences in medication use, symptom severity, healthcare utilisation or quality of life among the different groups. FEV1 percent predicted and FEV1/FVC ratio were higher in paucigranulocytics compared with mixed ($p=0.001$, $p<0.001$), neutrophilic ($p=0.013$, $p<0.001$) and eosinophilic ($p=0.038$, $p=0.001$) groups. FVC percent predicted was also higher in paucigranulocytics, compared with the mixed group ($p=0.041$). FEV1 reversibility post-bronchodilator was lowest in neutrophilic compared with eosinophilic ($p=0.003$) and mixed ($p=0.006$) groups.

Conclusions Inflammatory groups had similar demographics and clinical characteristics; however, severity of airflow obstruction was worst in the mixed and neutrophilic inflammatory groups, and neutrophilic inflammation alone was associated with least reversibility of airflow obstruction.

S137 SHORT-ACTING AND LONG-ACTING β2-AGONISTS UPREGULATE ASTHMA-RELEVANT PRO-INFLAMMATORY MEDIATORS IN HUMAN AIRWAY EPITHELIAL CELLS WHILE SHORT-ACTING MUSCARINIC ANTAGONISTS DO NOT

K Kumar, F Losa, T Kebadze, A Singanayagam, MR Edwards, SL Johnston. *National Heart and Lung Institute, Imperial College London, London, UK*

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Introduction and objectives Despite their undoubted benefits, increased mortality is associated with overuse of short-acting β_2-agonists (SABAs) and with using long-acting β_2-agonists (LABAs) in the absence of inhaled corticosteroids (ICS). Mechanisms underlying these adverse effects are unclear. It has previously been reported that salmeterol and formoterol induce disease-relevant mediators in bronchial epithelial cells (BECs).[1] We investigated whether other commercially available β_2-agonists, or the short-acting muscarinic antagonist ipratropium, cause similar effects.

Methods BEAS-2B BECs were stimulated with SABAs (salbutamol, fenoterol), LABAs (formoterol, indacaterol, olodaterol, vilanterol) or ipratropium at a range of concentrations or with vehicle control. Cell supernatants were harvested 24 hours post-stimulation.

Additionally, BEAS-2B BECs were stimulated with salmeterol, with and without the corticosteroid fluticasone, in the presence and absence of rhinovirus-16. Cell supernatants were harvested 8, 24, 48 and 72 hours post-stimulation.

Results Compared to vehicle control, there was significant induction of IL-6 by 100nM fenoterol ($p=0.021$), 1nM formoterol ($p=0.015$), 100nM indacaterol ($p=0.049$), 1nM vilanterol ($p=0.029$) and 0.1nM vilanterol ($p=0.028$); and significant induction of IL-11 by 10nM olodaterol ($p=0.028$) and 0.1nM olodaterol ($p=0.012$) versus vehicle-treated cells. There was no significant induction of IL-6 or IL-11 at any tested concentration of ipratropium ($p>0.05$).

Compared to vehicle control, there was significant induction of IL-6 by salmeterol, both with and without rhinovirus-16, at 8, 24 and 48 hours ($p<0.05$); and significant induction of IL-11 by salmeterol alone at 24 and 48 hours ($p<0.05$) and by salmeterol/rhinovirus-16 co-stimulation at 48 and 72 hours ($p<0.05$) versus vehicle-treated cells. IL-6 and IL-11 induction was abolished at all timepoints upon salmeterol/fluticasone co-stimulation, with and without rhinovirus-16.

Conclusions Clinically relevant SABAs and LABAs induce upregulation of asthma-relevant mediators in BECs. This effect is not exhibited by ipratropium. Inappropriate β_2-agonist use may cause adverse effects in asthma via induction of, and augmentation of virus-induction of, the pro-inflammatory mediators IL-6 and IL-11 in BECs. ICS protect against this adverse effect. *In vivo* studies are required for further confirmation.

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A multi-faceted approach to ILD management

P1 PSYCHOMETRIC PROPERTIES OF HEALTH-RELATED QUALITY OF LIFE TOOLS FOR IDIOPATHIC PULMONARY FIBROSIS

[1]J Kim, [1]A Clark, [2]S Birring, [1]C Atkins, [3]M Whyte, [1]AM Wilson. *[1]Norwich Medical School, Norwich, UK; [2]King's College Hospital NHS Foundation Trust, London, UK; [3]The University of Edinburgh, Edinburgh, UK*

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Background Assessing health-related quality of life (HRQOL) in idiopathic pulmonary fibrosis (IPF) is important clinically and for research. As there is no universally agreed HRQOL tool for IPF, a variety of different tools have been used. We aimed to compare the psychometric properties of various HRQOL tools used IPF, assess their relationship with 1-year mortality and determine minimal important clinical difference (MCID).

Methods This was an observational prospective longitudinal multicentre study, involving 238 people with IPF. Participants were asked to complete HRQOL tools including EuroQol 5 dimension (EQ-5D-5L), King's brief interstitial lung disease questionnaire (K-BILD) and St George's Respiratory questionnaire (SGRQ), at approximate three-monthly intervals over a 12 month period. Physiological measurements including spirometry and 6 minute walking distance were captured and matched with questionnaires.

Results There were 778 patient assessments with each individual having an average of 3.3 sets of questionnaires. All questionnaires showed good internal consistency with Cronbach's alpha coefficients of >0.8. There were strong correlations between questionnaires but not with physiological measurements. People with FVC% predicted ≤70% had higher mean SGRQ and MRC scores, and lower mean EQ5D and K-BILD score. People in upper tercile of baseline KBILD and EQ-5D-5L (better health status) had significantly reduced risk of deaths than those in the lower tercile (HR 0.06; 95% CI 0.01–0.42 and HR 0.27; 95CI 0.09–0.81, respectively). Those in the upper tercile of SGRQ (worse health status) had more than 3-fold increased risk of mortality than those in the lower tercile (HR 4.65; 95% CI 1.32–16.62). The MCID (anchor method) for K-BILD was 2.3 and SGRQ was 3.9.

Conclusion We recommend using the MRC dyspnoea scale rather than UCSD SOBQ, given it brevity and better known groups validity. Both the K-BILD and SGRQ were appropriate disease specific HRQOL tools for assessing people with IPF but we recommend the use of K-BILD, given its brevity and stronger relationship to mortality.

P2 THE VETERANS SPECIFIC ACTIVITY QUESTIONNAIRE AS A PATIENT REPORTED OUTCOME MEASURE IN PULMONARY VASCULITIS AND INTERSTITIAL LUNG DISEASE

[1]R Sethi, [1]F Gawecki, [2]M Mohamed, [2]RK Coker, [2]K Ward, [2]CL Shovlin. *[1]Imperial College London, London, UK; [2]Imperial College Healthcare NHS Trust, London, UK*

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Introduction and aims Patients with respiratory disease often report activity limitation that is not always adequately or efficiently described by existing physiological parameters or patient reported outcome measure (PROM) tools such as the MRC Dyspnoea Scale.[1] The Veteran's Specific Activity Questionnaire (VSAQ), modified in 2017 for UK use, can be self-administered in a few minutes and has been validated in multiple studies.[2] The aims of the current study were to evaluate the VSAQ in patients with interstitial lung disease and pulmonary vasculitis.

Methods Adult patients attending interstitial lung disease and pulmonary vasculitis clinics in a single centre were recruited. The VSAQ was self-completed by patients who underwent standardised pulmonary function assessments before clinical assessment incorporating assignment of the Birmingham Vasculitis Activity Score (BVAS) and MRC Dyspnoea Scale. Metabolic equivalents (METs) were calculated from the VSAQ by METs=4.74+0.97(VSAQ)-0.06(Age). Relationships between METs and physiological variables were evaluated using STATA IC v15.0.

Results Ninety-four patients were recruited, 45 with interstitial lung disease and 49 with pulmonary vasculitis. 44 were males. Ages ranged from 30–87 years, body mass index from 17.3–48.7 kg/m^2, and resting heart rate from 52–119bpm. Spirometric values averaged 80% of predicted; TLCO 60% predicted. Resting oxygen saturation ranged from 78–100%. METs ranged from 1.73–14.29 kcal/kg/hour (median 5.39) in the 94 patients, and BVAS score from 0–30 (median 5) in 35 vasculitis patients. The VSAQ captured dynamic changes better than the MRC Dyspnoea Scale, e.g. in one patient presenting with worsening dyspnoea, returning to baseline two weeks later: VSAQ score increased from 4 to 12 (METs from 5.38 to 13.14 kcal/kg/hour) but MRC Dyspnoea Scale only changed from 2 to 1. In preliminary analyses a significant inverse correlation was found between METs and resting heart rate [Spearman r=-0.38, p<0.01] and BVAS [r=-0.45, p<0.01]. There were positive correlations between METs and the forced vital capacity [r=0.26, p=0.02] and TLCO [r=0.41, p<0.01].

Conclusions The VSAQ may be useful to describe patient activity, and in serial measurements to monitor a patient's condition in patients with parenchymal disease and also patients with vasculitic/inflammatory disorders.

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P3 SLEEP CHARACTERISTICS AND QUALITY OF LIFE IN PATIENTS WITH FIBROTIC INTERSTITIAL LUNG DISEASE

KJ Myall, D Roque, S Simpson, ES Suh, A West, B Kent. *Guy's and St Thomas' NHS Foundation Trust, London, UK*

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Introduction and objectives Both nocturnal hypoxaemia (NH) and obstructive sleep apnoea (OSA) are common in patients with interstitial lung disease. We aimed to prospectively measure the incidence of sleep disordered breathing in these patients, and assess their relationship with disease specific and respiratory quality of life measures.

Methods Prospective observational study of patients with an MDT diagnosis of a fibrotic interstitial lung disease who all underwent a home sleep study. Data was collected for demographic and clinical characteristics, pulmonary function testing, six-minute walk test (6MWT), and patient-reported disease-

specific quality of life using the King's Brief Interstitial Lung Disease questionnaire (KBILD) and the St George's Respiratory Questionnaire (SGRQ).

Results 29 patients were included. Nine (31.0%) had nocturnal hypoxaemia (defined by ≥10% of sleep with SpO2 ≤90%), and 10 (34.4%) had at least moderately severe OSA (ODI ≥15). Both NH and OSA were associated with a trend towards a reduction in quality of life. In patients with NH, median KBILD score was 56.67 vs 53.80 in patients without (p=0.15). Mean SGRQ was 50.03±14.32 in patients with NH and 34.55±19.38 in patients without (p=0.09). In patients with at least moderately severe OSA, median total KBILD score was 59.52 vs 56.51 in patients without (p=0.49). Mean SGRQ in patients with OSA was 47.20 ±21.44 vs 33.92±16.39 in unaffected patients (p=0.13). Patients with OSA had a significantly lower FVC than those without (Mean 2.37±0.64 Vs 2.88±0.58, p=0.04. Mean BMI was 31.36±7.84 in patients with NH compared with 29.56 ±4.68 in those without (p=0.45), and in patients with OSA mean BMI was 32.62±6.84 vs 28.80±4.78 in those without (p=0.09).

Conclusions NH and OSA are common in patients with fibrotic interstitial lung disease, and, both tend towards a reduction in quality of life as measured by SGRQ and KBILD. Baseline FVC is lower in patients with OSA, although not NH, and as expected patients with OSA were more obese than those without.

P4 VALIDITY AND REPRODUCIBILITY OF CARDIOPULMONARY EXERCISE TESTING IN INTERSTITIAL LUNG DISEASE

[1]OW Tomlinson, [2]L Markham, [2]RL Wollerton, [3]BA Knight, [3]A Duckworth, [2]A Spiers, [1]CA Williams, [2]M Gibbons, [3]CJ Scotton. *[1]Sport and Health Sciences, University of Exeter, Exeter, UK; [2]Royal Devon and Exeter NHS Foundation Trust Hospital, Exeter, UK; [3]University of Exeter Medical School, Exeter, UK*

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Introduction Cardiopulmonary exercise testing (CPET) is shown to be feasible in patients with interstitial lung disease (ILD), highlighting its prospective use as an outcome measure for prognostic monitoring. However, validity and reproducibility, in terms of eliciting maximal exercise and identifying significant changes over time remain unknown.

Objectives To identify the validity and reproducibility of CPET in patients with ILD, with particular reference to peak oxygen consumption (VO_{2peak}).

Methods Eight males with ILD (68.6±8.2 years) performed two CPETs, 3 months apart on a cycle ergometer. A 'maximal' effort was determined if responses met at least one of the criteria established by ATS/ACCP guidelines: plateau in VO_2, achieving predicted VO_{2peak}, peak work rate or predicted peak heart rate, and a respiratory exchange ratio >1.15. Pearson's correlation and paired samples *t*-test established the relationship, and difference, between VO_{2peak} values from each CPET. Reproducibility of VO_{2peak} was characterised by means of absolute typical error (TE) and typical error as a percentage of the coefficient of variation ($TE_{CV\%}$).

Results Mean time between CPETs was 14±1 weeks. Reasons for termination included exhaustion (n=11), desaturation (n=4) and poor ECG signal (n=1). All CPETs satisfied at least one of the required ATS/ACCP criteria, with 10/16 satisfying two criteria. The most common criteria was RER >1.15, being satisfied in 15/16 CPETs. Mean VO_{2peak} at the first CPET was 1.38±0.39 $L.min^{-1}$, and 1.25±0.25 $L.min^{-1}$ at the second. The mean change of -0.13±0.14 $L.min^{-1}$ was not statistically significant (p=0.14). VO_{2peak} data from both CPETs were highly correlated (r=0.85, p=0.008). TE of VO_{2peak} over this period was 0.16 $L.min^{-1}$, with $TE_{CV\%}$ being 11.8%.

Conclusions This analysis has shown that CPET is valid and reliable in ILD. Maximal efforts can be identified through use of ATS/ACCP criteria and repeatability over 3 months is ~12%. Any change in VO_{2peak} beyond this value implies a significant change in function, which can in turn affect clinical decisions regarding prognosis and treatment.

P5 THE USE OF CARDIOPULMONARY EXERCISE TESTING IN IDIOPATHIC PULMONARY FIBROSIS: FEASIBILITY AND CORRELATION WITH QUALITY OF LIFE MEASURES

[1]RJ Davis, [1]SL Barratt, [2]J Viner, [2]C Dixon, [1]A Morley, [3]H Adamali, [1]N Maskell. *[1]Academic Respiratory Unit, University of Bristol, Bristol, UK; [2]Respiratory Physiology, North Bristol NHS Trust, Bristol, UK; [3]Interstitial Lung Disease Service, North Bristol NHS Trust, Bristol, UK*

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Introduction The heterogeneity of idiopathic pulmonary fibrosis (IPF) in terms of disease course and treatment response leads to challenges for patients and clinicians in terms of optimal timing for transplantation and/or end of life discussions. The use of cardiopulmonary exercise testing (CPET) in IPF prognostication remains largely unexplored.

Objectives

1. To explore the feasibility of undertaking CPET in this population;
2. To explore the correlation between baseline CPET variables, physiological variables and quality of life (QOL) scores.

Methods Consecutive IPF patients (n=74) were approached, with prospective recruitment of 42 participants. Patients with FVC <50% and/or DLCO <50% were excluded. King's Brief ILD (K-BILD) questionnaire assessed QOL. Patients undertook incremental exercise testing to maximal exertion using a cycle ergometer, with contemporaneous physiological testing (FVC, DLCO).

Results 32 patients were excluded from the study (22 screening failures, 10 declined), with study attrition of an additional 10 patients (n=4 withdrew consent, n=1 death prior to testing, n=5 developed exclusions). Thirty-two patients (23 mild IPF with FVC>80%, 9 moderate IPF with FVC 50–80%), 26M:6F and median age (IQR) 75 years (71–79), underwent CPET. One patient failed to reach anaerobic threshold (AT) and was excluded from the analysis. Median (IQR) pulmonary and exercise results were: FVC 92% (75–102), DLCO 62% (54–69), minimum $SpO_2$93% (88–95), VO_2 peak/kg 21 (17.4–23.8) $mL.kg^{-1}.min^{-1}$ and $V_E/VCO_2$27.2 (25.4–30.5). Median (IQR) QOL scores for each domain were: total K-BILD 64.4 (58.1–68.7), psychological 68.3 (56.9–80.9), breathlessness/activity (B/A) 50.2 (48–62.7) and chest symptoms 85.2 (73.4–85.2) (Table1).

VO_2 peak/kg correlated with chest (r=0.36, p=0.049) and B/A (r=0.43, p=0.016) domains of the K-BILD questionnaire. VO_2 peak/kg at AT also correlated with total K-BILD scores r=0.37, p=0.039 and chest domains (r=0.535, p=0.002). Total KBILD scores did not correlate with%FVC (r=0.26, p=0.15),%DLCO predicted (r=0.11, p=0.544) or SpO_2 (r=0.01, p=0.959) (Spearman's).

Abstract P5 Table 1 Baseline demographics, physiological variables, cardiopulmonary exercise testing results and King's Brief Interstitial Lung Disease quality of life scores

Variables	Median (Interquartile range)
Age (years)	75 (71–79)
Male: Female	26:6
Pulmonary function parameters	
FVC (% predicted)	92 (75–102)
DLCO (% predicated)	62 (54–69)
Cardiopulmonary exercise testing results	
Peak VO_2/kg ($mL.kg^{-1}.min^{-1}$)	21 (17.4–23.8)
V_E/VCO_2	27.2 (25.4–30.5)
Minimum O_2 saturation during exercise (%)	93 (88–95)
K-BILD score	
Total	64.4 (58.1–68.7)
Psychological domain	68.3 (56.9–80.9)
Breathlessness/activity (B/A) domain	50.2 (48–62.7)
Chest symptoms domain	85.2 (73.4–85.2)

Conclusions Initial results suggest CPET is a feasible method of testing in mild-moderate IPF. Whilst QOL did not correlate with baseline FVC and DLCO, the relationship between oxygen consumption and QOL measures, requires further exploration. Longitudinal data will hopefully provide further information on the usefulness of CPET as a prognostic marker.

P6 LONGITUDINAL CHANGES IN EXERCISE CAPACITY AND SPIROMETRY IN INTERSTITIAL LUNG DISEASE

[1]RL Wollerton, [1]L Markham, [2]OW Tomlinson, [3]BA Knight, [3]A Duckworth, [1]A Spiers, [2]CA Williams, [1]M Gibbons, [3]CJ Scotton. *[1]Royal Devon and Exeter NHS Foundation Trust Hospital, Exeter, UK; [2]Sport and Health Sciences, University of Exeter, Exeter, UK; [3]University of Exeter Medical School, Exeter, UK*

10.1136/thorax-2019-BTSabstracts2019.149

Introduction Traditional spirometry measures of forced vital capacity (FVC) and diffusion capacity for carbon monoxide (DL_{CO}) are used in interstitial lung disease (ILD) for prognostic monitoring and evaluating treatment efficacy. Cardiopulmonary exercise testing (CPET) has been proposed as an alternative to spirometry, although it is unknown how the primary outcome of CPET – peak oxygen uptake (VO_{2peak}) – changes relative to both FVC and DL_{CO}.

Objectives To identify the direction and magnitude of longitudinal changes in VO_{2peak}, FVC and DL_{CO} in patients with ILD, and identify independence between variables.

Methods 21 patients with ILD (17 male, 69.8±7.6 years) performed three CPETs on a cycle ergometer within a mean period of 42±14 weeks. Spirometry was retrospectively obtained from medical records. One-way ANOVA determined significant changes in time. Pearson's correlation coefficients established relationships between variables. Regression values and correlations were established for each patient's change in VO_{2peak}, FVC and DL_{CO}.

Results The correlation between VO_{2peak} and FVC regressions was r=0.34 (p=0.145) and between VO_{2peak} and DL_{CO} this was r=-0.20 (p=0.432). The majority of patients showed consistent decline in both VO_{2peak}, FVC and DLCO (n=9). However, some patients (n=4) showed an increase in one variable (with decreases in the other two), whilst a further n=4 showed an increase in two variables (decreasing in the third).

Conclusions This analysis has shown varied directions and magnitude of change in VO_{2peak} relative to traditional spirometric variables of FVC and DL_{CO}. This confirms the potential utility of CPET as an independent prognostic tool and further investigation is required to assess its clinical utility and associations with alternative clinical markers (e.g. biomarkers, radiology, patient reported outcomes).

P7 THE SAFETY OF BRONCHOALVEOLAR LAVAGE IN PATIENTS WITH IDIOPATHIC PULMONARY FIBROSIS

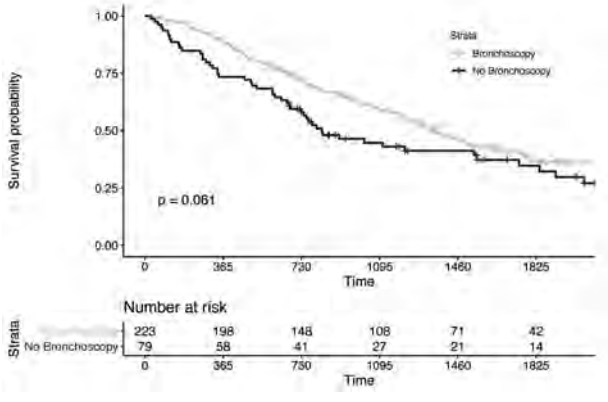
[1]J Smith, [2]FJ Chua, [2]AU Wells, [2]E Renzoni, [2]AG Nicholson, [3]RG Jenkins, [4]RP Marshall, [4]WA Fahy, [1]TM Maher, [1]PL Molyneaux. *[1]Imperial College London, London, UK; [2]Royal Brompton Hospital, London, UK; [3]University of Nottingham, Nottingham, UK; [4]GSK, Stevenage, UK*

10.1136/thorax-2019-BTSabstracts2019.150

Introduction Retrospective and anecdotal evidence have been used to suggest that bronchoscopy in patients with IPF could be associated with an increased risk of acute exacerbations or acute respiratory deterioration. We aim to clarify the safety of BAL in patients with IPF in the prospectively recruited PROFILE cohort.

Methods Patients diagnosed with IPF within the past 6 months were invited to participate in the PROFILE study. Patients were assessed at baseline, 1, 3, and 6 months and annually for 3 years. Fibreoptic bronchoscopy with BAL was performed at baseline in a subset of the Royal Brompton portion of the cohort. The procedure involved installation of 240 ml of warm saline in four aliquots into the right middle lobe followed by gentle aspiration by hand.Continuous variables are presented as means (±SD) and categorical variables as proportions. Differences between subject groups were evaluated with the use of the Mann–Whitney test for continuous variables and Fisher exact test for categorical variables. Time-to-event curves were calculated using the Kaplan–Meier method and compared with the use of the log-rank test.

Results 302 patients were prospectively recruited, of whom 223 underwent bronchoscopy (74%). The 79 IPF patients who did not undergo BAL were older (71.6 vs. 67.8 years,



Abstract P7 Figure 1 No Significant difference in overall mortality in patients with IPF undergoing bronchoscopy. Kaplan Meier curve generated by Cox proportional-hazards model. Log rank P test value reported.

$P=0.001$) and had a lower DLCo (39.2% vs. 47.6%, $P=0.001$) compared to subjects undergoing bronchoscopy. All subjects in the bronchoscopy cohort tolerated the procedure well. A leukocyte differential profile was determined in all cases and no immediate (<72 hrs) complications were reported. In the first 30 days post BAL, 6 patients (2.6%) reported complications including two with transient viral symptoms, one with odynophagia and three with a lower respiratory tract infection. Antibiotics were prescribed in all cases and one patient attended A&E. All-cause mortality at 90 days was 1.4% in the bronchoscopy cohort compared to 6.3% in the non-procedure cohort. The median survival for patients undergoing bronchoscopy was 3.7 years (figure 1).

Conclusions Bronchoscopy is a safe and well tolerated procedure in patients with IPF supporting its use as part of the diagnostic assessment of interstitial lung disease and as a research tool.

P8 ECMO BRIDGE TO LUNG TRANSPLANT IN PATIENTS WITH ILD OUR EXPERIENCE

B Zych, A Rosenberg, M Carby, A Simon, A Reed, N Kewalramai. *Royal Brompton and Harefield NHS Trust, London, UK*

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Introduction and objectives Patients with advanced ILD (Interstitial Lung Disease) have a narrow window when they can be successfully transplanted. The use of ECMO (Extracorporeal membrane Oxygenation) pretransplant has traditionally been associated with poor posttransplant outcomes. Advances in extracorporeal technology, patients election, and management during ECMO support have led to improved outcomes in carefully selected transplant candidates.[1]Bridge to transplant (BTT) strategies aim to support deteriorating patients until organs are available. The use of ECMO BTT has become more common internationally. We report our experience in single UK centre.

Methods We collected data from patients with ILD who required ECMO BTT between January 2017 to June 2019.

Results In total 9 ILD patients required ECMO as BTT in this period. 3 of them were females and 6 were males. 3 were below 40 years of age and 6 were above 40 years of age. Out of the 9 patients,4 successfully underwent Lung Transplant and are still alive. 4 were removed from the transplant list when the clinical teams agreed that a point of futility had been reached and the patient was no longer likely to survive transplant. One patient recovered and ECMO was successfully removed.

Conclusions ECMO as BTT can be successful in carefully selected patients. Our centre has the largest cohort of ILD patients who have attempted BTT. Many ILD patients die on the transplant list due to lack of availability of suitable organs. Successful ECMO bridge to transplant remains challenging, highlighting the need for both careful patient selection and anticipatory planning for potentially difficult end-of-life scenarios. Appropriate patient selection and timing of ECMO initiation remain crucial aspects of achieving success with ECMO as BTT.

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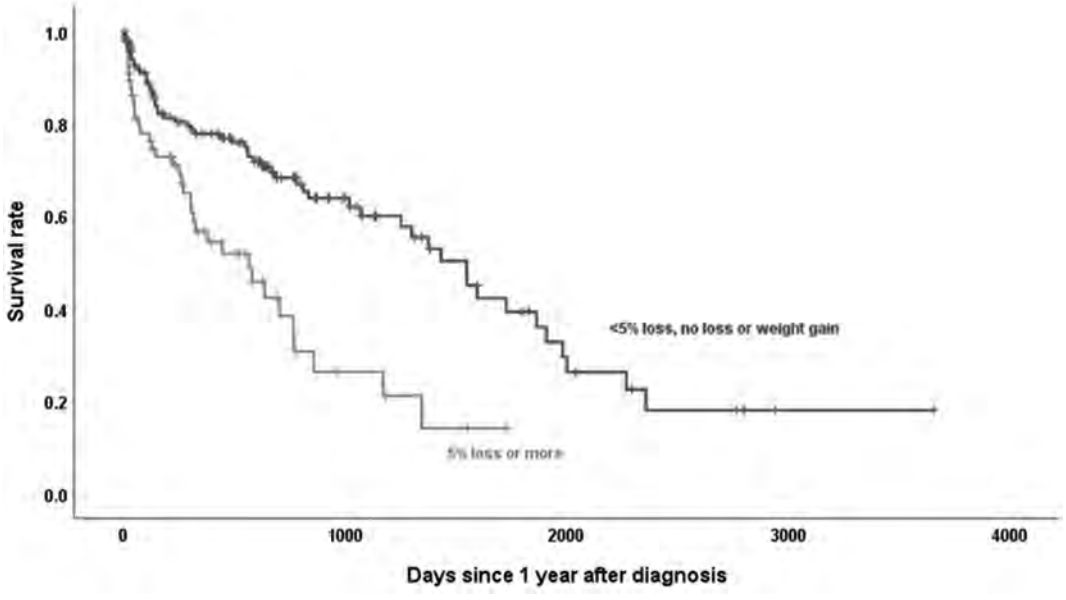
P9 WEIGHT LOSS AS A PREDICTOR OF MORTALITY IN PATIENTS WITH IDIOPATHIC PULMONARY FIBROSIS: A RETROSPECTIVE STUDY

[1]G Vekaria, [1]T Murrells, [2]J Porter, [3]M Heightman, [3]J Sahota, [3]T Miklasch, [3]L Beitverda, [1]R Starodub. *[1]King's College London Florence Nightingale Faculty of Nursing, Midwifery and Palliative Care, London, UK; [2]University College London, London, UK; [3]University College London Hospitals NHS Foundation Trust, London, UK*

10.1136/thorax-2019-BTSabstracts2019.152

Introduction Idiopathic pulmonary fibrosis (IPF) often leads to death from respiratory failure, but there is much variation in outcome between patients. Limited evidence suggests an independent relationship between body weight change and



Abstract P9 Figure 1 Survival rate by weight change group

mortality in patients with IPF.[1,2] Other prognostic biomarkers aid clinical decision making, and it is recognised that a decline in Forced Vital Capacity (FVC) of >10% in a year is a significant predictor of mortality in this disease.

Objectives To explore if weight loss independently affects mortality in individuals with IPF.

Methods Retrospective data were collected using electronic medical records on a sample of patients diagnosed with IPF at one tertiary care NHS teaching hospital in London, UK. Adult (≥18 y) patients diagnosed with IPF were included. Weight was collected at diagnosis and around 1 year after diagnosis together with details of comorbidities, medications, oxygen use, echocardiogram and pulmonary function tests. A significant body weight loss was defined as an annual body weight change of >5%.[2] Survival from 1 year after diagnosis onwards served as a primary endpoint in a multivariable Cox regression model.

Results A total of 205 patients diagnosed with IPF between 01/2017 and 12/2018 were included in the analysis. The mean age at diagnosis was 75.4±8.2 years and 172/205 (83.9%) were male. Median survival was 1172 days (95% CI 756 to 1589). Percent weight loss of 5% or more was associated with a shorter survival time (median 556 vs. 1548) compared to those who lost less weight. In the multivariable Cox regression model, only TLCO percent predicted at 1 year ($p<0.001$) and FVC decline of more than 10% in the last year ($p=.011$) were significantly associated with survival.

Conclusions Weight loss of 5% or more is independently associated with increased mortality of IPF patients.

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P10 WEIGHT LOSS IS A FEATURE OF PROGRESSIVE DISEASE IN IDIOPATHIC PULMONARY FIBROSIS

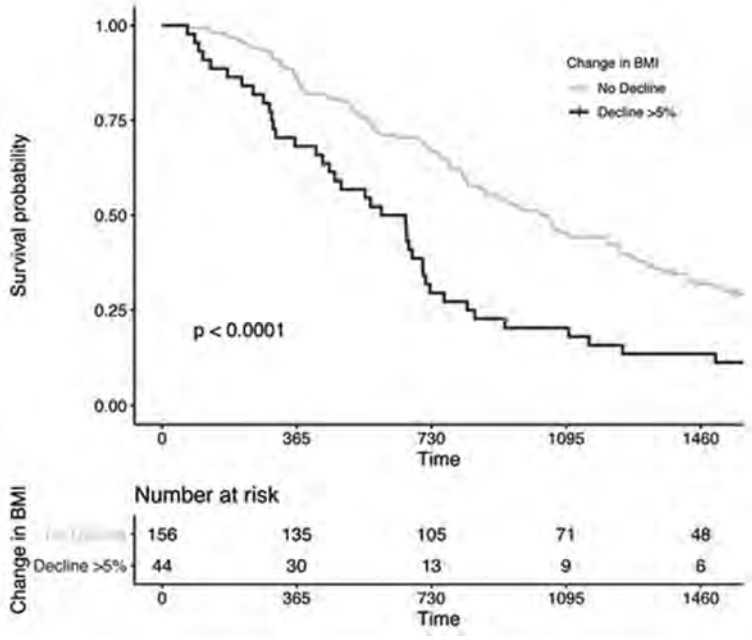
[1]S Barth, [1]C Hogben, [1]M King, [1]B Vitri, [1]J Mann, [1]P George, [1]M Kokosi, [1]V Kouranos, [1]E Renzoni, [1]AU Wells, [1]F Chua, [2]TM Maher, [2]PL Molyneaux. *[1]Royal Brompton Hospital, London, UK; [2]Imperial College London, London, UK*

10.1136/thorax-2019-BTSabstracts2019.153

Introduction Weight loss is a feature of many progressive respiratory conditions. We aimed to establish average weight loss over 12 months in a cohort of patients with Idiopathic Pulmonary Fibrosis (IPF) untreated with steroids or antifibrotic therapy. Our hypothesis is that weight loss is a feature of disease progression in patients with IPF.

Methods Patients diagnosed with IPF prior to the availability of antifibrotic therapy were retrospectively identified. Subjects receiving immunosuppressive therapy were excluded. Weight loss was assessed using body mass index (BMI) calculated from height and weight reported on serial PFTs. Longitudinal changes in BMI were assessed using a linear mixed effects model. Continuous variables are presented as means (±SD) and categorical variables as proportions. Differences between subject groups were evaluated with the use of the Mann–Whitney test. Time-to-event curves were calculated using the Kaplan–Meier method and compared with the use of the log-rank test.

Results Two hundred and ninety eight patients with baseline BMI data were included. Of those 200 subjects had longitudinal data available with an average follow up time of 17.6 (±13) months. The patients were predominantly male (78%) with a mean age of 68.6 years and moderately severe disease (DLCO 35.7% predicted; FVC 68.9% predicted). Baseline BMI was 27.4 (±4.8). Patients with more severe disease had a lower BMI at the time of diagnosis compared to those with milder disease (GAP Stage 1 vs 3; 28.1(±3.6) vs 25.0(±4.7, $P<0.001$). On average the cohort experienced an annual decrease in BMI of 0.51 kg/m^2 per year. There was no



Abstract P10 Figure 1 Patients with IPF who experiencing a 5% or greater decline in BMI over 12 months are at increased risk of mortality. Kaplan Meier curve generated by Cox proportional-hazards model. Log rank P test value reported

association between baseline BMI and mortality, but longitudinal decline in BMI did confer an increasing mortality risk (RR 1.40 for each 1% change in BMI; 95% CI 1.06–1.98, p<0.019). Those with ≥5% annual decline in BMI were at significant risk of mortality compared to patients not experiencing a decline (RR 2.13, 95% CI 1.46–3.13; $p<0.001$) (figure 1).

Conclusions Patients with more severe disease at baseline have a lower BMI at the time of diagnosis. While baseline BMI does not predict mortality, progressive decline in BMI does.

Asthma: endotypes/biomarkers

P11 SPUTUM NEUTROPHIL ACTIVITY IN ASTHMA

[1]CGM Barber, [1]JA Ward, [1]LC Lau, [1]K Gove, [1]SP Elliott, [1]T Brown, [1]H Rupani, [1]TSC Hinks, [1]RJ Kurukulaaratchy, [1]R Djukanovic, [2]A Chauhan, [1]K Staples, [1]PH Howarth. *[1]University of Southampton, Southampton, UK; [2]Queen Alexandra Hospital, Portsmouth, UK*

10.1136/thorax-2019-BTSabstracts2019.154

Background An abundance of neutrophils in sputum is associated with poor disease control[1]. In contrast to eosinophils, the role of neutrophils in asthma is poorly understood. Sputum neutrophil activity rather than proportions may provide a better insight into disease activity.

Objective The purpose of this analysis was to explore the relationship between sputum markers of neutrophil activity, symptoms and lung function in asthma.

Methods 23 mild asthma and 159 severe asthma patients recruited to the Wessex severe asthma cohort study underwent complex characterisation including spirometry, questionnaires and sputum induction. Sputum analysis included protein assays and differential cell counts. Myeloperoxidase (MPO) and Neutrophil Elastase (NE) were measured as markers of neutrophil activity using singleplex ELISA. Correlation analysis of lung function and asthma control with sputum measures were completed using Spearmans rho.

Results Weak correlations were found between lung function and sputum measures. However, neutrophil activity had a stronger relationship with lung function than neutrophil proportion. Asthma control (ACQ6) had a very weak correlation with sputum neutrophil proportion but a weak significant relationship with markers of neutrophil activity.

Conclusion Neutrophil activity in sputum is more reflective of lung function and asthma control than sputum neutrophil proportion in asthma. Markers of neutrophil activity, rather than neutrophils per se, may more accurately reflect the inflammatory processes in poorly controlled asthma.

Abstract P11 Table 1

	Neutrophil%		Sputum MPO ng/ml		Sputum NE ng/ml	
	r	p	r	p	r	p
Pre FEV_1%predicted	**-0.248**	*	**-0.364**	**	**-0.351**	**
Post FEV_1%predicted	**-0.237**	*	**-0.346**	**	**-0.316**	**
Pre PEF%predicted	**-0.273**	**	**-0.311**	**	**-0.318**	**
Post PEF%predicted	**-0.270**	**	**-0.307**	**	**-0.286**	**
ACQ6	**0.134**	**0.043**	**-0.227**	**0.001**	**-0.327**	**

Correlations of sputum biological markers and lung function and disease control in asthma n=182. Analysis using spearman rho, **p≤0.0001, * p≤0.0005

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P12 ASTHMA BREATHOMICS – A SYSTEMATIC REVIEW OF EXHALED VOLATILE ORGANIC COMPOUNDS ASSOCIATED WITH DIAGNOSIS AND DISEASE CHARACTERISTICS

AM Peel, A Sinha, YK Loke, AM Wilson, M Wilkinson, SJ Fowler. *University of East Anglia, Norwich, UK*

10.1136/thorax-2019-BTSabstracts2019.155

Introduction Breathomics is the study of the metabolome – those metabolites associated with a biological system – via the sampling of exhaled breath. As a potential non-invasive indicator of disease processes, breathomics has been applied to a wide range of diseases including asthma. We aimed to assess the evidence for the use of breathomics in the identification of disease and disease characteristics in adults with asthma.

Design A systematic review and qualitative analysis of the published literature on exhaled volatile organic compounds in adult asthma.

Methods We conducted online databases searches - including PubMed, Embase and OVID medline - in November 2018. We included studies of adult asthma (physician diagnosed or diagnosed according to recognised guidelines), collecting exhaled breath volatiles by any method and presenting primary data.

Results Twenty studies were identified; methodologically heterogenous they exhibited a variable risk of bias. Meta-analysis was deemed inappropriate and a qualitative, narrative analysis presented. Assessment using the CASP diagnostic checklist (Critical Appraisal Skills Programme, 2017) revealed studies to be of largely good quality, however, scores were reduced due to the hypothesis-generating stage of the research; none were studies of diagnostic test accuracy. Those studies comparing healthy controls and participants with asthma reported moderate or greater accuracy in the discrimination of samples, or significant differences in compound levels. Asthma phenotypes were differentiated with similarly high levels of accuracy in all but one study. Nine studies named those compounds which they had identified as significant; seventy six compounds were reported in total, of which nine were reported in two papers, and two (acetone and isoprene) featured in three.

Conclusion Results are encouraging but there was little concordance between studies in respect of the compounds upon which discriminatory models were based, and models based on such large data-sets are at risk of over-fitting. Validation using independent prospective cohorts and larger participant numbers is required; success would constitute an important step towards non-invasive disease monitoring and the development of personalised medicine in asthma.

P13 EXHALED NITRIC OXIDE AND BLOOD EOSINOPHIL COUNT IN PREDICTING SPUTUM INFLAMMATORY TYPE IN A HETEROGENEOUS AIRWAYS DISEASE POPULATION

[1]L Lehtimäki, [1]R Shrimanker, [1]A Moran, [1]G Hynes, [1]S Thulborn, [1]C Borg, [1]C Connolly, [1]A Gittins, [1]T Downs, [1]R Russell, [2]C Brightling, [1]J Cane, [1]I Pavord, [1]T Hinks, [1]M Bafadhel. *[1]Respiratory Medicine Unit and National Institute for Health Research (NIHR) Oxford Biomedical Research Centre (BRC), Nuffield Department of Medicine Experimental Medicine, University of Oxford, Oxford, UK; [2]Department of Respiratory Sciences, University of Leicester, Leicester, UK*

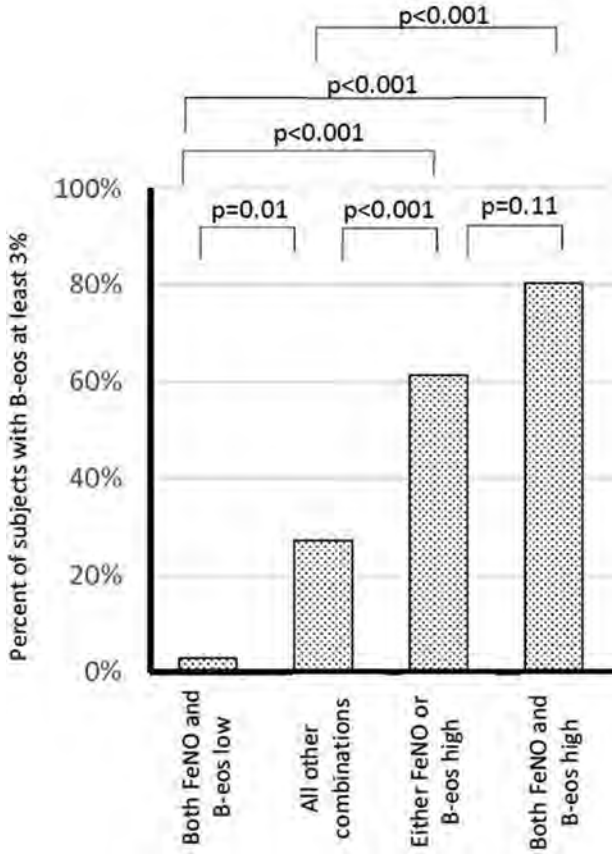
10.1136/thorax-2019-BTSabstracts2019.156

Background Exhaled nitric oxide (FeNO) and blood eosinophil count (B-eos) correlate with sputum eosinophil count in asthma and COPD, and cut-off values have been introduced to help decision making. However, these cut-off values have not been validated in large heterogeneous clinical cohorts. Our aim was to assess in a real life mixed airways disease population the abilities of currently recommended cut-off values of FeNO, blood eosinophil count and their combinations to predict the presence of airway inflammation as reflected by sputum eosinophil and neutrophil count.

Methods We recruited 310 subjects with obstructive airway disease (260 with asthma,50 with COPD) from a tertiary referral centre. Induced sputum cell differentials, FeNO, B-eos and spirometry were measured. FeNO and B-eos were categorised as low (<25 ppb and <0.150 x 10^9 cells/L), intermediate (25–50 ppb and 0.15 – 0.29 x 10^9 cells/L) and high (>50 ppb and ≥0.3 x 10^9 cells/L), respectively. A composite variable of FeNO and B-eos was formed with four categories as follows: both high, either high, both low, and all other combinations. We assessed the ability of FeNO, B-eos and their composite to predict the presence of sputum eosinophilia (≥3%) and neutrophilia (>61%).

Results The majority of subjects were on maintenance ICS (84.2%) and/or LABA (73.9%) and smaller proportions on LAMA (26.1%) and oral corticosteroids (16.1%). Both FeNO and B-eos were better in predicting sputum eosinophilia than in predicting neutrophilia. Having both FeNO and B-eos high was associated with an 80.4% probability of having sputum eosinophilia and a 25.5% probability of having sputum neutrophilia. On the other hand, having both FeNO and B-eos low was associated with a probability of only 2.9% of having sputum eosinophilia and a 61.8% probability of having sputum neutrophilia (Figure 1). B-eos performed equally well in subjects with asthma or COPD while FeNO performed better in subjects with asthma.

Conclusion Currently recommended cut-off values of FeNO and B-eos have good ability to predict presence or absence of sputum eosinophilia in a mixed group of subjects with airways disease. These markers in combination also have a moderate ability to predict presence or absence of sputum neutrophilia.



Abstract P13 Figure 1 Percentage of subjects having sputum eosinophils at least 3% in different categories of the composite variable of FeNO and B-eos

P14 CHARACTERISTICS OF T2-BIOMARKER LOW SEVERE ASTHMA PATIENTS IN THE UK SEVERE ASTHMA REGISTRY

[1]J Busby, [2]PE Pfeffer, [3]DJ Jackson, [4]AH Mansur, [5]A Menzies-Gow, [6]S Siddiqui, [7]R Chaudhuri, [8]M Patel, [1]LG Heaney. *[1]Queens University Belfast, Belfast, UK; [2]Barts Health NHS Trust, London, UK; [3]Guys and St. Thomas Hospitals, London, UK; [4]Birmingham Heartlands Hospital, Birmingham, UK; [5]Royal Brompton Hospital, London, UK; [6]University Hospitals of Leicester, Leicester, UK; [7]Gartnavel General Hospital, Glasgow, UK; [8]Derriford Hospital, Plymouth, UK*

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Background Some patients with severe asthma have persisting symptoms despite suppression of T2-cytokine pathways with corticosteroids. Multiple mechanisms including extra-pulmonary comorbidities have previously been implicated. This analysis examined baseline demographic features in T2-biomarker low patients.

Methods Baseline demographics for patients meeting ERS/ATS criteria for severe asthma were analysed in 1,408 non-smoking patients registered in the UK Severe Asthma Registry. The study included 119 T2-low subjects (FeNO<25 ppb, blood eosinophils <150/μL) and 613 T2-high subjects (FeNO≥25ppb, blood eosinophils ≥150/μL).

Results Asthma control (ACQ7 3.0 (1.3) v 3.1 (1.3)) and exacerbations in the 12 months prior to registration (5 (5) v 5 (4)) were similar in both groups at registration. T2-low patients were more likely to be Caucasian, have earlier onset disease and had higher BMI (32.7 (7.2) v 30.2 (6.6) kg/m^2, p<0.001). T2-low patients also had significantly lower total lung capacity and residual volume (102% (30) v 123% (45), p<0.05) with less airflow obstruction (FEV1/FVC ratio 70% (14) v 63% (14), p<0.001). T2-low patients were more likely to be on maintenance oral steroids (60% v 45%, p<0.001)

and, whilst the highest historical blood eosinophil count was lower than T2-high patients (0.7 (1.9) v 1.0 (1.1)), it was still elevated consistent with corticosteroid T2-suppression.

Discussion Significant differences were evident between T2-low and T2-high patients at registration in the UKSAR. T2-low patients have a substantial symptom burden, with higher BMI and more restrictive lung function which may require additional non-pharmacological management approaches. Characterisation of symptom mechanism, including extra-pulmonary factors such as obesity, is likely to be important.

P15 DETECTION OF INHALED CORTICOSTEROIDS IN THE SERUM – RELATIONSHIP TO ADHERENCE AND MARKERS OF ASTHMA SEVERITY

F Alahmadi, R Niven, L Elsey, B Keevil, K George, S Fowler. *University of Manchester, Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.158

Background Daily Inhaled corticosteroids (ICS) are fundamental to asthma management, but adherence to them is low in around two-thirds of patients and associated with increased risk of exacerbations and poor symptom control. Currently there is no direct way of assessing adherence to ICS. The primary aim of this project was to determine whether liquid chromatography tandem mass spectrometry (LC-MS/MS) could be used to detect ICS in serum within a time frame that may enable monitoring in clinic; a secondary aim was to investigate whether serum levels related to markers of disease severity.

Methods We collected five blood samples over an 8 hr period from patients with severe asthma prescribed at least 1000 mcg daily of beclomethasone dipropionate (BDP) equivalent. Following baseline sampling, patients were observed taking their usual morning dose. Subsequent blood samples were obtained 1, 2, 4 and 8 hrs post-inhalation and analysed by LC-MS/MS. Limit of quantification (LOQ) for all ICS inhalers was 10 ng/L except for Ciclesonide (CIC) which was 50 ng/l. Correlations between serum ICS levels and clinical data (including exacerbation rate, and spirometry) were investigated.

Results 60 patients were recruited, 41 female, 39 prescribed maintenance prednisolone, mean (SD) age 49 (12) yrs, FEV1 63 (20)%predicted. 8 hrs post-inhalation, all patients using budesonide (BUD, n=10) and BDP (15), and all but one using fluticasone propionate (FP, 28) had detectable serum drug levels. Fluticasone Furorate (FF) was detected in two patients (of 4 using FF), while CIC was not detected in any (of 7). Low adherence by prescription refill was identified in 43%. Log blood ICS levels negatively correlated with exacerbation rate, daily ICS dose and log daily prednisolone dose, and (for FP only) positively correlated with FEV1%predicted.

Conclusion Commonly used ICS (FP, BUD, BDP) can be reliably detected in the blood at least 8 hrs after dosing, and could therefore have a potential future application as a direct measure of adherence. Higher exacerbation rates and prescribed doses of ICS and prednisolone were associated with lower blood levels. Potential reasons include poor adherence (with inappropriate increase in prescribed dose) and/or poor absorption in those with severe airflow obstruction.

P16 CAN FENO BE USED TO OPTIMISE MANAGEMENT OF ASTHMA?

[1]SA Rahemtoola, [2]HJ Durrington, [2]A Simpson, [3]R Maidstone. *[1]University of Manchester Medical School, Manchester, UK; [2]Division of Infection, Immunity, Respiratory Medicine, School of Biological Sciences, Faculty of Biology, Medicine, Health, Manchester Academic Health Science Centre, The University of Manchester, Manchester, UK; [3]Division of Informatics, Imaging and Data Sciences, School of Biological Sciences, Faculty of Biology, Medicine and Health, University of Manchester, Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.159

Introduction and objective Fractional exhaled nitric oxide (FeNO) is a breath biomarker believed to measure type 2 inflammation, which drives the pathogenesis of some types of asthma. FeNO has recently been implemented in asthma diagnostic algorithms.[1] However, there is ongoing debate around whether FeNO is useful in managing asthma long-term and in guiding treatment decisions.FeNO has been proposed in a precision medicine approach to asthma management, however more research is required to be able to target the group of patients in which it is a potentially useful biomarker.

The purpose of this study was to (1) assess the performance of FeNO as a biomarker of airway inflammation in relation to ACT (asthma control test) (2) distinguish patients in whom FeNO can be relied upon to guide asthma management from those in whom follow up FeNO values have limited clinical significance.

Methods A 3-year retrospective study was carried out involving 171 asthmatic adults attending asthma clinic at Wythenshawe Hospital (University of Manchester NHS Foundation

Abstract P16 Table 1 shows the demographical differences between the different groups of patients

	Discordant		Concordant	
Characteristics	**DHF**	**DLF**	**CHF**	**CLF**
Number	29	34	23	32
FeNO	42 (27)	11(11)	42 (30)	11(6)
ACT	21(3)	15(7)	17(7)	22(2)
Age (years)*	48 (40)	46 (29)	**26 (23)**	44 (25)
BMI (kg/m^2)	25 (5.9)	32.7 (13.9)	23.8 (5.7)	34.4 (16)
Male: Female *	1: 1	1: 1	**1:3**	**1:3**
Percentage smoker*	**82**	**60**	**19**	**42**
Total IgE (KU/L)	350 (550)	185 (455)	247 (745)	199 (353)
Highest Blood eosinophils count(10^9L) *	0.6 (0.8)	**0.2 (0.3)**	0.6 (0.6)	**0.3 (0.3)**
Percentage with blood eosinophils count≥ (0.48*10^9L) *	51.7	**17.6**	56.5	**21.9**
Steroid level (mcg/BDP)	800 (910)	800 (920)	760 (400)	800 (600)
pulmonary function test (FEV1: FVC)	0.70 (0.3)	0.76 (0.11)	0.81(0.14)	0.76 (0.17)

Key:
1.DHF - Dis concordant high FeNO
2.DLF - Dis concordant Low FeNO
3.CHF - Concordant High FeNO
4.CLF- Concordant low FeNO
Data are represented as median (IQR)
*denotes the characteristics in which difference was statistically significant between the groups with p<0.05 using Kruskal Wallis Test or chi square test for categorical variable.
Bold characters are used to show data which are significantly different from the other groups in the same category with P<0.05 using Mann-Whitney test.

Trust). Subjects were stratified into 4 groups based on ACT score and FeNO level. The demographics of each group were compared.

Statistics Data was compared between groups using either Kruskal-Wallis or Chi Square. Mann-Whitney U test was used to determine how each group differed from one another; results were considered significant if $p<0.05$.

Results 46.2% of all asthma patients were concordant for FeNO and asthma severity (ACT); Of these 19.7% had high FeNO (>25ppb) with poor asthma control (ACT <20) and 26.5% had low FeNO (<25ppb) and good asthma control (ACT >20). 53.8% demonstrated non-concordance (FeNO and ACT did not correlate). Within the FeNO/ACT concordant groups there were significantly more females and non-smokers ($p<0.05$ for both). Moreover, an inverse relationship was noted between change in FeNO against (1) change in ACT score and (2) change in steroids against change in FeNO ($p<0.05$).

Conclusion Although change in FeNO has emerged as a potential marker in asthma treatment, further studies are needed to understand the efficacy especially in the disconcordant groups.

REFERENCE

1. Overview | Asthma: diagnosis, monitoring and chronic asthma management | Guidance | NICE.

P17 DIETARY NITRATE SUPPLEMENTATION INCREASES FRACTIONAL EXHALED NITRIC OXIDE: IMPLICATIONS FOR THE ASSESSMENT OF AIRWAY HEALTH IN ATHLETES

[1]HA Allen, [2]JH Hull, [1]JP O'Hara, [3]JW Dickinson, [1]OJ Price. *[1]Leeds Beckett University, Carnegie School of Sport, Leeds, UK; [2]Department of Respiratory Medicine, Royal Brompton Hospital, London, UK; [3]Sports Therapy, Physical Activity and Health Research Group, School of Sport and Exercise Sciences, University of Kent, Kent, UK*

10.1136/thorax-2019-BTSabstracts2019.160

Background Fractional exhaled nitric oxide (FeNO) is a simple tool that has an established role in the assessment of airway inflammation in athletes. Specifically, FeNO provides information concerning asthma phenotypes, aetiology of respiratory symptoms, response to anti-inflammatory agents, course of disease and adherence to medication. It is recognised that FeNO can be influenced by a variety of external factors (e.g. atopic status, exercise, respiratory tract infection), however, there remains limited research concerning the impact of dietary nitrate ingestion. The primary aim of this study was therefore to evaluate the effect of acute dietary nitrate supplementation on FeNO and resting pulmonary function parameters.

Method The study was conducted as a randomised double-blind placebo-controlled trial. Thirty male endurance trained athletes (age: 28±6 yrs; BMI: 23±2 $kg.m^{-2}$) free from cardio-respiratory and metabolic disease, and stable at time of study entry (i.e. entirely asymptomatic without recent respiratory tract infection) attended the laboratory on two separate occasions. On arrival to the laboratory, athletes consumed either 140 ml nitrate-rich beetroot juice (15.2 mmol nitrate) (NIT) or nitrate-depleted beetroot juice (0 mmol nitrate) (PLA). In accordance with international guidelines all athletes performed resting FeNO and forced spirometry (2.5 hrs post ingestion). Airway inflammation was evaluated using established FeNO thresholds: (intermediate [≥25ppb] and high [>50ppb]).

Results All athletes demonstrated normal baseline lung function (FEV_1% predicted >80%). A three-fold rise in resting FeNO was observed following NIT (median [IQR]): 32ppb [37] in comparison to PLA: 10ppb [12] ($P<0.001$). Twenty-two athletes (73%) presented with raised FeNO following NIT (intermediate: n=13; high: n=9) in comparison to four athletes (13%) following PLA (intermediate: n=2; high: n=2). Despite this, no difference was observed in any pulmonary function parameters between visits ($P>0.05$).

Conclusion Dietary nitrate ingestion should be considered when employing FeNO for the assessment of airway health in athletes. Our findings have implications concerning the decision to initiate or modify inhaler therapy. Further research is therefore required to determine the impact of chronic dietary nitrate ingestion on pulmonary function and bronchoprovocation testing in athletes with pre-existing asthma and/or exercise-induced bronchoconstriction.

P18 AIRWAVE OSCILLOMETRY IN RELATION TO PATIENT REPORTED OUTCOMES IN ASTHMA

CRW Kuo, B Lipworth. *Scottish Centre for Respiratory Research, University of Dundee, Dundee, UK*

10.1136/thorax-2019-BTSabstracts2019.161

Background Airwave oscillometry (AOS: Tremoflo, Thorasys, Montreal) uses a vibrating mesh to superimpose forced oscillations of sound waves on top of normal tidal breathing to measure respiratory impedance as lung resistance (R) and reactance (X). AOS is able to determine the degree of small airways dysfunction as either peripheral airway resistance (R5-R19) or compliance as area under the reactance curve (AX).

We therefore investigated the relationship of AOS to patient reported outcomes of asthma control (ACQ) and quality of life (mAQLQ). In particular, we were interested in ACQ which is a strong predictor of future exacerbation risk.

Patients and methods We evaluated 46 patients with persistent asthma: Age 51 yr, FEV1 87%, R5 142%, ICS (BDP equiv) 616 μg, 65% taking LABA, 11%, LAMA, 37% LTRA.

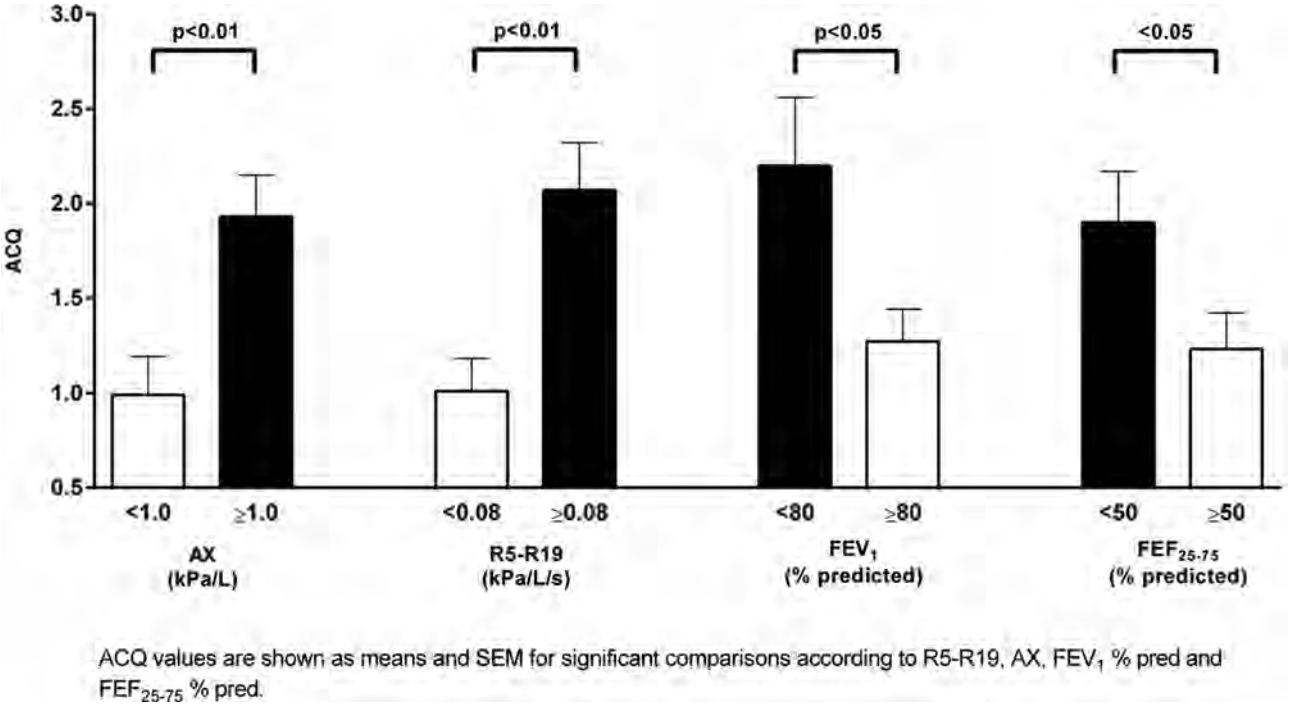
Using a cut point for R5-R19 of 0.08 kPa/l/s, there were differences (<0.08 vs ≥0.08 kPa/l/s) in mean ACQ values: 0.99 vs 1.93 (95%CI -1.66, -0.45) (Fig) and in mAQLQ (symptoms): 5.23 vs 4.30 (CI 0.10, 1.74). For AX with a cut point of 1.0 kPa/l there were differences in ACQ: 0.99 vs 1.93 (CI -1.55, -0.33), in mAQLQ symptoms: 5.28 vs 4.42 (CI 0.06, 1.66) and mAQLQ activity: 5.92 vs 5.01 (CI 0.004, 1.81).

For the R5-R19 there was also a difference in FeNO: 30 vs 45 ppb (CI 13, 17).

For FEV1 cut point of 80% pred differences were seen in ACQ: 2.20 vs 1.27 (CI 0.11, 1.76) and mAQLQ symptoms: 4.05 vs 5.09 (CI -1.93, -0.16) but not FeNO. For FEF25–75 cut point of 50% pred there were differences in ACQ 1.90 vs 1.23 (CI 0.003, 1.34) and FeNO 60 vs 35 ppb (CI 3, 48).

Differences for ACQ and mAQLQ all exceeded the respective MCID's of 0.5.

Conclusions Peripheral lung resistance and compliance measured by AOS are related to patient reported outcomes of



Abstract P18 Figure 1

asthma control and quality of life as well as to type 2 inflammation. We propose that measuring AOS should compliment spirometry as part of the routine work up of asthma patients in a real life clinic setting.

P19 TRACKING TREATMENT RESPONSE IN SEVERE ASTHMA USING A NOVEL ASSESSMENT OF LUNG INHOMOGENEITY

[1]NMJ Smith, [2]NP Talbot, [1]GAD Ritchie, [3]ID Pavord, [4]PA Robbins, [2]N Petousi. *[1]Department of Chemistry, Physical and Theoretical Chemistry Laboratory, University of Oxford, Oxford, UK; [2]Nuffield Department of Medicine, University of Oxford, Oxford, UK; [3]NIHR Oxford Biomedical Research Centre, University of Oxford, Oxford, UK; [4]Department of Physiology, Anatomy and Genetics, University of Oxford, Oxford, UK*

10.1136/thorax-2019-BTSabstracts2019.162

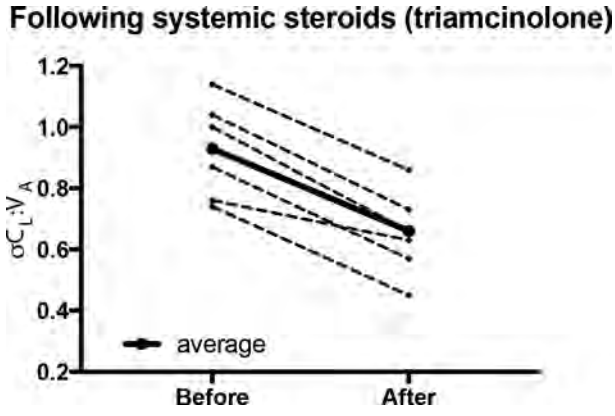
Background In asthma, physiological assessments are not always concordant with disease control e.g. symptoms, exacerbations, treatment response or the presence of underlying inflammation. In this study, we sought to investigate whether a novel technique that quantifies inhomogeneity in the lung can provide a sensitive physiological measure that can track response to treatment and change in disease inflammation in patients with severe asthma. Preliminary data are reported.

Methods Six patients with severe asthma on Step 4 treatment, with Type-2 high disease (high FeNO >50 ppb and eosinophilic inflammation with blood eosinophil count >350/ml) were studied at baseline, at 1 week following a FENO suppression test (high-dose inhaled steroids >1000 mcg fluticasone daily) and at 1 month following systemic steroids (80 mg intramuscular triamcinolone).

The technique involves a nitrogen-washout protocol (10 min air-breathing, 5 min 100% oxygen-breathing) using a novel highly-accurate in-airway gas analyser that uses laser absorption spectroscopy to measure respired gases every 10 ms; a novel mathematical model is then fitted to the gas-exchange data to obtain a distribution of lung compliance relative to lung volume. The standard deviation of the distribution (σCL:VA) provides a measure of regional variation in lung compliance.

Results The patients had a negative FeNO suppression test (i.e. had <40% reduction in FeNO), indicating ongoing airways inflammation that is refractory to inhaled corticosteroids, and therefore went on to receive a triamcinolone injection.

σCL:VA was elevated at baseline in these patients at 0.94 ±0.19 (mean ±SD), compared with healthy controls (0.47 ±0.09, n=23), indicating significant inhomogeneity. Following the FeNO suppression test, there was no significant change in σCL:VA (0.84±0.12). In contrast, at 1 month following triamcinolone treatment, there was a significant reduction in σCL:VA down to 0.65±0.14 (paired t-test, p<0.0005; figure 1), which was concordant with changes in markers of inflammation (eosinophil count and FeNO).



Abstract P19 Figure 1 Tracking treatment response in severe asthma using a novel assessment of lung inhomogeneity

Conclusion These preliminary data suggest that σCL:VA may be a sensitive marker of treatment response in patients with asthma, that tracks disease inflammation. This may be useful in patients with non T2-high asthma too, in which inflammatory biomarkers are not available.

P20 THE ASSOCIATION BETWEEN ASTHMA, CORTICOSTEROIDS AND ALLOSTATIC LOAD BIOMARKERS: A CROSS-SECTIONAL STUDY

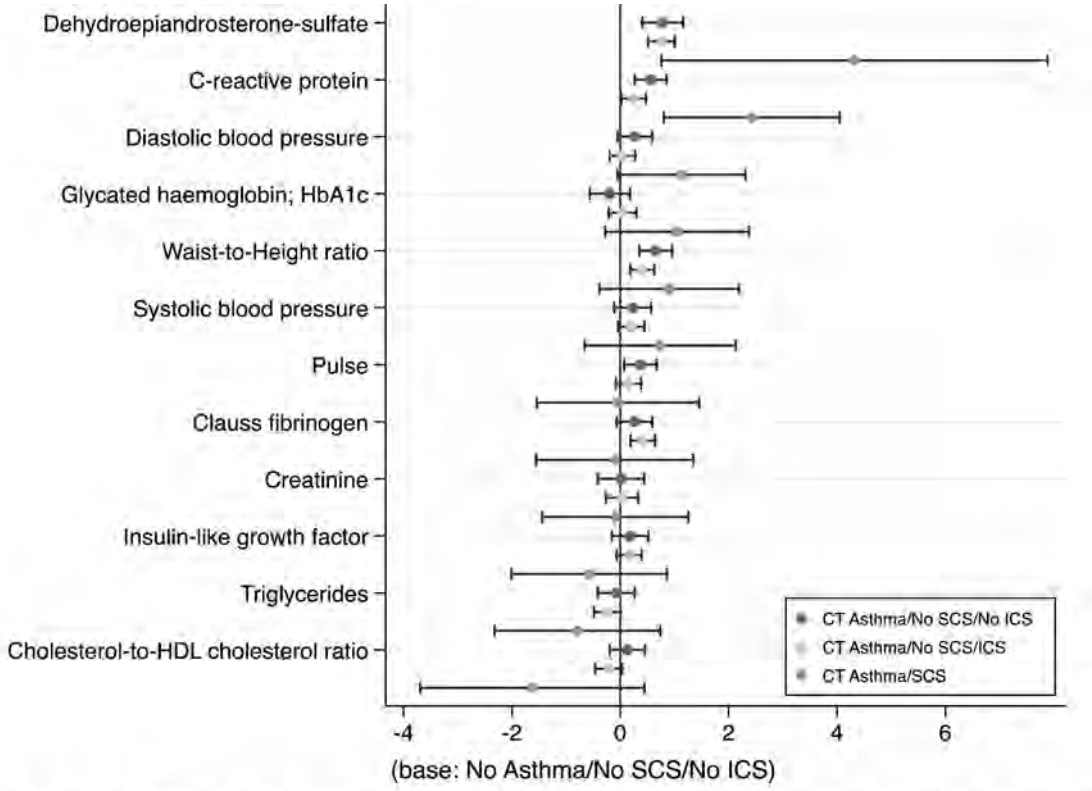
L Barry, C O'Neill, L Heaney. *Queen's University Belfast, Belfast, UK*

10.1136/thorax-2019-BTSabstracts2019.163

Introduction and objectives Allostatic load, a measure of 'wear and 'tear' from adapting to environmental challenges, has been suggested as a framework with which to understand the stress-related disruption on multiple systems of asthma. We aim to estimate for the first time the relationship between allostatic load (AL) and its constituent biomarkers, asthma and corticosteroid (CS) use among a large sample of the UK adult population while controlling for socioeconomic status.

Methods Data from *Understanding Society* (a nationally representative survey of UK community-dwelling adults) waves 1–3 (2009–2012) allowed the identification of a sex-specific risk profile across 12 biomarkers used to construct an AL index for a sample of 9,816 individuals aged 16 years and over. Information on asthma status and medication prescribing was used to create groups broadly consistent with other UK based research using GINA guidelines: 1) No asthma diagnosis and no prescription for any CS (control group); 2) Physician diagnosed asthma and in receipt of respiratory medication (henceforth Currently Treated (CT) asthma) but no Inhaled CS (ICS) and no systemic CS (SCS) prescription; 3) CT asthma, ICS prescription but no SCS prescription; 4) CT asthma and SCS prescription. Regression analyses were used to examine the association of these CT asthma/CS prescribing groups with allostatic load and its constituent biomarkers while controlling for socioeconomic status.

Results Those with CT asthma and no corticosteroid prescription have an allostatic load 1.2 ($p<0.001$) higher than those without asthma and no corticosteroid prescription (control group). Those in receipt of systemic corticosteroids had the highest allostatic load approximately 1.4 times higher than the control group ($p<0.001$). This association with allostatic load



Legend to Figure 1: Estimates are presented as log odds ratio in order to present graphically. Estimates to the right of the black line represent an increase in the odds of being in the high-risk quartile though the high-risk quartile does not necessarily mean elevated levels. Those with Currently Treated (CT) asthma and a Systemic Corticosteroid (SCS) prescription have a significantly increased odds of being in the high-risk quartile for levels of C-reactive protein ($p = 0.003$) and dehydroepiandrosterone-sulfate (DHEA-s) ($p = 0.018$). Each model adjusts for age, age-squared, sex, log of equivalised household income, job type, highest educational achievement, urban/rural dwelling status, whether the individual documented their ethnicity as white, marital status and whether the individual was responsible for children under 18 years.

Abstract P20 Figure 1 Relationship between Asthma/CS prescriptions and the (log) odds of being in the high-risk quartile for each allostatic load index biomarker adjusted for socioeconomic status (N=9,816).

was largely unchanged in sensitivity analyses and was likely driven by an association with specific biomarkers (dehydroepiandrosterone-sulfate and C-reactive protein, see figure 1).

Conclusion In relation to allostatic load, early ageing was present even in the mildest asthma group without prescriptions for corticosteroids: approximately equivalent to a penalty of 8 years on one's chronological age. Allostatic load is helpful in understanding the increased all-cause mortality and multi-morbidity observed in asthma.

Pulmonary rehabilitation: more and better

P21 INFLUENCE OF ATTENDANCE RATE ON PULMONARY REHABILITATION EFFICACY IN THOSE WITH RESPIRATORY DISEASE

[1]JL McCreery, [1]KA Mackintosh, [2]J Duckers, [2]T Lines, [3]J Chamberlain, [3]M Jones, [1]MA McNarry. *[1]Swansea University, Swansea, UK; [2]University Hospital Llandough, Cardiff, UK; [3]Cardiff University, Cardiff, UK*

10.1136/thorax-2019-BTSabstracts2019.164

Introduction Health-related quality of life (HRQoL) has been increasingly recognised as imperative for those with a chronic illness. As such, treatment strategies should not only focus on prolonging life expectancy and reducing symptoms, but also on improving HRQoL. Pulmonary rehabilitation (PR) programmes have been shown to have a positive effect on HRQoL in chronic obstructive pulmonary disease (COPD: McCarthy et al. 2015) but adherence and attendance can be low. Identifying the minimum number of sessions needed to elicit clinically meaningful improvements in QoL, and its interaction with respiratory disease type would therefore be useful for both practitioners and patients.

Methods Data was analysed from 1,083 participants with one of six pulmonary categories: COPD (n=723), Asthma (n=28), Interstitial lung disease (n=164), COPD/Asthma (n=64), Bronchiectasis (n=64) and Restrictive lung diseases (n=40), who completed a 6-week PR programme. Outcome measures were St George's Respiratory Questionnaire (SGRQ), Hospital Anxiety and Depression Scale (HADS) and 6-minute walk distance (6MWD) or incremental shuttle walk test (ISWT). Patients had to attend $\geq$12 session to complete the programme and were reassessed post-rehabilitation.

Results At baseline SGRQ was significantly lower in non-completers (p= 0.027), whereas there was no difference in HADS score or exercise capacity between groups. Those who completed $\geq$12 sessions had significant decreases in SGRQ score and HADS (10.1±0.2: p=0.000; 5.7±5.6: p=0.000, respectively) and a significant increase in distance (62.1±104.6 m; p=0.000), irrespective of disease. Conversely, those who completed <12 sessions had significant increases in SGRQ and HADS (9.0±13.8: p =0.029; 5.8±7.5 p=0.003, respectively), and a decrease, albeit not significant, in distance walked (-83.3±110.3 m), irrespective of disease.

Conclusion Participants that completed $\geq$12 sessions of a 6-week PR program significantly improved their HRQoL and exercise capacity compared to those who completed <12 sessions. This highlights the clinical importance of participants adhering and engaging in a PR program. Further prospective studies are warranted to substantiate these findings.

Abstract P21 Table 1

Demographics	Baseline (n=1083)	Non-Completers <12 (n=218)	Completers ≥12 (n=865)
Age	68.1±9.8	66.6±10.4	68.7±9.5
FEV1%	54.7±23.3	50.4±22.6	55.9±23.3
SGRQ	63.4±12.1*	61.8±9.7*	52.3±14.8*
HADS	16.7±8.6	12.1±5.9*	10.6±6.5*
6MWT (m)	160.2±73.9	153.4±78.9*	162.2±72.3
ISWT (m)	151.8 ±78.7	150.4±83.5*	146.5±80.3

Mean and SD values for demographic data
*denotes significance p<0.05

REFERENCE

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P22 ASSESSING THE IMPACT OF A TELEPHONE CLINIC TO SUPPLEMENT THE VETTING PROCESS FOR PULMONARY REHABILITATION (PR) REFERRALS

L Brock, L McDonnell, L Hogg, A Dewar. *Guy's and St Thomas' NHS Foundation Trust, London, UK*

10.1136/thorax-2019-BTSabstracts2019.165

Introduction and Objectives Local data shows that only around 60% of PR assessment clinic appointments are attended. Missed appointments delay treatments, increase the cost of care, reduce efficiency and negatively impact relationships between patients and health care professionals.[1]

Referrals to our university teaching hospital PR service are received from clinicians in primary, secondary or tertiary care. PR referrals they are vetted against clinical criteria (MRC $\geq$2 or decreased exercise tolerance and no contraindications) by senior physiotherapists.

Our aim was to investigate if supplementing the vetting process with a telephone clinic to assess suitability and engage patients would have any impact on attendance.

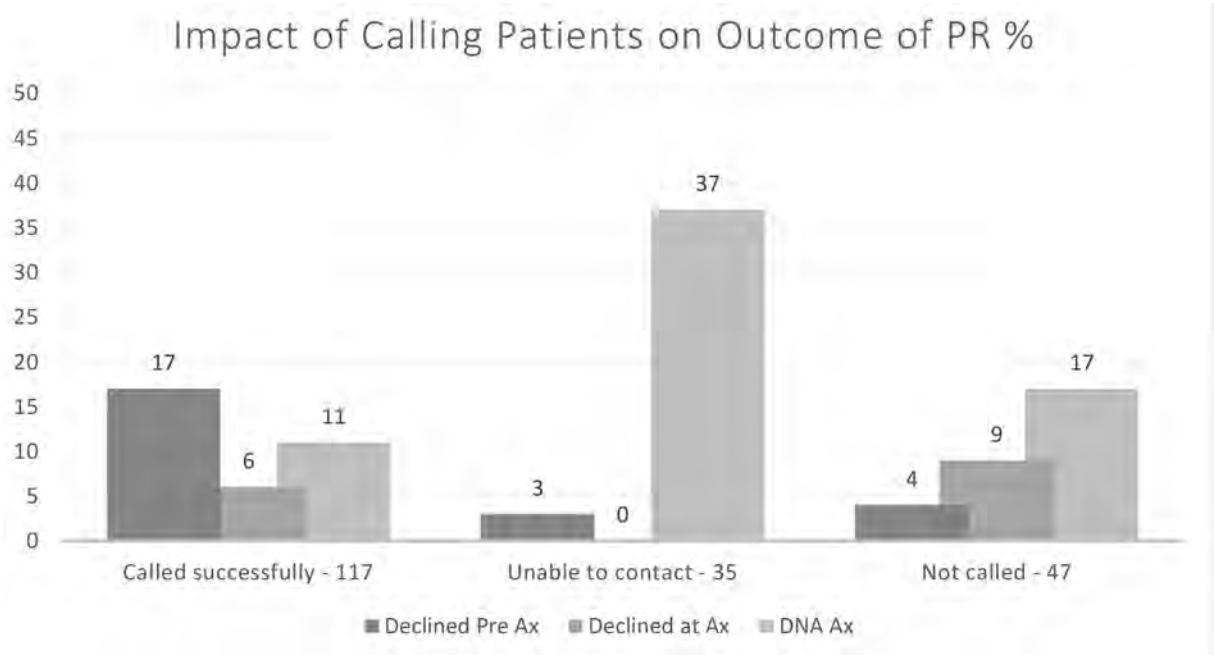
Methods Telephone calls were made by a senior physiotherapist and data was collected prospectively over a 7 month period. Patients were deemed as unable to be contacted after three telephone calls were attempted.

Results 199 PR referrals were vetted during this period. Staffing levels meant that 54 patients were vetted without receiving telephone calls. Thirty-five patients were unable to be contacted despite 3 attempts; therefore 117 patients received vetting calls.

Conclusions Patients who received telephone calls were more likely to decline to attend assessment clinic than to not attend the assessment appointment (DNA), this enabled an alternative patient to be booked in their place, and resulted in a lower non-attendance rate for the assessment clinic.

Attempted calls took approximately 5 minutes and successful calls took approximately 15 minutes compared to clinic appointments being 1 hour in duration.

Patients who could not be contacted had a much higher DNA rate than those we did not attempt to call or those who were successfully called. Further investigation into how best to engage with this group is likely to be beneficial. This patient group was also noted to have a high non-attendance rate in other clinical settings.



Abstract P22 Figure 1 The percentages of patients who were called, were unable to be contacted and who were not called who declined pre-assessment, declined at assessment or did not attend assessment

REFERENCE

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P23 RE-DEVELOPMENT OF A PULMONARY REHABILITATION EDUCATION PROGRAMME

C Bourne, N Gardiner, S Singh. *University Hospitals of Leicester NHS Trust, Leicester, UK*

10.1136/thorax-2019-BTSabstracts2019.166

Introduction Patient education is considered integral to a comprehensive pulmonary rehabilitation (PR) programme. Historically, there has been limited evidence on which to guide optimal design and delivery. Following the ATS/TSANZ/CTS/BTS Workshop (The American Thoracic Society (ATS) Workshop on Education in Pulmonary Rehabilitation for Individuals with Chronic Obstructive Pulmonary Disease (COPD)) in 2016, we recognised a need to update our current PR education programme.

Aim To re-develop and optimise delivery of the educational component of PR with a view toward enhancing the effectiveness of this component.

Methods We used the ATS/TSANZ/CTS/BTS Workshop Report: COPD Education in Pulmonary Rehabilitation[1] to structure our education re-development alongside Bloom's Taxonomy of Learning, Teaching and Assessing[2]. We created objectives based on learner needs and formulated a delivery strategy (consisting of content and method; figure 1).

Results 12 PR education sessions have been re-developed and are currently being implemented. Delivery has been cascaded using the following method, once each session has been finalised by the lead author of that session:

1. Observation of the new session
2. Practice delivery of the new session
3. Checked for fidelity to session plan

Staff received additional group training in facilitating groups due to the more interactive nature of the new sessions.

[Session Name]			
	Cognitive (Knowledge)	**Attitudinal**	**Skill/behaviour**
Specific measureable objectives			
Educational method			
Educational method to prevent decay			
Resources required			

Abstract P23 Figure 1 Example of the education session outline

Conclusions It is feasible to use the ATS/TSANZ/CTS Workshop Report to structure a PR education re-development. The final elements of the re-development process are to gain patient and staff feedback on the new sessions, to complete programme content and delivery. Following on from this we intend to evaluate the new programme of education.

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P24 ENABLERS AND BARRIERS IN REFERRAL AND UPTAKE OF PULMONARY REHABILITATION (PR) IN A SOUTH ASIAN PATIENT GROUP WITH COPD: A QUALITATIVE STUDY

[1]SE Fox, [2]F Early, [3]PM Wilson, [4]C Deaton, [2]HW Haque, [5]JR Ward, [2]JP Fuld. *[1]School of Clinical Medicine, University of Cambridge, Cambridge, UK*; *[2]Department of Respiratory Medicine, Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK*; *[3]Centre for Health Services Studies, University of Kent, Canterbury, UK*; *[4]Clinical Nursing Research Group, Primary Care Unit, Institute of Public Health, University of Cambridge, Cambridge, UK*; *[5]Engineering Design Centre, University of Cambridge, Cambridge, UK*

10.1136/thorax-2019-BTSabstracts2019.167

Introduction Pulmonary rehabilitation (PR) referral and uptake in the UK remains low despite being a high value treatment for COPD. The referral rate and uptake of PR in South Asian populations is known to be particularly reduced and reasons for this are poorly understood. This mixed methods study explored barriers and enablers for PR referral and uptake in a sub-group of South Asian (SA) patients and their clinicians.

Methods Interviews were conducted with White British (n=35) and SA (n=7) patients with COPD and with Health Care Professionals (4/38) working with SA patients. A deductive coding framework informed by Normalisation Process theory and supplemented by inductive codes was used. Codes were applied across the whole study and grouped into categories for analysis and comparison.

Results Six domains of enablers and barriers were identified; patient factors for accepting and declining, primary care and patient interface, factors within primary care, patient's first interaction with PR and factors within PR course.

Specific barriers and enablers emerged across all domains in the SA patient group:

1. Perceived barriers for accepting PR referral included poor understanding of PR, unfamiliarity with healthcare models and physiotherapy as a treatment option, and guilt and shame related to smoking.
2. A specific enabler of attendance was a strong belief in what doctors say.
3. Within the primary care–patient interface, language and patient interactions via the family unit were perceived barriers.
4. Within primary care, data was not specifically collected on SA referral/uptake of PR hence gaps would not be identified.
5. Information on patient translator needs not being conveyed to PR services ahead of patient assessment was identified as a barrier.
6. Within the PR course, both positive aspects and potential challenges of having a translator present in groups were reported.

Abstract P24 Table 1 Enablers and barriers using deductive coding Framework for referral and uptake of Pulmonary Rehabilitation (PR) in a South Asian patient group with COPD

Domain	Sample quotations
1. Patient factors for accepting PR: Poor understanding of PR Used to different healthcare models Unfamiliar with physiotherapy as treatment Guilt/shame re smoking	*'I did not know much about it till you explained.' [Pt BPA3];* 'they believe more in medicine and tablets, rather than, you know, these exercises and physio and pulmonary rehab things where there's more talking.' [GP HB2]; *'I see quite a lot of Asian women that smoke, and are quite embarrassed about it, but they do.' [GP HB1]*
2. Patient factors for accepting PR: Strong belief in what doctors say	'I would say if your doctor recommends, then one should listen to the doctor and attend these classes. because it is for our own benefit.' [Pt BPA1]
3. Primary care and patient interface: Language barriers Interactions via family unit	*'I can speak, but at times there are some things that you are unable to say. That is why I use an interpreter.' [Pt BPN1];* 'If you are visiting elderly housebound, non-English speaking patients, it can be very difficult to know what's always being translated.' *[GP HB1]*
4. Factors within primary care: Limited data on group referral & acceptance rate	*"In terms of South Asian I don't think many accept [the offer]… I would back possibly 40–50%"[GP HB1]*
5. Patient's first interaction with PR: Language barriers	'When the referrers refer we ask if they can provide what their main spoken language is, but we kind of rely on them to get in contact with us, to let us know what language they speak … Urdu, Gujarati, is it whatever … we're not often getting that feedback unfortunately.' [Physio B1]
6. Factors within PR course: Language barriers Benefits and challenges of having a translator present	*'If you don't understand the language you find it very difficult. People who speak the language can chat with others and joke while doing their exercise. They attend the classes happily.' [Pt BPA3]* 'It's very difficult and we've tried to use interpreters in the past. I'm delivering a session in English and then it's almost like I've got someone talking over me; other patients don't like it because it's hard to hear what I'm saying because all they're hearing is another language in the background.' [Physio B1]

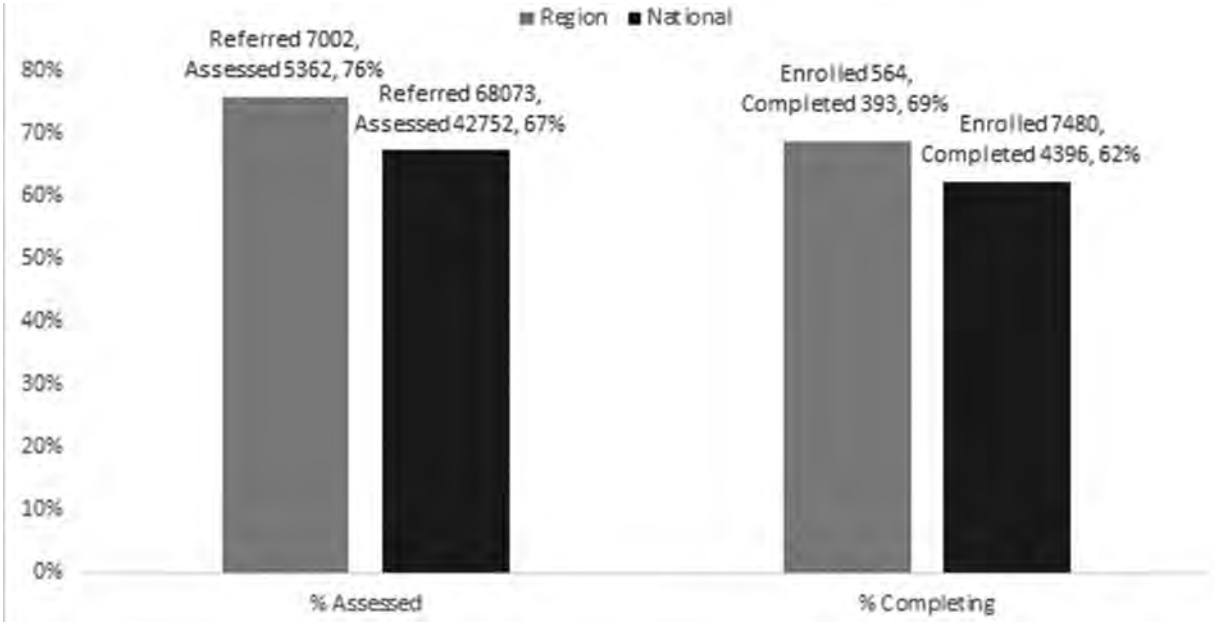
Conclusions Identification of specific factors that are perceived to influence PR referral and uptake for South Asian patients have important practical implications for increasing PR uptake and addressing this health inequality. Further research should seek to find effective ways of addressing the particular needs of this group.

P25 PULMONARY REHABILITATION QUALITY IMPROVEMENT VIA A REGIONAL NETWORK

L Morton-Holtham, E Wells, J Congleton, J Bott. *Kent Surrey Sussex Academic Health Science Network, Crawley, UK*

10.1136/thorax-2019-BTSabstracts2019.168

Background Our region has been running a pulmonary rehabilitation (PR) clinical network since 2010. The aim being to



Abstract P25 Figure 1 National and regional patient referrals: assessment, enrolled: completed

reduce variation in, and improve standards of, care. It provides opportunity for sharing good practice, including around national BTS PR Guidelines and Standards of Care, discussion of challenges, problem solving, and providing a safe space to support quality improvement (QI) and capability building. Clinicians are encouraged and supported to participate in the National Asthma and COPD Audit Programme (NACAP) PR audits, including a collaborative approach with the national PR audit Project Manager and Clinical Lead. Open sharing of data is encouraged.

Method The NACAP 2017 PR snapshot audit data were analysed. Analysis included comparing the mean of key identified outcomes of the region's 15 providers against the national mean (184 providers). The percentage mean for each provider was first calculated individually, before a mean of the findings was calculated as the overall for each metric and area. Thus, percentages stated do not add for the n=enrolled/completed & referred/assessed as these represent the totals of all services. A Mann Whitney U test was utilised due to the non-parametric data and difference in sample sizes between the groups.

Results The region's providers demonstrate a 9% higher mean conversion of referral to assessment rate than national average (76% [5362/7002] vs 67% [42752/68073], p=0.26) and a 7% higher mean completion rate (69% [393/564] vs 62% [4396/7480], p=0.202) (Fig). They also greatly exceed the national average on the number completing a practice walk for tests of exercise tolerance (84% vs 32%) and the number of patients receiving a written programme of exercise at discharge (91% vs 81%). The large difference in sample size between national and the region's providers, along with the limited sample size of the region, contributes to a lack of statistical significance; despite this a meaningful clinical difference is observed.

P26 PULMONARY REHABILITATION IN CHESHIRE AND MERSEYSIDE (C&M)

S Pilsworth. *Liverpool Heart and Chest Hospital, Liverpool, UK*

10.1136/thorax-2019-BTSabstracts2019.169

Pulmonary rehabilitation (PR) has long been known to be a pivotal treatment for managing chronic respiratory disease. Despite this very few patients are offered a referral into the programme as highlighted from the national COPD audit programme. The NHS long term plan, for the first time highlighted respiratory is as a key area for improvement, encompassing improving access and uptake of PR. However little is known about the 'readiness' of local PR services to be able to provide this. A scoping exercise was undertaking in C&M to review current service provision.

Method The PR leads from all the PR services in C&M were contacted in 2019 and a face to face or telephone discussion was conducted. This was followed up with an emailed document detailing further information required about funding, staffing numbers, challenges to service and further developments. 10 services were contacted to be involved in the project.

Results 8 services responded. PR provision across C&M is patchy, with good access in some areas and more limited access in others. Waiting times vary across the area from 2–3 weeks up to 20+ weeks, as do referrals into the services. Outcome measures vary widely across the area, as do length and type of programme. Provision within PR varies widely as does referral pathways into the programmes. Provisions for exercise post PR vary across the area as does access to post exacerbation PR.

Discussion There was good engagement from PR services to be involved in this review. However it highlights the significant variation in PR provision across a small area in the UK, and a postcode lottery patient's face in trying to access services. Staff running programmes were dedicated and keen to increases access and uptake, however many were faced with significant staffing problem and commissioning strictures. Quick wins are available such as services looking towards rolling programmes and looking at diversifying what services offer and offering post exacerbation PR.

It is clear investment in grass root services is required if the aims within the long term plan are to be achieved.

P27 DANCE FOR PEOPLE WITH CHRONIC BREATHLESSNESS: A FEASIBILITY STUDY

[1]SL Harrison, [2]K Bierski, [3]J Edwards, [3]V McFaull, [2]S McLusky, [2]A Russell, [2]G Williams, [4]S Williams. *[1]Teesside University, Middlesbrough, UK; [2]Durham University, Durham, UK; [3]Breathe Easy Darlington, Darlington, UK; [4]International Primary Care Respiratory Group, London, UK*

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Introduction and objectives This programme investigates a dance activity for people living with chronic breathlessness. Pulmonary rehabilitation is a recommended component in its clinical management but uptake is poor. Our research with British Lung Foundation (BLF) 'Breathe Easy' support groups suggests that patients are put off by the unfamiliarity of the gym-like space and the language of 'pulmonary' and 'rehabilitation'.[1] Collaborative work with neuroscientists has revealed that people with chronic breathlessness have poor 'interoception' or bodily awareness. We propose that a dance programme would address these issues by providing exercise in more culturally familiar form, in a non-challenging space, and engaging the entire body.

Methods Collaborating with the BLF 'Breathe Easy' group in Darlington, UK, a local exercise instructor delivered dance over ten weeks mentored by a dance instructor. Functional exercise tolerance, balance and functional quadriceps strength were tested at baseline and after the ten-week programme using the six minute walk test, timed-up and go and 30 second sit to stand test respectively. Health status was assessed with the COPD Assessment Tool, and mood using the Patient Health Questionnaire-9 and Generalised Anxiety Disorder assessment-7. The Multidimensional Assessment of Interoceptive Awareness collected information on body awareness. A researcher was involved as participant-observer in the classes to assess the response of participants.

Results Ten people regularly participated in the programme. Initial quantitative outcomes point to the value of dancing together and keeping up with the beat; and participants reported 'coming alive'. Full results will be analysed when the programme completes on 29th July. We will report on the quantitative and qualitative results.

Conclusions Potential impacts to explore include:

On the programme participants: enjoyment; any changes in physical and psychosocial outcomes, including interoception; acceptability of the intervention; exploration of an option beyond pulmonary rehabilitation to improve functional capacity and change breathlessness perception.

On clinicians managing chronic breathlessness: This programme, if successful, may add to the range of options available.

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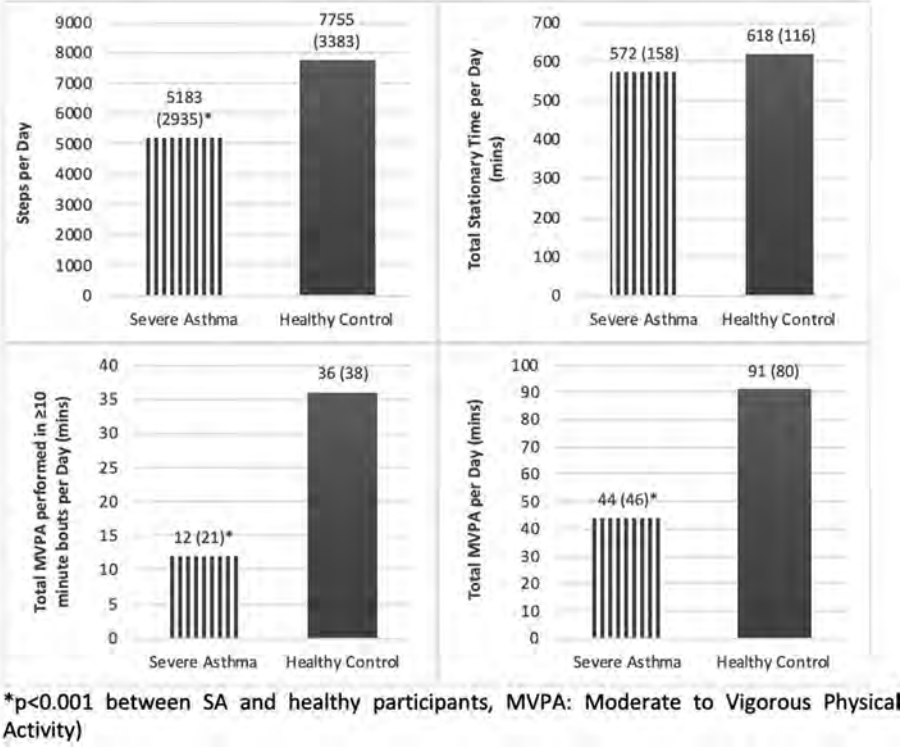
P28 A COMPARISON OF DAILY PHYSICAL ACTIVITY BETWEEN ADULTS WITH SEVERE ASTHMA AND HEALTHY CONTROLS

J Neale, M Orme, S Chantrell, S Majd, P Bradding, SJ Singh, RH Green, RA Evans. *Leicester NIHR BRC Respiratory Theme, Respiratory Science, University of Leicester, Leicester, UK*

10.1136/thorax-2019-BTSabstracts2019.171

Introduction Current WHO physical activity guidelines recommend adults accumulate ≥150 minutes per week of moderate intensity activity in bouts of ≥10 minutes. We aimed to compare daily physical activity levels and intensity of physical



Abstract P28 Figure 1 A comparison of physical activity levels between adults with severe asthma (SA) and healthy participants

activity between adults with severe asthma and healthy controls.

Methods Adults with severe asthma, defined by step 4/5 of the BTS/SIGN guidelines, under the care of a difficult asthma service at a tertiary centre, and age and sex-matched health controls were recruited. Age, gender, smoking status, and medication were recorded, and BMI calculated. Daily physical activity was measured for seven days using a SenseWear Pro-3armband triaxial accelerometer. Adequate wear time was defined as ≥eight hours per day for a valid day with a minimum of four valid days. Steps, stationary time, time spent in moderate-vigorous activity (MVPA) and MVPA in ≥10 minute bouts were analysed adjusted for wear time. Analysis of covariance (ANCOVA) was used to adjust for covariates.

Results 48 people with severe asthma (35% male, mean [SD] age 55 [13] years, 25% ex-smokers, 4% current smokers,50% prescribed oral steroids) and 48 age and sex-matched healthy participants (29% ex-smokers, 0 current smokers) completed the study. Mean [SD] BMI was higher for patients with severe asthma (33.0 [6.7] kg/m^2) compared to healthy participants (26.4 [4.4]) kg/m^2), p<0.001. Daily wear time for patients with severe asthma (mean [SD] 772 [108] min) was lower compared to healthy participants (826 [96] min), p=0.011. Figure 1 shows the physical activity levels for patients with severe asthma and healthy participants. After adjusting for BMI and monitor wear time, steps per day and time spent in ≥10 minute bouts of MVPA were lower for people with severe asthma compared to healthy participants, p=0.009 and p=0.012, respectively. However, there was no difference in stationary time between the two groups, p=0.296.

Conclusion Patients with severe asthma perform fewer steps and fewer 10 minute bouts of MVPA per day compared to their healthy peers, whereas time spent stationary was similar. Advice and interventions to increase physical activity in people with severe asthma should target MVPA.

P29 USE OF PEDOMETERS AS A TOOL TO PROMOTE DAILY PHYSICAL ACTIVITY LEVELS IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE: A SYSTEMATIC REVIEW AND META-ANALYSIS

[1]M Armstrong, [1]A Winnard, [1]N Chynkiamis, [1]S Boyle, [2]C Burtin, [1]I Vogiatzis. *[1]Northumbria University, Newcastle Upon Tyne, UK; [2]Hasselt University, Diepenbeek, Belgium*

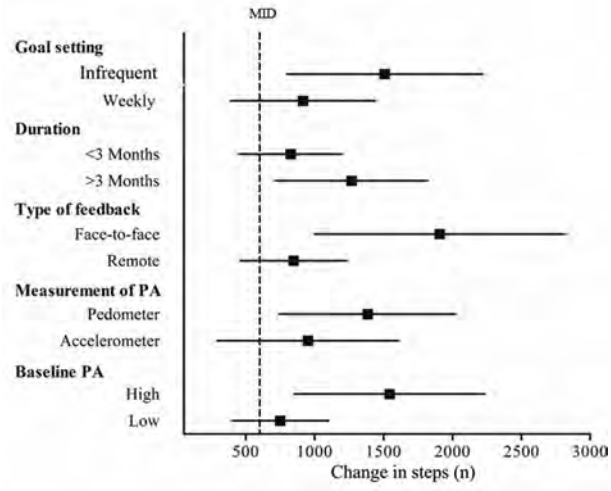
10.1136/thorax-2019-BTSabstracts2019.172

Introduction Interventions to promote daily physical activity are becoming important in the management of patients with COPD due to significantly lower levels of physical activity compared to healthy age-matched controls [1]. To-date inconsistent findings surrounding the implementation of physical activity promotion and the way pedometers are used have been reported.

Objective To systematically determine aspects of physical activity promotion, including how pedometers are used to optimise daily physical activity in COPD patients.

Methods A Systematic review-meta analysis of prospective studies reporting pedometer physical activity promotion in patients with COPD was performed using: Medline/Pubmed, Cochrane library, Web of science and CINAHL databases. Based on this search, the standard mean difference (SMD) of steps/day were pooled in a random-effects meta-analysis.

Results Of 2582 articles identified, 55 were reviewed in detail and 17 were included, involving 1677 patients. Daily physical activity was improved with pedometer physical activity promotion as a standalone intervention (SMD 0.53; 95% CI: 0.29, 0.77; n=12), and alongside pulmonary rehabilitation (SMD 0.51; 95% CI: 0.13, 0.88; n=7). Additional subgroup analyses found comparable improvements in daily physical activity among studies which provided: i) weekly or infrequent goal setting, ii) an intervention length less or more than 3 months, iii) remote or face-to-face contact (figure 1). Patients benefited more from physical activity promotion when baseline levels of physical activity were greater than 4000 steps/day and when physical activity was reported using a pedometer opposed to an accelerometer (figure 1).



Abstract P29 Figure 1

Conclusions Pedometer use is effective in inducing meaningful improvements in daily physical activity [2] in COPD both alongside pulmonary rehabilitation and as a standalone intervention. Future studies should investigate the effectiveness of combining pulmonary rehabilitation and physical activity promotion in patients with profoundly low activity levels and those experiencing anxiety and depression.

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Ventilation in neuromuscular disease

P30 USE AND UPTAKE OF LONG TERM MECHANICAL VENTILATION IN PATIENTS WITH MOTOR NEURONE DISEASE IN THE UNITED KINGDOM

J Palmer, B Kathiresan. *University Hospitals Plymouth, Plymouth, UK*

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Introduction and objectives The use of Long Term Ventilation in Patients with Motor Neurone Disease has been

recommended by NICE since July 2010. There is no recommendation that such patients are managed with tracheostomy ventilation (TV) but some centres do offer this treatment option. Use of TV in MND varies significantly across the world with reports of 30% of patients having TV in Italy and Japan. In the UK reported use of TV is around 1%.1 2 There are no recent data from the UK on the use and uptake of long term ventilation in MND invasive or otherwise.

Methods UK Home ventilation centres were approached to undertake a retrospective 5 year audit of the use of long term ventilation in MND. Data were obtained by retrospective case-note review of patients set-up on TV for MND between April 2013 and March 2018 inclusive.

Results Responses were received from 24 centres, 18 had set up MND patients with TV in 5 years . Data on the use of non-invasive ventilation (NIV) was received from 13 centres. These centres reviewed 2493 MND patients. Of these 60% (n=1496) opted for a trial of NIV. 1242 (90%) tolerated NIV . TV was initiated in 1.8% (n= 22) of these patients, 19 of these continued long term TV. The majority of TV was performed as an emergency rather than elective procedure (81% v 19%).

Conclusion In keeping with NICE Guidance the use of and take up of NIV in patients with MND in the UK is fairly commonplace and NIV is tolerated well. Use of TV however is limited with less than 1% of patients with MND receiving TV; elective tracheostomy for TV is incredibly rare.

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P31 REVIEW OF HOME MECHANICAL VENTILATION IN PATIENTS LIVING WITH MOTOR NEURONE DISEASE

[1]KK Rajan, [2]S Sheridan, [2]P Murphy, [2]ES Suh, [2]P Marino, [2]H Pattani, [2]J Steier, [2]N Hart, [2]G Kaltsakas, [2]M Ramsay. *[1]King's College London, London, UK; [2]Lane Fox Respiratory Service, Guy's and St Thomas' NHS Foundation Trust, London, UK*

10.1136/thorax-2019-BTSabstracts2019.174

Introduction Home mechanical ventilation (HMV) improves quality of life and survival in MND patients (Bourke et al, 2006). We report the clinical data of MND cohort managed in a complex home ventilation centre.

Methods Medical records of 84 patients, referred from 1st of January 2017 to 1st of January 2018, were retrospectively reviewed and followed up to 1st January 2019. Chronic respiratory failure was defined as an arterial partial pressure of carbon dioxide or transcutaneous carbon dioxide value greater than 6kPa. Difference in ventilation settings were calculated using a paired t-test or McNemar's test for proportions. Rate ratio reduction in mortality was calculated using the Mantel–Haenszel-type method.

Results The mean age of the cohort was 68±9.1 years and 54 patients (52%) were male. Twenty-seven patients (32%) had bulbar onset, 46 (55%) limb onset, 5 (6%) mixed onset and 6 (7%) unknown, having died before review. Forty-eight patients (57%) died, 34 (40%) survived during the observation period and 2 (2%) declined to be seen. Survival time for all patients was 334 days (IQR 144–453) from referral date. Median number of visits was 3 (1–6). At first visit, 29 patients (43%) demonstrated chronic respiratory failure. Forty-two patients (52%) received outpatient HMV treatment at first review with a further 22 (26%) initiated during the observation period. Ventilators settings at initiation and final review are shown in Table 1. Of patients initiated on HMV 38% never used it and the daily HMV usage of users was 9.3 hours (5.5–18.8). 50% of patients used HMV for >4 hours and had higher survival from the referral date (437 days, 341–549) compared to patients using <4 hours (242 days, 135–437). Additionally, they had a risk reduction in mortality compared to patients using <4 hours (0.37 95% CI 0.19–0.74 p=0.003).

Conclusion This retrospective review suggests that HMV increases survival in MND patients if they are able to tolerate and adhere to the treatment for >4 hours. Using HMV even for short periods may confer a survival benefit. A streamlined pathway with dedicated respiratory MND team is required to manage these patients in an effective and timely manner.

P32 SYMPTOMOLOGY VERSUS PHYSIOLOGY: TRIALLING LONG TERM NON-INVASIVE VENTILATION IN A MOTOR NEURONE DISEASE CLINICAL COHORT

E Parkes, J Shakespeare, A Bishopp, A Ali. *Coventry Ventilation Centre, Coventry, UK*

10.1136/thorax-2019-BTSabstracts2019.175

Introduction MND is a terminal, neurodegenerative condition resulting in muscle weakness leading to chronic hypercapnic respiratory failure (CHRF). NIV is an evidence-based therapy for treating both the symptoms and physiology of CHRF. NICE recommend a trial of NIV in patients who present with clinical signs of CHRF including dyspnoea, orthopnoea, FVC <50% predicted and SNIP<40cmH20.

Methodology All MND patients referred during a 2-year period were included. Physiological measurements including FVC, SNIP and pCO2 taken during the assessment for NIV were collected from the departments ventilation database. NIV

Abstract P31 Table 1 Median ventilation settings at initiation of HMV and at the last visit

	Pressure control (%)	IPAP (cmH_2O)	EPAP (cmH_2O)	Inspiratory time (s)	Backup rate (per min.)
At initiation (IQR)	33	12 (10–14)	3 (3–4)	1.2 (1.2–1.2)	12 (12–14)
At last visit (IQR)	78	14 (12 -1 8)	3 (3–4)	1.2 (1.2–1.2)	14 (12–16)
Mean difference (95% CI)	46 (28 – 64 p<0.0001)	2.5 (1.4–3.6 p<0.0001)	0.33 (0.10–0.55 p=0.005)	0 (-0.02 – 0.02 p=1.00)	1.3 (0.78 – 1.8 p<0.0001)

IPAP=inspiratory positive airway pressure
EPAP=expiratory positive airway pressure

Abstract P32 Table 1 Patient Demographics

n=30	Physiology (n=9) (SD)	Combined (n=21) (SD)	p value
Sex (% m)	67	67	1.000
Age (years)	71 (7.8)	67 (8.1)	0.188
BMI (m/kg2)	29 (11)	26.4 (8.5)	0.497
Smoking Pack Years	0	21 (17.7)	-
FVC (%pred)	78 (25.7)	60 (25.6)	0.135
SNIP (cmH20)	29 (23.7)	31 (20.5)	0.822
pC02 (kpa)	5.9 (0.71)	6.15 (1.07)	0.526
HC03- (mmol/L)	30.1 (3.82)	29.8 (3.98)	0.731
IPAP (cmH20)	13 (4)	14 (3)	0.869
EPAP (cmH20)	5 (1)	5 (1)	0.348
Interface (% full face)	100	90	0.338
30 day compliance (%)	44	62	0.376
90 day compliance (%)	56	86	0.073

BMI=Body Mass Index. FVC – Forced vital capacity. SNIP=sniff inspiratory nasal pressure. IPAP=Inspiratory positive airway pressure. EPAP=expiratory positive airway pressure.

compliance (>4 hrs per night >5 nights per week) was obtained from a remote monitoring platform (ResMed AirView). Patients were sub-grouped into reason for NIV trial; physiological impairment (Phys) and physiological impairment plus symptoms (Comb). Between group comparisons were made using pC02, FVC, SNIP, 30 and 90-day compliance.

Results Patient demographics are shown in Table 1. In total 30 patients with MND were referred. A total of 21(70%) patients were initiated on NIV due to a combination of physiological impairment plus symptoms. No between group differences were observed for FVC, SNIP and pC02 (p=0.135, p=0.822, p=0.526, respectively). There was no difference in time from diagnosis to NIV trial (p=0.082) or time from NIV initiation to follow up (p=4.83). Both 30 and 90-day compliance were similar between groups (p=0.376, p=0.073, respectively). MND phenotypes (bulbar; limb) had similar 30-day compliance (p=0.961).

Discussion Our data provides evidence to suggest commencement of NIV at the earliest opportunity may increase the likelihood of effective symptom control and survival advantage regardless of initial patient presentation. Even in the absence of significant symptoms patients with both types of clinical features present with similar baseline physiology and achieve comparable therapy compliance. In addition, patients with bulbar impairment are as compliant as those without.

P33 VOTECO2ALS: VALIDATION OF TIDAL EXPIRED CO2 MEASURED AT HOME AS SURVEILLANCE FOR VENTILATORY FAILURE IN PEOPLE WITH MOTOR NEURONE DISEASE (MND)

[1]I Smith, [1]M Davies, [1]A Fofana, [1]J Grey, [1,2,3]J Altrip, [3]M Haines. *[1]Royal Papworth Hospital, Cambridge, UK; [2]Pilgrim Hospital, Boston, UK; [3]Cambridge Respiratory Innovations Limited, Cambridge, UK*

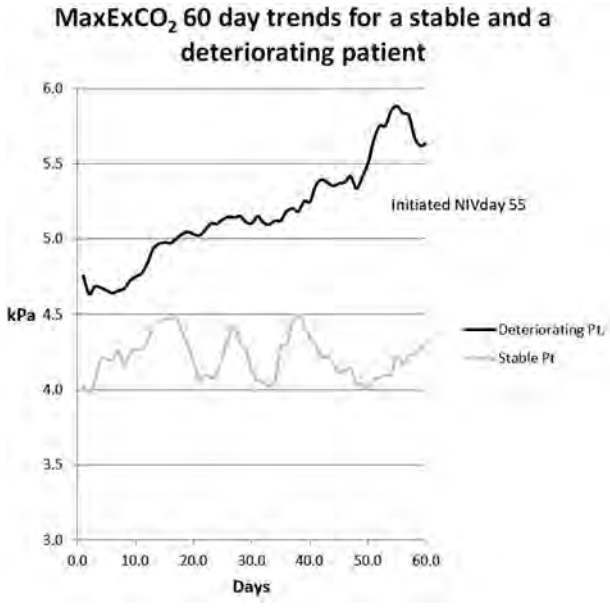
10.1136/thorax-2019-BTSabstracts2019.176

Introduction and objectives For people with MND who might benefit from home non-invasive ventilation (NIV), current NICE guidance recommends 3-monthly surveillance visits with review of respiratory symptoms, lung function and daytime SpO_2. In previous work we have found these recommended parameters poorly predict an elevated arterial CO_2 ($PaCO_2$) and the 3 month intervals can be too long as patients die unexpectedly between appointments. We are developing a home-monitoring approach, using personalised capnometry-derived indices, to try to identify developing ventilatory failure, potentially improving on current management pathways. We present initial findings from our pilot study.

Methods Patients with MND attending routine clinics have been invited to use a novel LED-based capnometer 3 times daily at home for up to 52 weeks. At 3-monthly clinic visits, participants perform capnometry and have arterial blood gases (measuring $PaCO_2$) along with daytime SpO_2 and lung function tests. The primary study aim was to assess agreement between values for CO_2 from capnometry and $PaCO_2$. Secondary aims include an examination of changes in a number of mathematically extracted features of capnometry over time to discover if any predict clinical deterioration.

Results We have recruited 28 participants for home capnometry. Data for $PaCO_2$ from clinic visits (n=39) and paired measures from capnometry were analysed for correlation. The strongest relationship was for the maximum expired (MaxEx) CO_2 but even for this r was just 0.4 (p=0.01). Bland-Altmann analysis confirms that agreement between capnometry and $PaCO_2$ was weak with a trend towards an offset with capnometry under calling the $PaCO_2$. However early analysis of home monitoring over several weeks shows potential for differentiating between stable and deteriorating patients. The attached figure shows plots of 7 day rolling average $MaxExCO_2$ for a clinically stable participant and one who deteriorated and required NIV.

Conclusions Preliminary data show weak agreement between selected capnometry parameters and $PaCO_2$ in clinic. Changes over time in extracted data suggest that home monitoring with capnometry may differentiate stable and deteriorating patients. This might be a trigger for clinical review in a timely fashion while reducing unnecessary clinic visits.



Abstract P33 Figure 1 $MaxExCO_2$60 day trends for a stable and a deteriorating patient

P34 NON-INVASIVE VENTILATION IN MOTOR NEURONE DISEASE: ARE WE OFFERING TO ALL WHO NEED IT?

H Rai, B Kathiresan, J Palmer. *University Hospitals Plymouth NHS Trust, Plymouth, UK*

10.1136/thorax-2019-BTSabstracts2019.177

Introduction and objective NICE (2016)[1]Motor Neurone Disease (MND) guideline recommends respiratory assessment should be undertaken by exploring symptoms and pulmonary function tests which includes measuring oxygen saturation using SpO_2 and performing blood gas measurements. Smith et al., (2018)[2] demonstrated that the NICE screening method risks missing half of the patients who have developed ventilatory failure. Our centre does not currently undertake blood gas analysis routinely if SpO_2 is above the NICE recommendation. We wanted to know whether patients die without being offered NIV by following NICE recommendation.

Methods MND patients referred to our centre between April 2013 to March 2018 were retrospectively evaluated using clinical records.

Results 171 patients were evaluated from the registry. Among them, 94 (55%) patients had a trial or started Non-invasive Ventilation (NIV) and 76/94 (81%) managed NIV in the long term. 31 (18%) patients refused NIV and 46 (27%) patients were never offered NIV. Among the 46 patients, 15 patients are currently alive without an indication for NIV.

31 patients died without ever being offered NIV. These have been categorised in figure 1. Among these, 25 patients had no indication for NIV based on NICE guidance. 4 of these patients underwent blood gas analysis and had pCO_2 of <6kPa. 3 patients were seen within a week prior to death while 10 were reviewed within a month. 12 were last reviewed more than a month prior to death. NIV was not offered as there was no indication based on symptoms and clinical assessment as per NICE recommendation.

Conclusion This review demonstrates that there is a cohort of MND patients who were not offered NIV based on NICE screening guidelines and who died shortly after review. More detailed work should be undertaken to understand why patients with MND, who do not appear to need NIV die before being offered this life prolonging treatment.

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P35 DELIVERY OF BOTULINUM INJECTION AS A SERVICE IN OUTPATIENT SETTINGS FOR CONTROL OF HYPERSALIVATION: A SAFE AND EFFICACIOUS SERVICE WHEN DELIVERED BY TRAINED HOME VENTILATION CONSULTANT

VL Lostarakos, THM Tedd, TD Doris, MPB Messer. *North East Assisted Ventilation Service, Newcastle upon Tyne Hospitals NHS Foundation Trust, Newcastle Upon Tyne, UK*

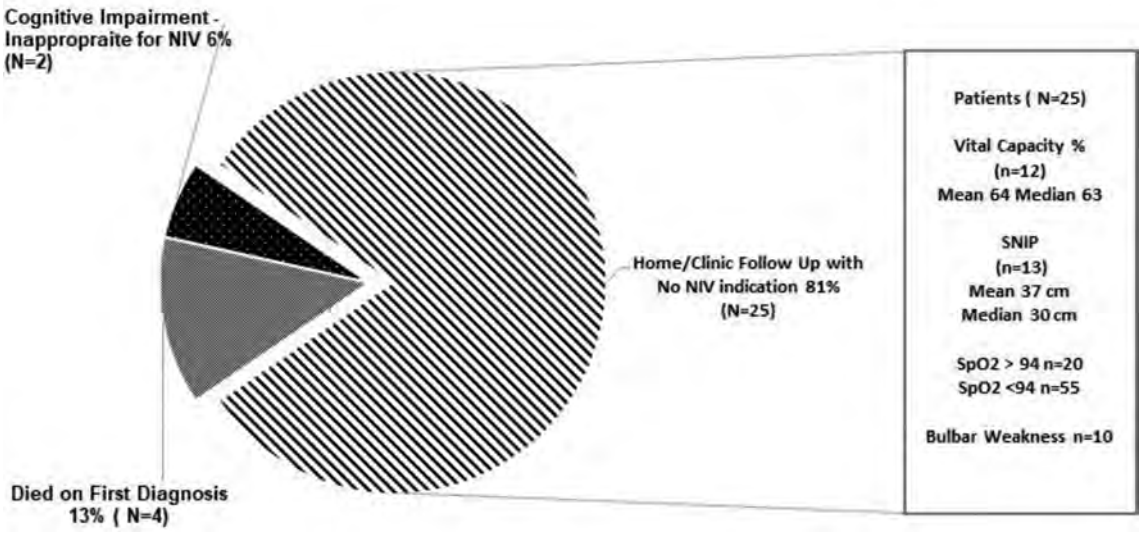
10.1136/thorax-2019-BTSabstracts2019.178

Excessive salivation is a distressing symptom for patients. Excessive salivation is a common clinical challenge for home ventilation specialists and managing it is an important part of patient care. The inhibitory effect of botulinum injection was first established successfully in Parkinson disease patients[1].

Within our regional home ventilation service, we have developed a botulinum toxin injection service, delivered by the home ventilation consultants, to manage hypersalivation symptoms as part of our holistic approach to care.

Method We conducted a retrospective analysis of our botulinum toxin injection service within the home ventilation team to review the efficacy and safety of delivering this service. The procedures were performed by trained consultants gaining the theoretical and practical expertise with cadaveric practice, head and neck radiology training and supervised practice to develop competence.

Results 33 patients underwent botulinum toxin injections in outpatients over a period of three years: 45% had motor neuron disease (M.N.D.), 45% suffered from neurodisability and 10% from a genetic muscle disease. 66.6% of the patients



Abstract P34 Figure 1 Patients died without NIV offer

had a beneficial response with a reduction in hypersalivation symptoms following administration. From this subgroup, 40.9% required multiple injections for ongoing control of hypersalivation (mean 1.5, minimum value:1-maximum value:5). The tolerance profile was satisfactory with 9.3% reporting poor tolerance mainly due to discomfort or thicker secretions. The reported side effects were limited to 1 case (3% of patients) in the form of angioedema.

Discussion We have demonstrated that the training of home ventilation specialists in the delivery of a botulinum toxin injections results in the delivery of safe and efficacious treatment with 66.6% of patients gaining benefit from the treatment. We consider management of hypersalivation an essential part of our holistic approach to care.

P36 CHARACTERISTICS AND OUTCOMES OF SPINAL CORD INJURY PATIENTS DISCHARGED FROM A TERTIARY SPINAL INJURIES UNIT WITH LONG-TERM TRACHEOSTOMY VENTILATION

[1]A Forrest, [2]B Chakrabarti, [2]A Manuel, [1]M Bevan, [1]A Ward, [3]S Lane, [2]R Parker, [2]PK Plant, [2]N Duffy, [1]S Lari, [1]F Selmi, [1]B Soni, [2]RM Angus. *[1]Northwest Regional Spinal Injuries Centre, Southport, UK; [2]University Hospital Aintree, Liverpool, UK; [3]University of Liverpool, Liverpool, UK*

10.1136/thorax-2019-BTSabstracts2019.179

Background Patients sustaining a Spinal Cord Injury (SCI) may require long-term mechanical ventilation via a tracheostomy. Little UK data exists regarding outcomes of such patients following hospital discharge. We aimed to define the characteristics and chart the outcomes of adult SCI patients discharged with tracheostomy ventilation from a tertiary spinal injuries unit.

Methodology The records of patients discharged with long-term tracheostomy ventilation from the Northwest Regional Spinal Injuries Centre were retrospectively analyzed with comorbidity defined using ICD-10 coding.

Results The records of 47 patients (Age 51 years (Range 66 years), LOS 366 days (Range 1738 days), 72% male) with SCI discharged with long-term tracheostomy ventilation between1982 and 2019 were available for analysis. 83% (39/47) were classified as sustaining a Traumatic SCI with the level of injury on discharge being C0–1 in 15%, C2–4 in 62% and C5–6 in 15%. 68% (32/47) and 17% (8/47) were classified as ASIA-A and ASIA-B respectively on discharge. 68% (32/47) were exclusively on a normal diet/fluids whilst 23% (11/47) were exclusively fed by a gastrostomy tube. 53% (25/47) were discharged on 24 hour ventilation whilst 47% (22/47) were discharged on a minimum of nocturnal ventilation but less than 24 hour ventilation. 72% (34/47) were discharged to their own place of residence whilst 28% (13/47) were discharged to Institutional Care. 9% (4/47) of subjects had died 12 months post hospital discharge increasing to 17% (8/47) who had died at 3 years post hospital discharge and 21% (10/47) who had died by 5 years post discharge. A coded diagnosis of underlying Pulmonary Disease was associated with death at 12 months ($p=0.04$) but did not appear to be a significant adverse prognostic factor by 3 or 5 years post discharge. Advanced age was associated with death at 5 years (64 (11) years v 41 (20) years). The level of injury, ASIA classification, length of stay and degree of ventilator dependence did not appear to be linked to survival.

Conclusion Patients diagnosed as SCI with long-term tracheostomy ventilation have favourable outcomes following hospital discharge. A coded diagnosis of pulmonary disease predicts early mortality in this group.

P37 ONASEMNOGENE ABEPARVOVEC GENE-REPLACEMENT THERAPY FOR SPINAL MUSCULAR ATROPHY: FROM BENCH TO BEDSIDE

[1]P Kaufmann, [1]I Kausar, [1]KD Foust, [1]A Kaspar, [1]BK Kaspar, [2]JR Mendell. *[1]AveXis, Inc., Bannockburn, USA; [2]Center for Gene Therapy, Nationwide Children's Hospital, Columbus, USA*

10.1136/thorax-2019-BTSabstracts2019.180

Introduction and objectives Spinal muscular atrophy (SMA) is a progressive neurologic disease that causes loss of motor and bulbar muscle function essential for normal breathing and swallowing. If untreated, SMA can lead to death/need for permanent ventilation by 2 years of age. The genetic root cause of SMA is lack of a functional survival motor neuron 1 (*SMN1*) gene. Here we describe the development of onasemnogene abeparvovec (formerly AVXS-101), a one-time intravenous (IV) *SMN* gene-replacement therapy (GRT) that treats the genetic root cause of SMA by delivering the *SMN* gene. Onasemnogene abeparvovec crosses the blood-brain barrier to target non-dividing motor neurons and is designed for immediate, sustained SMN expression.

Methods SMA mice ($Smn^{-/-}$) received IV scAAV9-*SMN* or scAAV9-*GFP*. Non-human primates (NHPs) received IV scAAV9-*GFP* and transduced cell types were assessed. In the first-in-human, open-label phase 1/2a study (NCT02122952), onasemnogene abeparvovec was administered as a one-time IV infusion at low (n=3) or therapeutic dose (n=12) in patients with SMA type 1 (SMA1); patients were followed for 2 years for safety/tolerability, survival (no death/permanent ventilation), motor milestones, and motor function. Patients could enroll in a long-term follow-up (LTFU) study that assesses safety.

Results scAAV9-*SMN* improved survival and motor function in SMA mice. scAAV9-*GFP* targeted motor neurons in NHPs. In the phase 1/2a trial, all patients given the therapeutic dose survived event free to 24 months post-treatment; 11/12 patients reached CHOP INTEND $\geq$40 points (maximum: 60); 11 sat unassisted $\geq$5s, 9 for $\geq$30s; 2 crawled, stood, and walked. No previously attained milestone has been lost in LTFU; 2 patients have gained milestones. No patient received nusinersen during the 24-month study; 4 patients had asymptomatic transient rise in serum aminotransferase. As of 8 March 2019, the oldest patient was 4.8 years old (4.3 years post-treatment).

Conclusions In the phase 1/2a study, onasemnogene abeparvovec GRT demonstrated unprecedented outcomes in symptomatic SMA1 infants compared with the untreated natural history of the disease. Long-term safety is being monitored for 15 years (LTFU). Global phase 3 trials in SMA1 are ongoing/planned. Additional trials are investigating the GRT in presymptomatic SMA and in older patients using intrathecal administration.

Driving quality improvement through education and training

P38 'GETTING IT RIGHT FIRST TIME' (GIRFT) IN THE MANAGEMENT OF COPD

N Ahmad, E Crawford, K Srinivasan, H Moudgil. *Princess Royal Hospital, Telford, UK*

10.1136/thorax-2019-BTSabstracts2019.181

Background GIRFT identifies medicine optimisation to improve efficiencies and cost savings. Reducing prescription of High dose inhaled corticosteroids (HD-ICS) in chronic obstructive pulmonary disease (COPD) helps improve patient care by reducing the incidence of pneumonia. A previous work carried out by this group showed an association between HD-ICS prescriptions and the incidence of pneumonia in COPD patients locally, at the primary care level (Ibrahim J et al,Thorax 2018;73:A114-A115). Following this work, a protected learning time event was held in October 2017 for the region's general practitioners to highlight the local COPD guidelines, role of community respiratory MDT and a protocol for weaning COPD patients from HD-ICS inhalers.

Aim Primary aim was to demonstrate an achievement in cost savings from reduction in pneumonia admissions coupled with reduced HD-ICS prescriptions. Hence, we compared the incidence of pneumonia in COPD patients and HD-ICS prescriptions between April-September of 2017 (P1) and 2018 (P2) in the region of Telford and Wrekin clinical commissioning group.

Method Data were obtained on all hospital admissions for pneumonia between April-September 2018 with a secondary diagnosis code J44 indicating COPD, from the information desk of the clinical commissioning group. For the purpose of comparison, we had the data from previous year for the same time period. We obtained data on HD-ICS prescriptions from *openprescribing.net*

Results There were 97 pneumonia admissions in P2 v 123 in P1, thereby indicating an absolute reduction of 21%. The total cost of pneumonia admissions in P2 was £337,233 v £463,779 in P1, thereby achieving cost savings of £126,546 over a period of 6 months.

There were 300 less HD-ICS prescriptions in the 14 general practices during P2 as compared to P1.

4 practices with the highest proportion of COPD patients, achieved most reductions in HD-ICS prescriptions (reduction by 281 prescriptions) and at the same time accounting for 32 less pneumonia admissions.

Conclusion GIRFT objectives can be achieved through engagement with primary care. In this respect, it is important to achieve integration as we have done in our area. Our effort fully supports development of new care models to achieve efficiencies within the local health economy

P39 ACUTE NON- INVASIVE VENTILATION (NIV) DELIVERY IN WARD SETTINGS – IMPROVING NURSING COMPETENCY IMPROVES OUTCOMES IN NCEPOD RECOMMENDATIONS

K Dalton, D Hinge, S Hippolyte. *Brighton and Sussex University Hospital Trust, Brighton, UK*

10.1136/thorax-2019-BTSabstracts2019.182

Introduction Acute NIV reduces mortality from 20% to 10% when compared to standard care in decompensated respiratory failure in COPD[1]. BTS national audit data identified an increase in acute NIV-associated mortality 2013–2016, despite its increased use across acute trusts/hospitals since 2000. The NCEPOD report (2017) 'inspiring change' highlighted areas where delivery of acute NIV could be optimised to reduce mortality. A key recommendation is for NIV delivery within environments with minimum safe levels of staff competencies (45.4% hospitals NIV delivered by non-NIV competent staff).

Objectives and methods Trust-wide monthly NIV training with incorporated competency self-assessments were introduced from 2017 across two sites. NIV is primarily delivered on wards in this trust. Training included 6 hours of lectures and simulation delivered by NIV nurse lead (critical care background). Local audit data from 2017 were compared to 2019 and NCEPOD data to see if there was an objective improvement in standard of care delivered, and whether this correlated with an increase in nursing competency levels and self-assessment scores. Specifically NCEPOD recommendations 12&13 focusing on nursing care (documentation of vital signs/ventilation settings and using a standardised pro-forma) were examined by collecting data in both 2017&2019 BTS audit periods for all acute NIV episodes identified through coding.

232 non-NIV competent nurses completed self-assessment (score 0–10) before and after training in 'using NIV' and 'analysing arterial blood gases' (ABGs).

Results After one year of training days, 49% non-NIV competent nurses, had attended training. Confidence scoring results showed significant improvement in both using NIV (3.5 increased to 8/10) and analysing ABGs (4.9 increased to 7.9/10) p-value=0.03.

Local audit (2019) showed significantly higher levels than NCEPOD data for recommendation 13 p-value=0.002.

Abstract P39 Table 1 2019 result of audit of NCEPOD recommendations 12 and 13 in 2017 and 2019

	Trust 2017 (%) n=45	Trust 2019(%) n=29	NCEPOD 2017 (%) n=678	p-value comparing 2019 Data with NCEPOD 2017
Hourly vital signs documented: (NCEPOD recommendation 12)	80	80	67	p-value>0.05
Ventilator settings documented: (NCEPOD recommendation 13)	69	80	49	**p-value=0.002**
Using a standardised pro forma: (recommendation 13)	90	86	69	p-value>0.05

Conclusions Investing specialist time in training nurses delivering NIV care outside the critical care environment has increased confidence and standards of care for NCEPOD NIV recommendations 12&13. Further work is required to evaluate the impact this makes upon other recommendations such as mortality, reducing inappropriate NIV prescribing and ensuring early initiation of NIV.

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P40 EFFECT OF PRACTICAL NON-INVASIVE VENTILATION TRAINING SESSIONS ON CONFIDENCE AND COMPETENCE OF CLINICIANS

H Rai, D Crowle, B Kathiresan. *University Hospitals Plymouth NHS Trust, Plymouth, UK*

10.1136/thorax-2019-BTSabstracts2019.183

Introduction and objectives The NCEPOD (2017) report on Acute Non Invasive Ventilation (NIV) underlined the failings in the provision of appropriate care for acute NIV patients in UK.[1] The report highlighted that 45% of hospitals had staff supervising patients on acute NIV without defined training competency. BTS (2018) produced a NIV quality standards detailing that staff prescribing, initiating or changing NIV settings should maintain ongoing competency through training.[2] Hence, we developed a pilot NIV training program at our Trust and evaluated its impact by undertaking a follow up survey.

Methods We developed a 3 hour NIV training program comprising of lecture and a hands-on session on a NIV machine and masks. This was followed up by a competency assessment session. Participants were enrolled from different backgrounds in three different session over a period of 12 months and impact evaluation was conducted by surveying participants after at least 3 months following their training.

Results A total of 25 participants were enrolled, comprising mainly of Medical Registrars (76%). Other participants included Core Medical Trainees, Trust Grade Doctors, Medical Consultants and Advanced Nurse Practioners. Participants were from a range of specialities, including Respiratory, Endocrinology, Acute Medicine, Geriatric and Emergency medicine. 17 completed the follow up survey. Prior NIV training was mixed, with 5 participants having no prior NIV training, and a further 4 participants stating no training within the previous 12 months. Participants had managed a mean of 7 patients on acute NIV following completion of their training. Figure 1 demonstrates that overall, this training has significantly increased their confidence to initiate and mange patients on acute NIV, as well as increased awareness of the BTS blood gas result to mask time among attendees.

Conclusions An effective pilot NIV training was provided to ensure staffs managing acute NIV patient are trained as per BTS NIV quality statement. We aim to roll out NIV training to all other appropriate staff across trust by incorporating it as part of trust induction and competency maintenance requirement.

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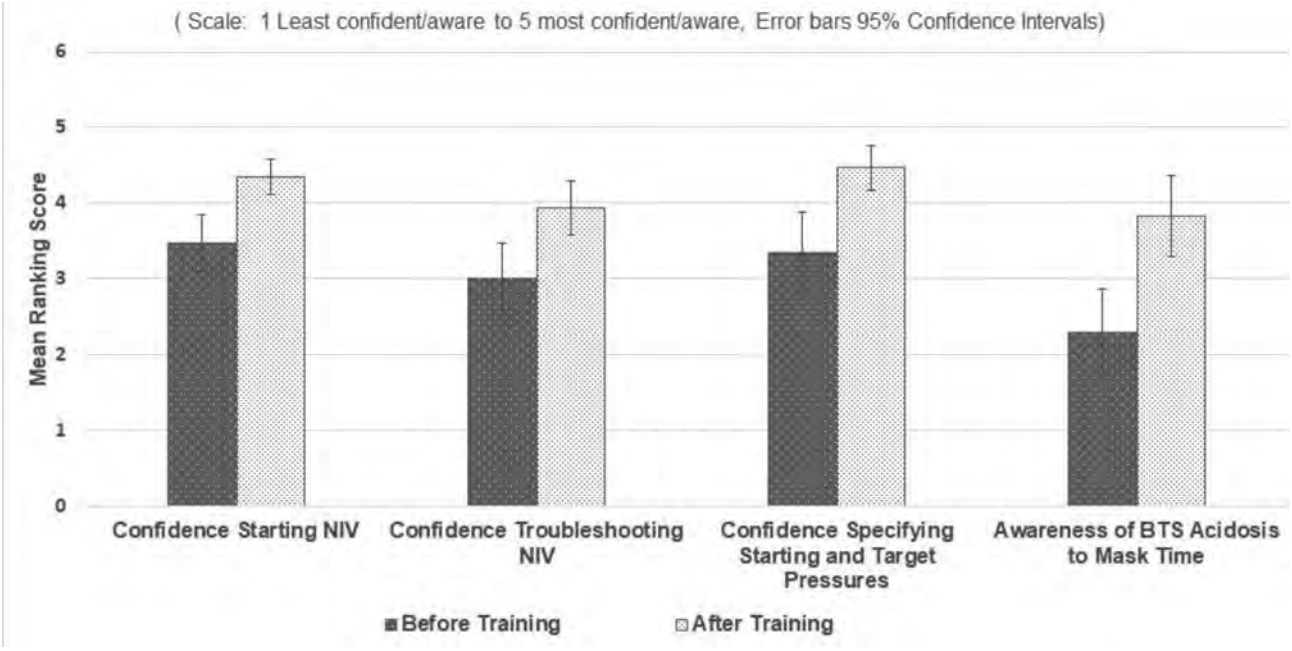
P41 IMPROVING NIV TRAINING FOR GENERAL MEDICAL TRAINEES: A TRAINEE LED INITIATIVE BY RESPTRACT

FS Grudzinska, S Thein, R Edgar, DPS Dosanjh, D Parekh. *University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK*

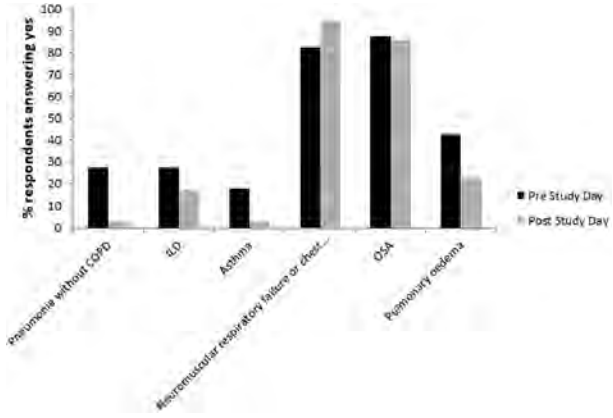
10.1136/thorax-2019-BTSabstracts2019.184

Introduction and objectives Acute non-invasive bi-level ventilation (NIV) reduces mortality by 50% in acidotic acute hypercapnic ventilatory failure (AHRF) caused by exacerbations of chronic obstructive pulmonary disease.[1] However NIV treatment is frequently inadequate.[2] NIV is often initiated by non-respiratory specialist trainees, who are most likely to inappropriately initiate this intervention.[2] We aimed to assess non specialist trainee's knowledge and experiences regarding NIV and then provide appropriate training to improve outcomes for patients.

Methods RespTRACT is a collaborative of respiratory trainees. We conducted an anonymous survey of general medical trainees across the West Midlands and assessed their knowledge compared to BTS guidance and quality standards. Based on this we designed a general internal medicine training day addressing the BTS guideline and quality standard and then repeated the anonymous survey.



Abstract P40 Figure 1 Mean response before and after practical NIV training with participants rating confidence/awareness on a numerical scale



Abstract P41 Figure 1 Comparison of pre and post study day responses regarding appropriate uses of NIV: would you use NIV in the following situations?

Results Forty trainees from a range of non-respiratory specialties participated. Of these 22.5% had received NIV training in the past year. In the pre-course survey, 87% of trainees had limited confidence when using NIV, poor awareness of appropriate indications for NIV as demonstrated in figure 1. 58% lacked confidence in recognising patients who should be managed in in a critical care setting. All participants felt the training day impacted their practice. Following the training day, we demonstrated an increase in overall confidence when using NIV, 97% rated themselves as mostly or fully confident. Better awareness of appropriate indications (Figure 1) and improved understanding of prognostication.

Conclusion Despite clear guidance and standards practice remains below the expected level. Much of the decision making is led by non-specialist trainees, by targeting this group we have demonstrated improved awareness of BTS guidance. Trainee led education is a feasible and successful delivery model to improve standards for NIV.

on behalf of RespTRACT

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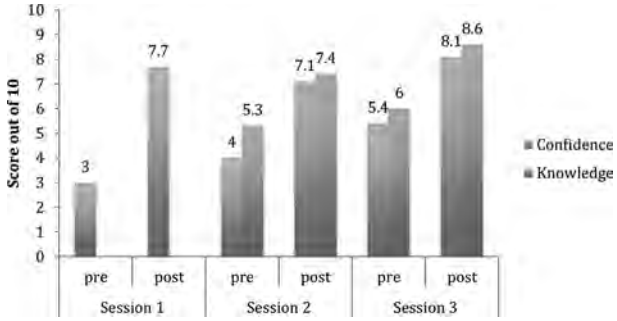
P42 DEVELOPMENT OF AN ACUTE NON-INVASIVE VENTILATION TEACHING PROGRAMME FOR TRAINEES IN A DISTRICT GENERAL HOSPITAL FOLLOWING THE NCEPOD REPORT – INSPIRING CHANGE

R Anstey, K Millington, F Easton, R Mason. *Royal United Hospital, Bath, UK*

10.1136/thorax-2019-BTSabstracts2019.185

Introduction and Objectives The *Inspiring Change*(NCEPOD 2017) report in to acute Non Invasive Ventilation outlined recommendations to improve acute NIV care through service development and education. Review of our existing DGH service, identified no formal NIV teaching for doctors commencing and managing NIV. We aimed to develop an interactive case-based education programme to improve patient selection, clinical confidence and competence and patient outcomes in our trust.



Abstract P42 Figure 1 Confidence and knowledge ratings pre and post NIV teaching

Method Baseline survey: 90% trainees had attended NIV teaching. 50% had not attended teaching in past 12 months. 70% felt confident in completing treatment escalation plans prior to commencing NIV. Average confidence in initiating NIV was 3/10.

Therefore an interactive, case-based simulation teaching session was developed aimed at ST3+ and CMTs. Following trainee feedback a revised NIV teaching evening was developed and delivered in October 2018 and July 2019 encompassing all training grades.

Results Three teaching sessions were arranged. Feedback found that confidence and knowledge improved across all sessions (figure 1).

July 2018 SIM teaching (ST3+): Attendees liked the small group teaching, use of NIV machines and realistic cases; however, they felt the simulation aspect of the session did not add to experience and recommended the session was delivered out of hours. 66% felt NIV teaching should be mandatory.

October 2018 NIV teaching evening(20 CMTs and ST3+): Attendees praised the small group aspect and liked the interactive use of machines. All attendees felt it should be part of their training curriculum.

Feedback was used to develop the session further and was repeated in July 2019

July 2019 (14 F1s and CMTs): This most recent data suggests further improvements with the biggest development in the F1 confidence (2.7 to 6.9/10).

Conclusion Development of a formal interactive case-based teaching programme has improved trainee confidence and knowledge of managing patients on acute NIV. This, along with other measures to optimise our acute NIV service, has reduced inpatient NIV mortality from 30% to 6%. The trust will now offer a bi-annual interactive teaching programme.

P43 AN INTEGRATED AND SUSTAINABLE EDUCATION PROGRAMME IMPROVES KNOWLEDGE, LEADERSHIP AND CONFIDENCE IN ACUTE NON INVASIVE VENTILATION (NIV) IN LINE WITH THE BTS QUALITY STANDARDS

CA Peal, AD Moriarty, J Wyatt, AW Molyneux, DP Smith. *Sherwood Forest Hospitals, Sutton in Ashfield, UK*

10.1136/thorax-2019-BTSabstracts2019.186

Introduction Inspiring Change, the 2017 NCEPOD report on NIV demonstrated that improvement in clinical and/or organisational care was required in 73.2% of patients. Many hospitals (45.4%) did not maintain a record of competency for

Abstract P43 Table 1 Pre and post-simulation median results (Likert Scale). Wilcoxon matched-pairs signed-rank test used to test significance

	Pre-simulation median	Post-simulation median	Significance (p value)
Anxious about undertaking the simulations	3	3	Not significant
My clinical knowledge is appropriate for my level	3	4	<0.01
I have effective leadership skills in emergency situations	3	4	0<0.01
I am able to communicate effectively in emergency situations	4	4.5	<0.001
Knowledge of the Indications for NIV	3.5	4	<0.01
Initiating NIV	3	4	<0.001
Reviewing a patient on NIV	2.5	4	<0.001

staff delivering acute NIV care. BTS Quality Standards state that staff initiating or making changes to acute NIV treatment must be competent and a register should be maintained. At Sherwood Forest Hospitals, we maintained a log of competency for Band 6 acute NIV nurses but did not record evidence of training for rotating doctors or ward nurses.

Methods We developed a multifaceted, multi-disciplinary, integrated and sustainable education programme for all staff with responsibility for managing acute NIV. This comprised an E-learning package; a low-fidelity (lo-fi), in-situ simulation training and quarterly update sessions referencing our BTS NIV QI toolkit Acute NIV prescription; and posters featuring a newly created treatment acronym: 'BREATHE'. Feedback from E-learning is electronically sought, and a register maintained through the package's final assessment.

The simulation employed a 'Resusci Annie' manikin as patient, a side-room or treatment room on our acute NIV ward, and mock notes and drug card. Faculty comprised one facilitator and a respiratory specialist nurse. Junior doctors were trained in-hours during induction to the respiratory department. Pre- and post-simulation questionnaires, using a 5-point Likert scale, were completed and results analysed using a Wilcoxon signed-rank test.

Results 14 junior doctors undertook the lo-fi, in-situ simulation, and questionnaire responses demonstrated statistically significant (Table 1) improvements in knowledge, confidence, leadership and escalation.

32 staff, including 13 nurses and 19 junior doctors, completed the E-learning package within the first 2 months. Feedback was universally positive with all staff reporting that the knowledge gained will improve their work and the assessment consolidated their learning.

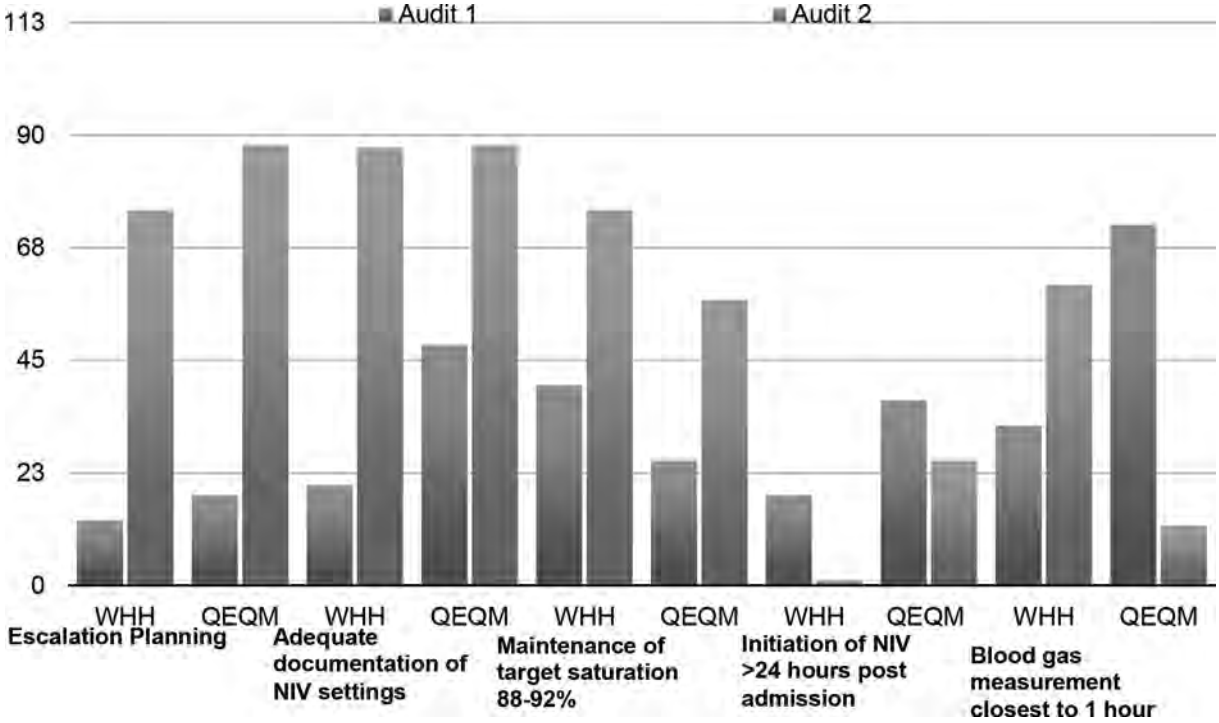
Conclusion Appropriate training and registration for all staff involved in acute NIV care is essential in line with BTS Quality Standards. The multidisciplinary in-situ simulation is reproducible and delivers similar outcomes to more formalised training in an expensive simulation centre. An E-learning programme is a sustainable method of integrating clinical documentation and assessments allowing a contemporaneous register of staff competency and training.

P44 NIV PRESCRIPTION PROFORMA–DOES IT IMPROVE PATIENT CARE?

[1]A Dhara, [1]P Bandipalyam, [2]J Patel, [2]A Ladva, [2]A Maheswaran, [2]S Srivastava. [1]*East Kent University Hospitals NHS Trust, Ashford, UK*; [2]*King's College, London, UK*

10.1136/thorax-2019-BTSabstracts2019.187

Introduction Respiratory Failure in COPD patients is the second most common reason for hospital admissions and the fifth-biggest killer in the UK. Non - Invasive Ventilation (NIV) has revolutionised the management of this condition but



Abstract P44 Figure 1

compliance with BTS guidance has been poor. East Kent is a large Trust with high respiratory morbidity and mortality. We introduced NIV prescription proforma in East Kent to improve compliance and in turn, patient care.

Methods A baseline was established by undertaking, local spot audits on randomly chosen days, at the two acute sites in the Trust - Queen Elizabeth Queen Mother Hospital, Margate in October 2018 and William Harvey Hospital, Ashford in July 2018. ITU and HDU patients were excluded.

This was followed by a quality improvement programme which included three arms: a) the development and roll-out of an NIV prescription pack (including posters, aide memoir cards, desktop screensavers), b) a training programme for all staff and c) development of Respiratory Support Units (with 1:2 staffing ratio) on both our acute sites. A further audit was undertaken at both sites in January 2019 and feedback regarding the proforma was sought.

Result The results of both audits are presented in graph 1. There was a significant improvement in documentation of escalation planning, NIV settings, maintenance of target saturations and initiation of NIV >24hours after admission. Areas that required further improvement included measurement of blood gas within an hour of initiating NIV and specialist consultant review within 14 hours.

Conclusion Introduction of a new NIV proforma significantly improved compliance with BTS guidance and patient care. Continued education will be necessary to sustain this improvement but adequate specialist resources coupled with changes in consultant job planning will also be required to completely comply with the guidance.

P45 A STUDY OF BURNOUT AND PROFESSIONAL FULFILLMENT AMONG RESPIRATORY PHYSICIANS (RP) IN UNITED KINGDOM

[1]S Piracha, [1]U Maqsood, [1]M Saleem, [2]M Ganaie, [3]A Raza. *[1]Sandwell and West Birmingham Hospitals, Birmingham, UK; [2]University Hospitals of North Midlands, Stoke on Trent, UK; [3]University Hospitals of Leicester, Leicester, UK*

10.1136/thorax-2019-BTSabstracts2019.188

Background Work related burnout is a rising concern among healthcare providers. GMC survey states that a quarter of trainees and over a fifth of trainers have reported burnout due to various reasons. Respiratory medicine is one of the more intense specialties in terms of workload and patient acuity. To date, respiratory physicians' (RP) wellbeing has not been probed as a specialty.

Aim We aimed to study professional fulfilment and burnout among UK respiratory physicians.

Methods 16-question survey, Professional Fulfillment Index (PFI), designed using Google Forms was sent to 14 deaneries across UK. Data was collected on RPs' job role, age group, gender, job plan (ie general medicine (GIM) on-call commitment) and opinion on the top causes for burnout.

Results 110 RP completed the survey. 43 (76.8%) consultants and 44 (91.7%) training registrars (TR) lacked professional fulfillment. While 27 (48.2%) consultants and 26 (54.2%) RT were found to have burnout. All trust grade registrars (n=6) were deficient of professional fulfillment and had burnout. Participants rated Rota Gaps as the leading cause for burnout, while GIM on-call commitment and lack of respect from administrators were voted 2nd and 3rd respectively.

Conclusion Prevalence of burnout is much more profound among RP when comparing similar studies in general medicine. Also, scarcity of professional fulfillment is another concern. We recommend running this survey on a wider forum to improve the results and to take remedies against at-least the top causes.

P46 STOPPING SMOKING IN THE UNSTOPPABLE

[1]D Kadar, [2]A Broadhurst, [3]G Agboado, [4]S Sibley, [4]S Pilsworth. *[1]Liverpool Heart and Chest Hospital, Liverpool, UK; [2]University of Liverpool, Liverpool, UK; [3]Knowsley Council, Liverpool, UK; [4]Liverpool Heart and Chest Hospital, Liverpool, UK*

10.1136/thorax-2019-BTSabstracts2019.189

Introduction Knowsley council is the 2nd most deprived local authority in England, with the 7th highest adult smoking prevalence and this statistic has remained high in the last 10 years. Smoking cessation (pharmacotherapy with behavioural support) is the most effective intervention in stopping the progression of Chronic Obstructive Pulmonary Disease (COPD).

In the last 7 years, COPD admissions in Knowsley were reduced by 40% through pulmonary rehabilitation, hospital at home and medicine optimisations. To improve further admission avoidance, smoking cessation is paramount to tackle in light of the static smoking prevalence. It is difficult for patients to access the current local council stop smoking service. Feedback from patients are that they did not like to discuss emotional issues with unfamiliar counsellors.

Aim To evaluate the effectiveness of our enhanced stop smoking service pilot

Method The pilot involved a pharmacist trained to deliver smoking cessation support/pharmacotherapy in the outpatients setting. Patients were contacted weekly to monitor compliance and motivational advice was provided. Quit rates were measured at 4, 8 and 12 weeks. Quit was defined as patient self-report.

Between September 2018-March 2019, 41 patients were enrolled.

Results The mean smoking history was 53 pack years, 35 patients continued in the pilot beyond the initial consultation, see table 1.

At 4 weeks 12 (34.3%) were smoke-free and they remained smoke free at week 12. In addition, 6 more patients quit after 4 weeks of intervention and making a total of 18 (51.4%) smoke free after 12 weeks of treatment.

Abstract P46 Table 1

Quit method	Total number treated	Number quitting at 4weeks	Quit rate at 4 weeks	Number quitting at 12 weeks	Quit rate at 12 weeks
Varenicline (Champix)	28	10	35.7%	15	53.6%
Nicotine Replacement Therapy	5	2	40.0%	3	60.0%
Will power alone	1	0	0.0%	0	0.0%
Zyban	1	0	0.0%	0	0.0%
Grand Total	35	12	34.3%	18	51.4%

Discussion This pilot proves that smoking cessation support delivered by the healthcare professionals that are aware of the physical and psychological background of the patients is more effective than the current community provisions. Smoking cessation is a challenging area, close clinical contacts and having a long-standing affiliation with patients allow teachable moments and can address emotional, psychological and social barriers.

Following this successful pilot, this service has now been commissioned by local council on a wider scale, available to all patients who access our Community Services (Respiratory, Cardiovascular and Stroke).

P47 INVESTIGATING CHANGES IN PARENTS' PERCEPTIONS AND ATTITUDES OF SMOKING IN THE HOME AFTER A SECOND HAND SMOKE EDUCATIONAL INTERVENTION IN NURSERIES

Y MacNicol, NJ Roberts. *Glasgow Caledonian University, Glasgow, UK*

10.1136/thorax-2019-BTSabstracts2019.190

Exposure to second hand smoke (SHS) has negative consequences in children. There is a strong link between cigarette smoking and socio-economic groups, children from more deprived areas are at a higher risk of exposure to SHS in their home.

A previous study in Lothian[1] aimed to raise awareness of SHS with parents and carers of primary aged children and the associated health risks of smoking in their homes/cars. This was achieved in partnership with primary schools who produced materials and delivered activities to the children. NHS Greater Glasgow and Clyde[2] used a storybook to demonstrate the associated health risks of SHS and the association between primary school-based approaches to health behaviours and behaviour change. This study follows on from these studies and examines parents/carers experiences' after the storybook was adapted by NHS Forth Valley for use in nurseries as a SHS intervention for parents/carers of nursery aged children in Clackmannanshire.

Parents/carers (current smokers or ex-smokers who had stopped smoking <6 months) from two nurseries participated in the study. Participants took part in a semi-structured interview about their experiences, perceptions and attitudes towards smoking in the home and to discuss, any changes to these following the intervention.

Emerging themes show that not all parents remembered the intervention, but all thought it might protect children from the dangers of SHS, it may encourage some parents to stop smoking in the home or completely and should be rolled out to all nurseries. Although all were still smoking they wanted to protect their children from SHS with most smoking outside. All participants welcomed the story telling resource and felt it would make some parents consider their smoking behaviours and some felt children could positively influence parents/carers into making effective health behaviour changes in relation to smoking.

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P48 A JOINT RESPIRATORY AND PALLIATIVE CARE CLINIC: THE PATIENT EXPERIENCE

N Nathoo, N Devani, R Brusse, R Craig, S Mandal. *Royal Free Hospital, London, UK*

10.1136/thorax-2019-BTSabstracts2019.191

Background There are a growing number of patients in the community with chronic debilitating respiratory disease. Early identification, assessment and management of their symptoms and their own and their family's psychosocial needs can improve quality of life and prevent unnecessary hospital admissions.

We present our findings from a newly established joint Respiratory and Palliative Care clinic which aimed to identify

Abstract P48 Table 1 Summary table of results regarding the appointment

Summary table			
Which of the following issues were addressed in clinic?			
	%age of patients stating agreement	**How useful was this? (Scale of 0-10)**	
		Mean	**SD**
Symptom control	75.00%	6.67	1.12
Planning Future	87.50%	6.43	1.76
Support relative/ carer	62.50%	7.20	2.72
Inform regarding community support services	37.50%	4.67	3.78
Emotional needs/concerns	87.50%	5.29	2.31
Did you have enough time to discuss concerns?	100.00%		
Did you feel involved?	100.00%		
Do you think your contact was;			
- about right	100.00%		
- too often	0.00		
- not enough	0.00		
Would you recommend?	100.00%		
Scale 1-10 how satisfied overall care (mean)	8.75		

patients with chronic respiratory illness and address their chronic symptoms and psychosocial needs using an MDT approach. Specifically, the clinic aimed to address symptom control, emotional needs, future-planning, support for relatives/carers, and provide information about community services.

Method Patients attending the joint clinic were asked to complete a standardised questionnaire after clinic, to assess their experience.

Results 12 patients completed the questionnaire. The diagnoses of the patients were advanced COPD (n=4), motor neurone disease (n=2) and chronic hypercapnic respiratory failure requiring NIV (n=4), obstructive sleep apnoea (n=1) and severe bronchiectasis (n=1). Prior to attending clinic, 87.5% (n=7/8) were aware of the referral and reason for it. Seventy-five per cent (n=6/8) believed the clinic was informative, 62.5% (n=5/8) felt it was supportive, and 25% (2/8) felt relieved about the referral. Fifty per cent (n=4/8) felt anxious prior to the clinic and 25% (n=2/8) thought it would be unnecessary.

Patient experiences after the clinic appointment have been summarised in table 1. Assessment of utility was undertaken using a likert scale of 0 – 10 (with 0='not useful at all' and 10=very useful).

Conclusion A joint respiratory and palliative care clinic involving dedicated discussions for patients with chronic debilitating respiratory disease is favoured by patients with a mean satisfaction score of 8.75. All patients believed they had enough time to discuss any concerns, felt involved in decision-making and would recommend the clinic.

However, our data suggests that more focus needs to be spent on issues such as providing information about community support services and support for relatives and carers. Furthermore, perceived utility scores for many of the interventions are lower than we expected. This highlights that further work is required to identify exactly what is important for patients or what areas perhaps have been under-addressed during previous consultations to avoid duplication.

P49 UK COST-EFFECTIVENESS VALUE PYRAMID OF ASTHMA INTERVENTIONS

C Roukas, F Tomini, B Mihaylova. *Queen Mary University of London, London, UK*

10.1136/thorax-2019-BTSabstracts2019.192

Aim In the UK, the British Thoracic Society (BTS)/Scottish Intercollegiate Guidelines Network (SIGN) and the National Institute for Health and Care Excellence (NICE) have published guidelines for the management of people with asthma. However, although the clinical evidence used for the guidelines development were similar, BTS/SIGN appraised the clinical evidence alone while NICE reviewed also the health economic evidence and supplemented it with further health economic analyses.

The aim of this study is to propose a cost-effectiveness value pyramid of asthma interventions in the UK using all available evidence for the additional healthcare cost per an extra quality-adjusted life year (QALY) with different interventions.

Method We followed a three-stage approach. Firstly, the UK-relevant cost-effectiveness findings from economic evaluations of asthma interventions were identified following a systematic review of peer-reviewed economic evaluation studies. Secondly, economic analyses developed or reviewed (e.g. external published studies or pharmaceutical company submissions to NICE) were added. Finally, our review was extended to economic findings for common interventions recommended by BTS/SIGN and NICE in the context of general populations in the absence of results in people with asthma specifically.

Results The totality of available evidence on cost-effectiveness of asthma interventions in UK is presented separately for adolescents/adults (aged 12 years and over) and children (aged 6–14 years). The most cost-effective treatments of interventions with reported ICER<£10,000 per QALY gained were: smoking cessation interventions and services (ICER £13–£3,601 per QALY) and flu vaccination uptake (£2,996–£3,158), outpatient asthma clinic (£1,378–£6,776), specific subcutaneous immunotherapy (£6,975), ICS+LABA combination inhaler (£7,604–£13,706), and temperature-controlled laminar airflow devices (£8,915) in adults. In children, these were: flu vaccination uptake (£2,294–£4,751), specific subcutaneous immunotherapy (£6,975) and temperature-controlled laminar airflow devices (£8,915).

Conclusions Lack of cost-effectiveness evidence leads to possible confusion when prioritizing asthma interventions that provide the most benefits for required resources. While our study provides some guidance for highest priority interventions, we have also identified gaps in the cost-effectiveness evidence. Future studies assessing the cost-effectiveness of SABAs, theophylline, oral steroids, immunosuppressant, bronchial thermoplasty, allergy avoidance, exercise and other complimentary therapies are required.

P50 CLINICAL OUTCOMES AND MICRO-COSTING OF BRONCHIAL THERMOPLASTY IN SEVERE ASTHMA IN THE UK

[1,2]L White, [1,3]C Capbianco, [1,3]AH Mansur. [1]*University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK*; [2]*University Hospitals Birmingham, Birmingham, UK*; [3]*Boston Scientific, Paris, France*

10.1136/thorax-2019-BTSabstracts2019.193

Bronchial thermoplasty (BT) is a cost-effective (Zafari Z et al. PLoS One. 2016, 11:1) therapy for severe asthma (SA) delivered in three bronchoscopic procedures. National Institute for Health and Care Excellence recently recognized the safety and efficacy of BT for SA treatment (NICE IPG635,2018).

Aims Measure patient outcomes pre and post BT treatment and compare the actual cost of BT to national reference costs and tariff income to assess the adequacy of current payment in the UK.

Methods We performed a retrospective micro costing study on 53 BT procedures (total of 18 patients) over the 2012–2017 period at a UK hospital. We collected patient outcomes 12 months before and after BT. For comparison we used 2017/18 national reference costs and national tariffs of the HRG DZ67Z Major Therapeutic Bronchoscopy.

Results After BT, we observed a significant improvement in mean FEV_1 (1.99L ± 0.64 vs 2.50L ± 0.66; p=0.001), and a reduction of mean rescue oral corticosteroid/year (6.6 ± 4.2 vs 1.5 ± 1.7; p=0.00004). The average cost of a BT session was £3362 for day cases (DC) performed under sedation (n=22), £4354 for elective admissions (EL) under sedation (n=27),

£6925 for EL under general anesthesia (n=4). This compares to 2017/18 reference costs for DC and EL of £1380 and £2563 respectively, demonstrating an average deficit of £2064. 2017/18 tariff for DC and EL of £2050 does not cover BT admission costs whether BT is done as a DC or EL.

Conclusions In this patient group BT improved health outcomes. Micro costing reveals that reference costs do not reflect the actual cost of BT. Since reimbursement is based on reference costs, BT is underfunded, which may represent a barrier to patient access.

P51 PATIENT SATISFACTION DURING BRONCHOSCOPY: A QUALITY IMPROVEMENT PROJECT

J Tonkin, E Gannon, SJ O'Connor. *Kingston Hospital NHS Foundation Trust, Kingston-upon-Thames, UK*

10.1136/thorax-2019-BTSabstracts2019.194

We conducted a survey to learn about patients' experiences during bronchoscopy and to improve the patient experience. We surveyed patients, bronchoscopists and bronchoscopy nurses and repeated the assessment on patients 2 weeks later.

Methods We asked patients to rate using an analogue scale from 0–10 how well tolerated the bronchoscopy was (0 is well tolerated, 10 is poorly tolerated). Cough, breathlessness and overall satisfaction were assessed. We also asked for any comments about anything they wished they had known in advance.

Results 22 patients were surveyed at the time and 15 patients responded to the follow-up questionnaire. The mean satisfaction score at the time of bronchoscopy was 4.1 for cough, 4.2 for breathlessness and 4.0 overall. When repeated at 2 weeks the satisfaction scores were much improved at 1.9 for cough, 2.0 for breathlessness and 1.8 overall.

The comments section provided interesting reading. Patients varied significantly in how prepared they felt they were for bronchoscopy. Some patients reported that the bronchoscopy leaflet 'gave [them] all the information [they] needed' while others claimed it was 'nothing like the procedure'. A common theme, however, when asked 2 weeks later that many patients did not recall being given their results.

We noticed the sedation satisfaction scores between patients, bronchoscopy nurses and bronchoscopists varied significantly. There was no tendency for one group to report higher tolerability scores.

Discussion and outcomes Firstly, there is little correlation between patients, nurses and bronchoscopists reports of tolerability. A 'well-tolerated procedure' may have been satisfactory for sampling but not well tolerated by the patient. Secondly, satisfaction scores improved significantly on the second time of asking, we suggest this is due to the amnesic effect of benzodiazepines. Likely due to the effect of benzodiazepines, many patients did not recall having their results given to them after the procedure.

We have created a 'normal letter' for patients with a normal examination to take home. In view of mixed opinions on pre-procedural preparation we developed a new patient information leaflet, focusing on areas the patients wished they had known beforehand. We continue to survey patients and staff for ongoing quality improvement.

Prognosis and outcomes in ILD

P52 VITAMIN D DEFICIENCY IS ASSOCIATED WITH ADVERSE SURVIVAL IN PATIENTS WITH IDIOPATHIC PULMONARY FIBROSIS

[1]R Kumar, [2]J Mann, [2]F Chua, [2]T Maher, [2]E Renzoni, [2]M Kokosi, [2]V Kouranos, [3]P Molyneaux, [3]A Wells, [4]J Mackintosh, [2]P George. *[1]Barnet General Hospital, Royal Free Hospital NHS Foundation Trust, London, UK; [2]Interstitial Lung Disease Unit, Royal Brompton Hospital, London, UK; [3]National Heart and Lung Institute, Imperial College London, London, UK; [4]Department of Thoracic Medicine, The Prince Charles Hospital, Brisbane, Australia*

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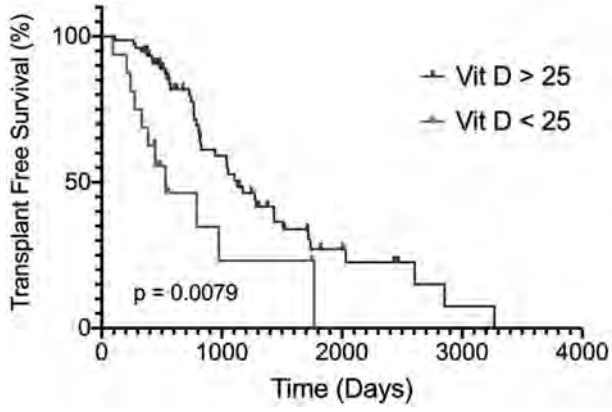
Background Vitamin D (VitD) has been shown to have anti-fibrotic properties in the bleomycin mouse model of pulmonary fibrosis. This study aimed to establish whether an association exists between VitD deficiency and outcomes in patients with idiopathic pulmonary fibrosis (IPF).

Methods The VitD status of an anti-fibrotic treated IPF patient cohort at a single UK tertiary centre was retrospectively analysed. Clinical deficiency was defined as VitD<25 nmol/L as per NICE guidelines. Serial lung function was determined in the 12 months (or as close as possible) after the VitD test. Frequency of infections and acute exacerbation events were recorded, and transplant-free survival was calculated from the earliest patient contact.

Results Of 300 IPF patients, 92 (30.6%) had documented VitD results (78.3% male, mean age 72±8 years). Sixteen (17.4%) patients were clinically deficient. Baseline FVC and DLco were 70.3%±11.9% and 39.1%±12.9% in the non-deficient and 68.4%±10.7% and 39.8%±8.8% in the deficient groups respectively (p=0.55, p=0.85 respectively). There was no significant difference in the prevalence of VitD deficiency between patients taking Pirfenidone (11/66 (17%)) and Nintedanib (5/26 (19%))(p=0.77). Median transplant-free survival was 1128 days in the non-deficient group and 532 days in the deficient group (p=0.0079)(Figure 1). Following adjustment for age, gender and baseline composite physiologic index (CPI), the Cox proportional hazard ratio for VitD deficiency and transplant-free survival was 2.36 (95% CI 1.128–4.942, p=0.023). There was no difference in mean annual relative change in FVC between deficient (-8.0%±8.9%) and non-deficient patients (-9.1% ±12.9%)(p=0.79). The incidence of infections and acute exacerbations did not significantly differ between groups.



Abstract P52 Figure 1 Unadjusted Kaplan-meier survival curve for the presence of vitamin D deficiency in Idiopathic pulmonary fibrosis patients

Conclusions In this cohort of antifibrotic treated IPF patients, there is an association between VitD deficiency and adverse outcomes. Whether VitD deficiency is associated with a poorer prognosis as a surrogate for a co-morbid state or is relevant to IPF disease pathogenesis remains unclear. Although limited by cohort size, it is curious that reduced survival appears to be independent of lung function decline and further analyses with regard aetiology of mortality is required. Prospective studies of VitD supplementation in antifibrotic treated IPF patients may be indicated to explore a potential therapeutic role.

P53 INCIDENCE OF IDIOPATHIC PULMONARY FIBROSIS IN PEOPLE WITH TYPE 2 DIABETES: THE FREMANTLE DIABETES STUDY

[1]WA Davis, [2]V Navaratnam, [2]RB Hubbard, [1]TME Davis. *[1]Medical School, University of Western Australia, Fremantle, Australia; [2]Division of Epidemiology and Public Health, University of Nottingham, Nottingham, UK*

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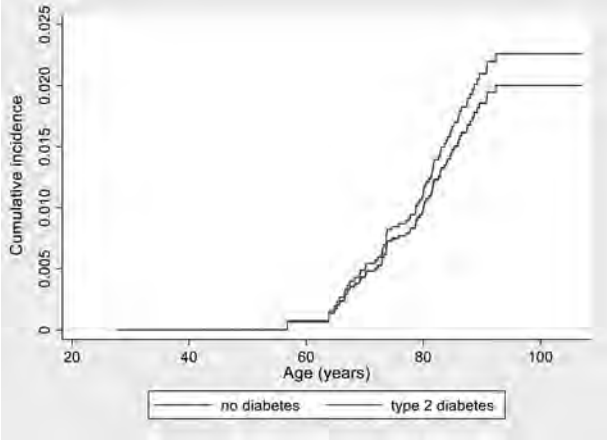
Background Most studies that have examined the relationship between diabetes and idiopathic pulmonary fibrosis (IPF) have utilized administrative databases and/or have had limited/incomplete data. The aim of this study was to determine the incidence of IPF in a well-characterized community-based cohort of people with type 2 diabetes compared with a matched cohort without diabetes.

Methods The Fremantle Diabetes Study (FDS) Phase I type 2 diabetes cohort and four randomly-selected, age-, sex- and postcode-matched people without diabetes per FDS participant were followed through the Western Australian Data Linkage System for hospitalisation for/with and death from/with IPF from study entry (1993–6) until end-2017. Incidence rates (IRs) and IR ratios (IRRs) were calculated. Cox regression models adjusting for age, sex and co-morbidities were generated to ascertain the cause-specific (cs) hazard ratios (HR) for incident IPF by type 2 diabetes status.

Results Mean age of the pooled cohorts was 64 years (SD 11.2) and 49% were male. Eight (3 with type 2 diabetes) participants who had prevalent IPF were excluded. Mean follow-up was 16.6 (SD 7.6) years, during which 17 (1.3%) of the type 2 diabetes cohort and 57 (1.1%) of the no diabetes cohort developed incident IPF. This equates to IRs of 90.6 (95% CI 52.8–145.1) and 64.7 (95% CI 49.0–83.8) per 100,000 person-years respectively. The crude IRR for incident IPF in people with type 2 diabetes compared to those without diabetes was 1.40 (95% CI 0.76–2.44; p=0.22). The cumulative incidence of IPF for people with type 2 diabetes versus no diabetes with age as the time line was higher, but statistically non-significant (p=0.13; see Figure 1).After adjusting for confounders, type 2 diabetes was associated with a csHR for IPF of 1.43 (95% CI 0.83–2.47).



Abstract P53 Figure 1 Cumulative incidence of idiopathic pulmonary fibrosis (IPF) stratified by type 2 diabetes status

Conclusion In a cohort of community-based individuals with type 2 diabetes, few had prevalent IPF or developed IPF during follow-up, due partly to the competing risk of death from other causes. Within the limitations of an uncommon outcome in a restricted sample, with more intensive cardiovascular and diabetes management, it is likely that greater rates of IPF will emerge in future.

P54 PREDICTING OUTCOMES OF PATIENTS HOSPITALISED WITH AN ACUTE RESPIRATORY DETERIORATION OF IDIOPATHIC PULMONARY FIBROSIS

C Hyams, DB Hettle, H Adamali, SL Barratt. *Interstitial Lung Disease Service, North Bristol NHS Trust, Bristol, UK*

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Introduction Acute respiratory deteriorations of idiopathic pulmonary fibrosis (ARDIPF) have a poor prognosis, and new developments including antifibrotics may affect outcome. Few studies have investigated risk factors associated with poor outcomes.

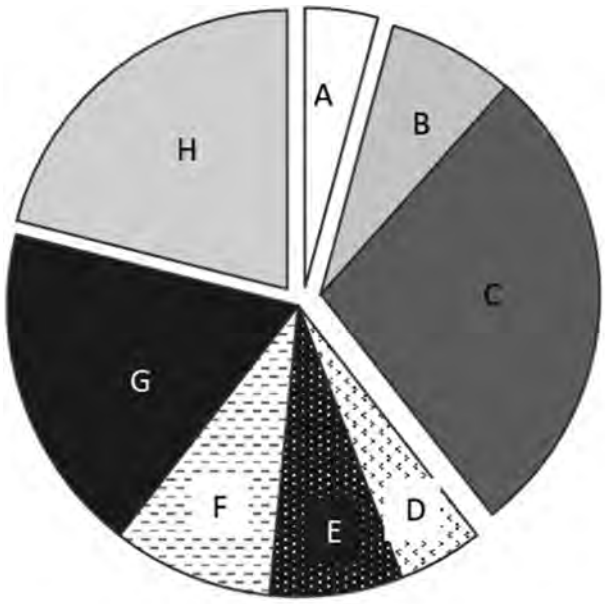
Objectives To define characteristics of hospitalised ARDIPF patients and investigate risk factors for adverse outcome.

Methodology A retrospective cohort analysis of hospitalised ARDIPF patients between January 2014 and December 2018. Clinical records, blood results, microbiological and radiological investigations were examined to identify patient characteristics associated with increased mortality. Mann Whitney U and Chi square were applied as appropriate.

Results One-hundred and ninety ARDIPF admissions (in 142 patients) were identified; (63% male, median age 77yr (IQR 70–84), 50% definite-UIP and 24% probable-UIP at diagnosis with 26% patients having undefined radiology on admission). Median length of stay was 7 days (IQR 3–14). 19% patients (n=27) were receiving antifibrotic medication on admission (Nintedanib n=15, Pirfenidone n=12).

A precipitating cause was definitively identified in 61% (n=115) of admissions (cardiac failure 15% (n=17/115), pulmonary embolus 7% (n=8/115), infection 78% (n=90/115). The remainder of admissions were attributed to idiopathic acute exacerbations (n=35), or other causes including disease progression (n=40) (Figure One). In cases attributed to infection, a pathogen was identified in 25% (n=23). The majority of microbiological diagnoses were made by sputum culture (83%), 17% by viral PCR.

All-cause inpatient mortality was 16% (n=30/190) (30-day mortality 21%, 90-day mortality 31%). Those ARDIPF associated with a causative pathogen had a lower inpatient mortality than both those ARDIPF attributed to infection but no organism identified (35%) and in those with idiopathic acute exacerbations (18%) (respective *P*-values<0.05). Inpatient mortality of ARDIPF precipitated by PE was 75% (6/8) and 29% (5/17) in those secondary to cardiac failure.



Abstract P54 Figure 1 Causes of admission with ARDIPF

Age, gender, use of antifibrotics, and preceding radiological pattern of fibrosis were not associated with all-cause inpatient mortality ($P>0.05$).

Conclusions ARDIPF mortality remains high, with better outcomes in those patients with an identified respiratory pathogen. Further studies should investigate if improved microbiological diagnosis of ARDIPF improves patient survival.

P55 BLEEDING RISK IN PATIENTS WITH IDIOPATHIC PULMONARY FIBROSIS (IPF) ON NINTEDANIB AND CON-CURRENT ANTICOAGULATION OR ANTIPLATELET THERAPY

EK Denneny, G Vekaria, J Sahota, L Beitverda, C Warner, H Garthwaite, M Heightman, H Booth, JC Porter. *University College London Hospital, London, UK*

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Introduction Nintedanib, one of two approved antifibrotic treatments for patients with IPF, is a tyrosine-kinase inhibitor whose inhibition of vascular endothelial growth factor poses a theoretical bleeding risk. Bleeding events were reported in 10% of patients in clinical trials[1] despite excluding patients at risk of bleeding including those on con-current anticoagulation (AC) or antiplatelet (AP) therapy. Consequently, Nintedanib is relatively contraindicated for patients with IPF on AC/AP treatment.

Methods We performed a retrospective analysis to examine bleeding risk within a tertiary-care ILD centre in the UK. Patients make an informed choice of anti-fibrotic and Nintedanib is offered even if patients are on AC/AP. Bleeding events were defined as intracranial, lower or upper gastrointestinal (GI) or respiratory tract (haemoptysis/epistaxis). Due to widespread prophylactic use of aspirin in both groups this was excluded from the analysis.

Results Of 317 patients with IPF (median age 76 years, 83% male), 118 (37%) were on Nintendanib and 79 (25%) on Pirfenidone. The remaining patients (48%) were outside criteria for, or had not tolerated, antifibrotic therapy. There were no significant differences in baseline characteristics. In the Nintedanib group 21 (17.8%) patients were also on an AC/AP: Warfarin (n=6), DOACs (n=6), dalteparin (n=2) and clopidogrel (n=7). This compared to 11 (13.9%) patients in the Pirfenidone group: Warfarin (n=1), DOACs (n=5) and clopidogrel (n=5). Of the 21 patients on an AC/AP in the Nintedanib group 1 (4%) had a bleeding complication (lower GI bleed on a DOAC), compared to none in the Pirfenidone group. There were no deaths in either group.

Conclusion Our results from real-life data demonstrate that 17.8% of our patients with IPF are on AC/AP and the overall incident of bleeding events in those patients taking both Nintedanib and an AC/AP, is similar to that reported for Nintedanib alone[1]. Our results suggest that con-current AC/AP doesn't increase bleeding risk and shouldn't be a reason to withhold Nintedanib. Further larger observational studies are needed to explore this risk further.

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P56 WHAT HAPPENS TO PATIENTS WITH IDIOPATHIC PULMONARY FIBROSIS WHO ARE NOT ELIGIBLE FOR ANTIFIBROTIC TREATMENT DUE TO CURRENT NICE GUIDELINES

[1]S Noor, [1]S Nawaz, [2]T Garfoot, [2]M Greaves, [2]C Hayton, [2]G Margaritopoulos, [2]T Marshall, [2]A Montoro, [2]H Morris, [2]K Newman, [2]P Rivera-Ortega, [2]S Stanel, [2]K Zakis, [2]C Leonard, [2]N Chaudhuri. *[1]The University of Manchester, Manchester, UK; [2]University Hospital of South Manchester, Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.199

Antifibrotic prescribing for Idiopathic Pulmonary Fibrosis (IPF) is limited by the National Institute of Health and Clinical Effectiveness (NICE) to patients with a forced vital capacity (FVC) of 50–80%. 38% of IPF patients on the British Thoracic Society registry have an FVC above 80%.

Methods This is a retrospective single centre cohort study of IPF patients with baseline FVC above 80%, between January 2007 and September 2018. We assessed electronic records to collect data on patient demographics, treatment and lung function changes over time. Data and statistics are described as in Table1. A linear mixed model was performed to assess the change in FVC and DLCO over time.

Abstract P56 Table 1 Baseline demographics, treatment and adverse events in patients with FVC above 80% according to treatment. T-tests or Chi square was used for univariate analysis.

	No Treatment (n=33)	Pirfenidone (n=42)	P value Pirfenidone vs No Treatment	Nintedanib (n=104)	P-value Nintedanib vs No Treatment
Age in years (mean ± SD)	72.2±7	73 ±6.9	0.661	72.8±7.7	0.722
Gender M:F no (%)	27:6 (82:18%)	32:10 (76:24%)	0.561	75:29 (72:28%)	0.269
Lung Function					
FVC Litres (%)	3.55 (100.5)	2.88(89)	**<0.001**	2.96 (92)	**<0.001**
DLCO mmol/kPa/min (%)	4.13 (54.3)	3.3 (44)	**0.001**	3.52 (47)	**0.016**
FVC% Decline per year	-3.72	-3.24	0.65	-2.64	0.33
Smoking Status: no (%)					
Never	8 (24)	11 (26)	0.850	25 (24)	0.891
Current	1 (3)	4 (10)	0.269	6 (6)	0.537
Ex-Smoker	24 (73)	27 (64)	0.443	73 (7)	0.782
Comorbidities: no (%)					
None	5 (9.6)	7 (9.7)	0.861	14 (7.1)	0.919
Hypertension	10 (19.2)	6 (8.3)	0.166	30 (15.2)	0.790
Ischaemic Heart Disease	7 (13.5)	13 (18.1)	0.350	24 (12.2)	0.825
Gastro oesophageal Reflux	8 (15.4)	8 (11.1)	0.422	22 (11.2)	0.711
Diabetes	2 (3.8)	8 (11.1)	0.103	17 (8.6)	0.138
Emphysema	2 (3.8)	5 (6.9)	0.395	18 (9.1)	0.112
Hiatus Hernia	2 (3.8)	2 (2.8)	0.807	6 (3)	0.778
Lung Cancer	1 (1.9)	2 (2.8)	0.709	4 (2)	0.829
Stroke	1 (1.9)	2 (2.8)	0.709	2 (1)	0.707
					P value Pirfenidone vs Nintedanib
Duration of treatment: months Mean ±SD		13.6±12		17.2±12.7	0.206
Adverse effects: no (%)		(Ave 2.4 per patient)		(Ave 1.6 per patient)	
None		5 (5.4)		14 (8.4)	0.92
Nausea/Vomiting		13 (14.1)		26 (15.7)	0.39
Appetite Loss		16 (17.4)		16 (9.6)	**0.004**
Indigestion		14 (15.2)		19 (11.4)	**0.049**
Weight Loss		5 (5.4)		6 (3.6)	0.21
Diarrhoea		5 (5.4)		60 (36.1)	**<0.001**
Constipation		0		4 (2.4)	0.2
Fatigue		16 (17.4)		16 (9.6)	**0.002**
Skin Rash		9 (9.8)		0	**<0.001**
Bleeding		1 (1.1)		4 (2.4)	0.66
Other		8 (8.7)		1 (0.6)	**<0.001**
Mean time to develop first AE months		2.6 ±5.5		3.1±5	
Discontinuation rate	NA	17 (40.5)		23 (22.1)	**0.024**
Death post diagnosis no (%)	6 (18.2)	20 (47.6)	**0.013**	49 (7.1)	**0.003**

AE-Adverse Event, SD-Standard Deviation, no-number, Ave-Average, NA-Not Applicable

Results 161 patients with baseline FVC above 80% were included, 74.5% (n=120) were male. The mean age was 72.7 ±7.4. 128 patients initially were treated with antifibrotics through compassionate use programmes (CUP) (42 (26.1%) on pirfenidone and 104 (64.6%) on nintedanib) compared to 33 patients who had no treatment, as the CUP had closed. Patient demographics, duration of treatment, adverse events and reasons for discontinuation are presented in Table 1. Patients without antifibrotic therapy had a statistically higher baseline FVC compared to other groups (3.55 (100%) vs. 2.88 (89%) pirfenidone vs 2.96 (92%) nintedanib) (p<0.001). FVC decline over 12 months was similar regardless of therapy (3.72% untreated vs. 3.24%pirfenidone vs 2.64% nintedanib). Untreated patients died within 2.7 ±1.4SD years post diagnosis (median survival of 2.5 years) compared to 3.6 ±1.8 years of diagnosis (median survival of 3.5 years) on pirfenidone and 3.1 ±1.3 years of diagnosis (median survival of 3 years) on nintedanib.

Conclusion Untreated patients had higher FVC and DLCO compared to treated cohorts, which makes comparison of lung function decline difficult. Despite this, one in five untreated patients with an average FVC of 100% still die within a median of 2.5 years while antifibrotic therapy was associated with a median survival to 3–3.5 years in a cohort with lower baseline lung function. Lung function decline in treated cohorts is similar to that seen in clinical trials (-2.64%nintedanib and -3.24%pirfenidone).

P57 PERIPHERAL BLOOD MONOCYTE COUNT AS A PROGNOSTIC MARKER IN FIBROTIC INTERSTITIAL LUNG DISEASE (FILD): ANALYSIS FROM A SINGLE UK SPECIALIST CENTRE

[1,2]TJM Wallis, [2]K Pontoppidan, [1,2]CJ Brereton, [1]B Welham, [1,2]MG Jones, [2]SV Fletcher. *[1]Clinical and Experimental Sciences, Faculty of Medicine, University of Southampton, Southampton, UK; [2]NIHR Southampton Biomedical Research Centre, University Hospital Southampton, Southampton, UK*

10.1136/thorax-2019-BTSabstracts2019.200

Background Predicting individual patient course and prognosis in fILD is challenging and there are no established prognostic biomarkers to aid clinical judgement. An association between peripheral blood monocyte (PBM) count and survival was recently proposed in patients with Idiopathic Pulmonary Fibrosis (IPF) (*Scott et al. Lancet Respir Med 2019–7:497–508)*. We investigated in a single UK centre whether monocyte count was an independent predictor of survival in cohorts of patients with an MDT diagnosis of IPF, chronic hypersensitivity pneumonitis (cHP) and unclassified ILD (uILD).

Methods Single centre study of consecutive patients with an MDT diagnosis of IPF, cHP or uILD. Electronic records and blood results were reviewed. The PBM count nearest to the MDT diagnosis was imputed. Time to death/transplant was calculated by Kaplan-Meier analysis and cumulative risk of death/transplant quantified by multivariate Cox-regression analysis (IBM-SPSS®v25).

Results 385 patients (IPF n= 199, cHP n= 101, uILD n=85) were included. Baseline demographics, IPF-cHP-uILD respectively - mean (SD). Age (years): 72.7 (7.8), 66.6 (12.3), 71.7 (8.4). FVC% predicted (FVC%pred): 73.8% (19.8), 77.0% (20.0), 83.5% (20.8). DLCO%pred: 46.5% (15.1), 53.8% (15.3), 57.1% (18.1). Gender: (Males%): 76.1%, 36.0%, 61.7%.

The IPF cohort had significantly higher absolute PBMs compared to cHP but not uILD ($0.77x10^9$/L vs $0.65x10^9$/L vs. $0.74x10^9$/L respectively IPFvs.HP p<0.001). Multivariate Cox-regression analysis identified no significant association between absolute PBMs and death/transplant in any cohort. When PBMs were stratified into high>$0.94x10^9$/L (Mono>0.94) or Low≤$0.94x10^9$/L (Mono≤0.94) as Scott et al. 2019; in the IPF cohort Mono>0.94 was associated with significantly reduced time to death/transplant compared to Mono≤0.94 (171.7weeks (95%CI 132.6–210.8weeks) vs. 262.2weeks (95%CI 211.7–312.7weeks) p=0.035). Multivariate Cox-regression analysis (age, sex, FVC%pred and DLCO%pred) identified Mono>0.94 as an independent predictor of death/transplant in IPF; Hazard-Ratio 1.576 (95%CI 1.023–2.300) p=0.031. There was no association between absolute or stratified monocyte count and survival in the cHP or uILD cohorts.

Conclusions In this UK single-centre study a stratified PBM of >0.94x10*9/L was an independent risk factor for death/transplant in IPF but not in patients cHP or uILD. Prospective studies are required to confirm this observation.

P58 CHEST IMAGING ABNORMALITIES IN PATIENTS WITH UNCONTROLLED RHEUMATOID ARTHRITIS PRIOR TO STARTING BIOLOGICAL THERAPY

A Benjamin, K Ward. *Imperial Healthcare NHS Trust, London, UK*

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Background RA associated interstitial lung disease (RA-ILD) is thought to occur in around half of RA patients. Updated guidelines for RA in England advise early introduction of biological disease modifying anti-rheumatic drugs(b-DMARDs) if disease control is not achieved without them.[1] TNF inhibitors (TNF-i), often the first line b-DMARDs, have been associated with serious respiratory adverse events(SRAE). There is increased mortality in RA-ILD patients given TNF-i compared to rituximab.[2] It is important to know which patients have RA-ILD. There is no consensus on screening for RA-ILD. Patients with RA-ILD may be without respiratory symptoms if joint disease limits exercise. CT chest would not usually be performed in asymptomatic patients. Chest X ray (CXR) is insensitive for lung parenchymal changes.

RA patients requiring b-DMARDs have a CXR. We set out to describe CXR and CT abnormalities in this group with uncontrolled RA at the point of assessment for first b-DMARD.

Methods We identified adult RA patients assessed for first b-DMARD from 11/10/17–26/10/18. We reviewed CXR, CT, smoking status, rheumatoid factor (RhF) and anti–citrullinated protein antibody (ACPA) status. Those with abnormal CXR had a chest CT; additional CTs were performed at clinicians' discretion. Chi square and logistic regression explored predictors of abnormal CXR and CT; smoking, ACPA and RhF status were potential predictors.

Results See Table 1. Of 27 patients with an abnormal CT, 12 (44%) had a normal CXR. Normal CXR was not a significant predictor of normal CT. Smoking and ACPA status were not significantly associated with CXR or CT abnormality. RhF positivity was significantly associated with abnormal CXR: $\chi^2=6.30$(1 d.f., n=80),p=0.01. There was no valid model to predict abnormal imaging (CXR or CT).

Conclusion We describe CXR abnormalities in a cohort of patients at a set point in their RA disease course. 40% of the 30 CTs performed picked up lung abnormalities missed by CXR, including RA-ILD. It is difficult to predict patients with RA-ILD from CXR; clinicians need to be aware of possible toxicity of TNF-i and have a low threshold for performing CT chest.

Abstract P58 Table 1 Patient demographics, seropositivity and chest imaging

Total number of RA patients and CXRs	82	
Median age (years)	56	Range 19–80
	number	proportion
Females	63	77%
Ever smoker (total 72 results)	28	39%
CXR performed	82	100%
CT performed	30	37%
Anti–citrullinated protein antibody positive (total 79 results)	42	51%
Rheumatoid factor positive (total 80 results)	38	46%
Abnormal CXR (total 82 CXRs)	23	28%
Abnormal CT chest (total 30 CTs)	27	90%
Proportion of patients with CT abnormality	27	33%
CT chest abnormalities found in those with normal CXR (12 patients)	Bibasal pulmonary fibrosis (n=1), ground glass opacity (n=2), lung nodules (n=3), bronchiectasis (n=2), emphysema (n=2), atelectasis (n=1), biapical scarring (n=1), linear scarring (n=1), lymphadenopathy (n=1), effusions (n=1)	
Some scans had >1 abnormality		

Key for Table 1: RA= rheumatoid arthritis, CXR=chest radiograph, CT=computerised tomography

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P59 THE UTILISATION OF FLOW CYTOLOGY AND EVALUATION OF CD4/CD8 RATIOS FROM MEDIASTINAL AND HILAR LYMPH NODE SAMPLING BY ENDOBRONCHIAL ULTRASOUND-GUIDED TRANSBRONCHIAL NEEDLE ASPIRATION (EBUS-TBNA): EXPERIENCES AT OXFORD UNIVERSITY HOSPITALS FOUNDATION TRUST (OUH)

A Achaiah, O Lomas, A Moore, J Wrightson, A Sykes. *Oxford University Hospitals Foundation Trust, Oxford, UK*

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Introduction EBUS-TBNA is widely used in investigating mediastinal lymphadenopathy of unclear cause and can negate the need for invasive and higher risk procedures such as mediastinoscopy. Mediastinoscopy is still required in non-diagnostic cases and we assessed whether addition of flow cytometry could add further useful information to standard testing

Aim

1. Characterise CD4/CD8 profiles of mediastinal and hilar lymphadenopathy by EBUS–TBNA sampling and flow cytometry.
2. Compare with simultaneous cytology sampling to determine if CD4/CD8 profiles correlate with any particular disease state which may, in cases of uncertainty, assist diagnosis.

Abstract P59 Table 1

Diagnosis	n	Median CD4/ CD8 Ratios (SE)	Diagnosis by EBUS	Mediastinoscopy	p value
Sarcoid	44	4.0 (±0.47)	44	0	–
Not Sarcoid:	38	2.9 (±0.42)	36	2	0.013*,
No Malignant cells	21	3.5 (±0.56)	20	1	0.21‡, 0.007†
Lung Cancer	12	1.7 (±0.81)	12	0	0.0006*
Haematological Cancer	2	–	1	1	–

P Values (p≤0.05): *; Comparison of CD4/CD8 ratios from Sarcoid with both Not Sarcoid and Lung cancer groups; both comparisons significant. ‡; Lung cancer vs No malignant cells; not significant. †; Comparison of No malignant cells vs Sarcoid; significant.

Methods 106 EBUS-derived samples of lymphoid tissue were obtained between October 2015 and October 2018. 85 samples were analysed by flow cytometry and diagnostic cytology. Sampling and analysis was performed in house by OUH. Samples were categorised as either Sarcoid or Not Sarcoid (subdivided into Lung cancer, Haematological cancer or Non-malignant). Statistical analysis was performed using Mann-Whitney Test for Two Independent Samples.

Results 3 samples were inadequate for flow cytology and excluded. From histological analysis 44 cases were consistent with Sarcoidosis. 12 lung cancer, 2 haematological malignancy. In 21 cases no malignancy was identified. In 5 of these diagnosis remained uncertain and were kept under observation. Median CD4/CD8 ratio 3.0 (SE ±0.42). In 2 cases EBUS-TBNA sampling was non-diagnostic; diagnosis later confirmed by mediastinoscopy (1 case TB and 1 case Lymphoma). CD4/CD8 profiling not used in diagnosis and therefore did not influence decision to proceed to mediastinoscopy. Table 1 details flow cytometry results.

Discussion Our findings support current literature that CD4/CD8 ratios from EBUS-TBNA sampling of Mediastinal lymph nodes are higher in Sarcoidosis. From our data CD4/CD8 ratios were significantly lower in the Non-sarcoid group. Especially between Lung cancer Vs Sarcoid (p=0.0006) and Non-malignant Vs Sarcoid groups (p=0.007). CD4/CD8 ratios were not significantly different between Lung cancer and Non-malignant groups. Our study is limited by small sample size.

Conclusion Flow cytometry profiling of CD4/CD8 ratios from Mediastinal lymph nodes suggested that higher ratios may favour Sarcoid but its utility, at present, is unlikely to be helpful in clinical practice.

P60 TEMPORALLY CLOSE PRESENTATION OF PRIMARY LUNG CANCER AND IDIOPATHIC PULMONARY FIBROSIS (IPF): AN ANALYSIS OF INCIDENT IPF CASES FROM 2007 – 2018

E Daniels, O Kadwani, P Molyneaux, P George, J Mann, A Devaraj, E Renzoni, TM Maher, V Kouranos, M Kokosi, S Kemp, P Shah, AG Nicholson, SR Desai, AU Wells, F Chua. *Royal Brompton Hospital, London, UK*

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Background Lung cancer is historically described as a late complication of IPF, implying that screening in early IPF would have a low yield. The frequency of finding lung cancer in newly diagnosed IPF is not known.

Methods The Lung Cancer multidisciplinary team (LCM) database at the Royal Brompton Hospital was retrospectively examined for the period 2007–18 to identify cases with underlying IPF. Additionally, new ILD referrals seen over the same period were retrospectively filtered for cases with a final/MDT diagnosis of IPF.

Results In the period of interest, 3267 cases of suspected lung cancer were referred by various parties to the LCM and a total of 1780 cases of IPF were diagnosed by the RBH ILD Unit. Of the latter, 61 were referred for exclusion of malignancy (mean age 70.7; 84% male; mean predicted FVC 80.1% and TLco 39.7%). Primary lung cancer was histologically confirmed in 30/61 (49.2%) cases and highly suspected in another 16 (26.2%) based on tumour behaviour and/or PET-FDG staging. The rate of cancer diagnosis amongst all IPF patients was therefore 2.6% (46/1780). Coexistent emphysema was present in exactly half (23/46) of this group. Cancer subtyping revealed 24 cases of non-small cell and 7 cases of small cell lung cancer. Patients considered unfit for biopsy had poorer lung function; FVC: 67.6%±21.9% vs. 84.9%±18.3% (P<0.05) and TLco: 32.3±13.1% vs. 42.6±10.5% (P<0.005). Lung cancer and IPF were diagnosed within 12 months of each other in 14/30 (46.7%) of those with confirmed malignancy; in five cases, radiological suspicion of cancer predated IPF diagnosis. The two entities were similarly identified within a 12-month interval in half of cases with a high-probability cancer that could not be biopsied. Overall, 1 in 2 cancers in the cohort was diagnosed at stages III/IV, a frequency lower than that for the general population (70–75%, CRUK 2014–15 data).

Conclusions Near-contemporaneous (<12-month interval) presentation of IPF and lung cancer is not rare in ostensibly 'mild' IPF especially when there is concomitant emphysema. A number of factors may account for the lower proportion of high-stage cancer in IPF patients including more frequent imaging prompted by symptom change.

Paediatric respiratory pick and mix

P61 THE IMPACT OF INITIAL DURATION OF HOSPITAL ADMISSION AND VIRAL AETIOLOGY OF BRONCHIOLITIS IN THE FIRST SIX MONTHS OF LIFE ON SUBSEQUENT RESPIRATORY MORBIDITY

[1]J Bloor, [2]P McNamara, [2]G Saint. *[1]University of Liverpool, Liverpool, UK; [2]Alder Hey Children's Hospital, Liverpool, UK*

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Background Bronchiolitis is known to be one of the earliest and most common causes of hospitalisation in children under the age of two, affecting up to 50% of infants within the first 24 months of life. Between 2015 and 2016, over 500 patients were admitted to Alder Hey with a clinical diagnosis of bronchiolitis. Alder Hey is a specialist Paediatric hospital in the north west of England that operates on a local, regional, national and international level.

Aim To determine if increased original duration of stay in hospital (indicating increased severity of infection) led to a greater number of readmissions to Alder Hey for respiratory causes within the subsequent 3 years. The study also identified trends in the incidence of Respiratory Syncytial Virus and Rhinovirus in children <6 months of age, as well as if these viruses showed a significant difference in the time taken for infants to re-present.

Methods This is a retrospective study, including children admitted to Alder Hey between 2015 and 2016 with acute bronchiolitis. Date of admission, and viral infection detected by molecular assays were analyzed for patterns of seasonal viral peaks and correlation. Only children <6 months of age that were admitted with either RSV or Rhinovirus positive were included in this study, all other cases of bronchiolitis in other age groups and other viral origins were excluded.

Results Between 2015 and 2016, PCR testing was performed on 515 children who suffered an RSV or RhV infection, 370 of which were <6 months old. 42.7% of patients admitted for all cause bronchiolitis, were re-admitted within 3 years for a respiratory related presentation. Patients suffering a rhinovirus infection took on average 30.3 weeks (CI 17.8–42.9 p=0.089) to return to A&E vs RSV infection who took 42.3 weeks (CI31.8–58.8 p=0.089). Patients that suffering a rhinovirus infection had a greater number of respiratory readmissions (1.14 CI 0.78–1.50) within the subsequent 3 years after initial infection compared to patients that suffered a RSV infection (0.79 CI 0.52–1.06)

Conclusion Patients that have longer initial admission periods for bronchiolitis and those that suffer a RhV positive infection have a greater number of respiratory readmissions in the future. There is also a degree of temporality in the respect that RhV patients re-present to A&E more quickly than RSV patients following initial admission.

P62 THE ASSOCIATION BETWEEN PERINATAL AND EARLY LIFE EXPOSURES AND LUNG FUNCTION IN AUSTRALIAN ABORIGINAL YOUNG ADULTS: THE AUSTRALIAN ABORIGINAL BIRTH COHORT STUDY

[1]V Navaratnam, [2]DL Forrester, [1]AB Chang, [3]SC Dharmage, [1]G Singh. *[1]Child Health Division, Menzies School of Health Research, Darwin, Australia; [2]Department of Respiratory Medicine, Royal Darwin Hospital, Darwin, Australia; [3]Allergy and Lung Health Unit, Centre for Epidemiology and Biostatistics, Melbourne School of Population and Global Health, University of Melbourne, Melbourne, Australia*

10.1136/thorax-2019-BTSabstracts2019.205

Background Lung function in early adulthood has been shown to influence future morbidity and mortality. Its impact may vary across ethnic groups due to potential gene-environment interactions. There are limited data on risk factors for lung function deficits amongst the Australian Aboriginal population, particularly on early life exposures. The aim of our study was to investigate the association of perinatal and early life exposures on lung function in this population.

Methods We used data from the Australian Aboriginal Birth Cohort (ABC), a birth cohort of 686 singleton babies born to a mother who self-identified as either Aboriginal and/or Torres Strait Islanders. Linear regression was used to evaluate the association between perinatal and early life exposures with FEV_1, FVC, FEV_1%predicted, FVC%predicted and FEV_1/FVC ratio as individual outcomes in turn. Age, sex, height and smoking status were identified as *a priori* confounders for FEV_1, FVC and FEV_1/FVC. Smoking status was an a priori confounder for FEV_1 and FVC% predicted. We used Directed Acyclic Graphs to identify minimally sufficient adjustment set of confounders.

Results 459 (70.7%) participants were followed-up, of which spirometry undertaken on 312 but only 148 spirometry traces were deemed acceptable and included in subsequent analyses. The cohort mean age was 25.8 years (SD=1.1) and 74 (50%) were male. 62.8% were current smokers, 68.9% lived in remote communities and 58.8% depended on benefits as their main source of income. We found that 59 people (39.9%, 95%CI 31.9–48.2) had abnormal spirometry patterns (38 restrictive, 21 obstructive). Lung function parameters were strongly associated with maternal age, respiratory hospitalizations in early childhood and place of residence at birth (table 1).

Conclusion Spirometry deficits are common in our cohort. Pre-school hospitalisations for respiratory infections and living remotely are risk factors for lower lung function in young Australian Aboriginal adults whilst increased maternal age is associated with better lung function. Studies evaluating perinatal and early life interventions that optimise attainment of normal lung function are required to minimise future morbidity and mortality in Aboriginal adults.

Abstract P62 Table 1 Association between perinatal and early life exposures with FEV_1, FEV_1% predicted, FVC, FVC% predicted and FEV_1/FVC ratio

Variable		FEV_1 (mls) (95% CI)	FEV_1% predicted (95% CI)	FVC (mls) (95% CI)	FVC% predicted (95% CI)	FEV_1/FVC (95% CI)
Maternal Body Mass Index (BMI)	Underweight (BMI<18.5)	187.8 (-109.6 to 485.2)	6.1 (-2.2 to 14.3)	190.2 (-175.8 to 556.2)	6.1 (-2.6 to 14.7)	0.02 (-0.03 to 0.06)
	Overweight or Obese (BMI≥25)	48.8 (-215.7 to 313.3)	3.4 (-3.8 to 10.7)	107.4 (-181.6 to 396.4)	4.2 (-2.5 to 11.0)	-0.01(-0.04 to 0.04)
Maternal smoking*	Smoked during pregnancy	-49.6 (-233.0 to 133.8)	-1.9 (-7.0 to 3.2)	-77.7 (-282.3 to 126.8)	-2.4 (-7.2 to 2.4)	-0.01 (-0.04 to 0.02)
Maternal age*		**18.3 (5.4 to 31.3)**	**0.6 (0.2 to 0.9)**	**22.1 (7.6 to 36.7)**	**0.5 (0.3 to 0.8)**	**-0.01 (-0.02 to 0.01)**
Birthweight &(grams)		0.43 (-1.2 to 2.0)	0.2 (-0.2 to 0.6)	0.51 (-1.4 to 2.4)	0.1 (-0.1 to 0.5)	-0.02 (-0.04 to 0.05)
Any respiratory hospitalizations ≤2 years%	**1 or more**	**-185.5 (-377.2 to -6.2)**	**-5.2 (-10.4 to -0.4)**	**-275.8 (-497.3 to -54.2)**	**-6.1 (-11.2 to -0.98)**	**0.01 (-0.02 to 0.04)**
Any respiratory hospitalizations ≤5 years%	**1 or more**	**-216.0 (-396.7 to -35.3)**	**-5.5 (-10.5 to -0.5)**	**-285.0 (-496.2 to -73.8)**	**-6.6 (-11.5 to -1.6)**	**0.01 (-0.01 to 0.04)**
Place of residence at birth	**Remote**	**-435.6 (-667.1 to -203.9)**	**-13.7 (-20.0 to -7.5)**	**-577.1 (-842.1 to -312.1)**	**-15.7 (-21.8 to -9.7)**	**-0.02 (-0.05 to 0.06)**
Childhood weight Z-scores#		-68.2 (-177.9 to 41.7)	-1.2 (-4.2 to 1.7)	-9.7 (-142.0 to 122.6)	0.5 (-0.1 to 0.2)	-0.01 (-0.03 to 0.01)

FEV_1,FVC and FEV_1/FVC were adjusted for age, sex, height and smoking status FEV_1 and FVC%predicted were adjusted for smoking status
*Also adjusted for place of residence at birth
&Also adjusted for maternal BMI
%Also adjusted for birthweight
#Also adjusted for any respiratory hospitalizations ≤5 years

P63 DETECTION OF VIRUSES IN THE GUT OF CHILDREN WITH BRONCHIOLITIS AND VIRAL INDUCED WHEEZE – INCREASING OUR UNDERSTANDING OF THE GUT-LUNG-AXIS

[1]SA Unger, [1]J Boxhall, [1]S Griffin, [1]H Basten, [2]K Templeton, [1]R Langley. *[1]Royal Hospital for Sick Children Edinburgh, Edinburgh, UK; [2]NHS Lothian, Edinburgh, UK*

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Background Changes in the gut microbiome can affect the incidence of wheeze and bronchiolitis. There is little evidence in regard to the association between enteric viral populations and their potential effects on respiratory health.
Methods In a prospective cased-controlled study we recruited over two bronchiolitis seasons (2016–2019) children (0–10years) admitted to a tertiary hospital with a diagnosis of bronchiolitis (<1year old) or viral induced wheeze along with healthy age-matched control patients, excluding those with acute/chronic gastrointestinal conditions. Assays for 15 different viruses (Entero, Parecho, FluA/B, RSV, Adeno, Myco, PFlu1/2/3, MPV, Rhino, Nora, Rota, Boca) were performed by real-time PCR on nucleic acid extracted from stool samples during the illness.
Results Stool samples from 43 children with wheeze, 64 with bronchiolitis, and 87 controls were analysed. Viruses were detected significantly more frequent in stool of children with wheeze (7.1% wheeze, 3.7% controls, $p<0.005$) and bronchiolitis patients compared to controls (66.3% bronchiolitis, 33.7% controls, $p<0.001$). Rhinovirus was the most prevalent virus in both patient groups reaching significance in those with wheeze compared to controls (32.6% wheeze, 11.8% controls, $p=0.02$). Influenza A was detected significantly more frequently in the stool in the control compared with the bronchiolitis group (0% bronchiolitis, 16.7% controls, $p<0.005$).
Discussion Respiratory viruses can be identified in the GI tract of patients during acute paediatric respiratory illnesses such a bronchiolitis and exacerbation of wheeze. Although this may represent gut seeding from the respiratory tract there were significant differences between the cohorts included in this study. Disease severity and outcome may be influenced by 'gut priming' of the immune system by viruses, and further exploration by deep genome sequencing analysis is indicated to enhance our knowledge of the gut-lung-axis.

P64 AN IN-SILICO INVESTIGATION OF DNA REPAIR GENE VARIATION IN THE MYCOBACTEROIDES ABSCESSUS SUBSPECIES ABSCESSUS ST26 CLONAL LINEAGE

[1]D Kenna, [1]N Mustafa, [2]C Peters, [1]J Turton, [3]RJ Langley. *[1]Antimicrobial Resistance and Healthcare Associated Infections (AMRHAI) Reference Unit National Infection Service, Public Health England, London, UK; [2]Queen Elizabeth University Hospital, Department of Microbiology, Glasgow, UK; [3]Department of Paediatric Respiratory Medicine, Royal Brompton Hospital, London, UK*

10.1136/thorax-2019-BTSabstracts2019.207

There is growing concern about the increasing prevalence of *Mycobacteroides abscessus* subspecies among children and adults with cystic fibrosis (CF). Reasons for this increase include improved identification and surveillance, antibiotic resistance and in some cases, transmission. In the CF population various typing methods have highlighted the prevalence of international clonal lineages such as ST1 and ST26, shown to be associated with chronic infection, increased inflammatory response and enhanced intracellular survival in macrophages. We examined whole genome sequences (WGS) of three paediatric CF ST26 isolates from a single CF centre for the presence of mismatch and DNA repair mutations which might contribute to the success of this lineage, based on homology to *Mycobacterium tuberculosis* genes. Of 46 genes examined, 20 had 100% amino acid identity with those of the type strain CIP 104536, while 26 had ≤99% identity. All three isolates had identical gene profiles. Eleven candidate genes coding for MutY, UrvD2, PolC, RecF, RecB, RecB exodeoxyribonuclease V beta chain, Ung, DnaE, MazG, Mfd and Ssb-1 with ≤99% identity to CIP 104536 were examined in more detail. Of these, MazG and Mfd had six and seven amino acid changes respectively, compared to CIP 104536, and exhibited variation among 17 publicly-available WGS. The MazG mutations were found in six other ST26 genomes but in only one other ST (ST82), suggesting they are particularly prevalent in ST26. All seven Mfd mutations were only found in two of six ST26 genomes, and in none of the other STs, suggesting these mutations are more prevalent in ST26, but that intra-lineage variation exists. *M. tuberculosis* studies have shown that deletion of MazG results in a mutator phenotype during oxidative stress and stationary phase, and in increased survival under hypoxic conditions compared to the wild-type. In *Bacillus* sp., Mfd ('Mutation frequency decline') works in combination with the RecBC repair pathway protecting the bacteria against the genotoxic effect of nitrite. Further experimentation is needed to examine any effects on bacterial survival and mutation rates.

P65 FACTORS IMPACTING CHEST X-RAY RESOLUTION FOLLOWING PAEDIATRIC EMPYEMA

PB Bhatia. *University of Liverpool – School of Medicine, Liverpool, UK*

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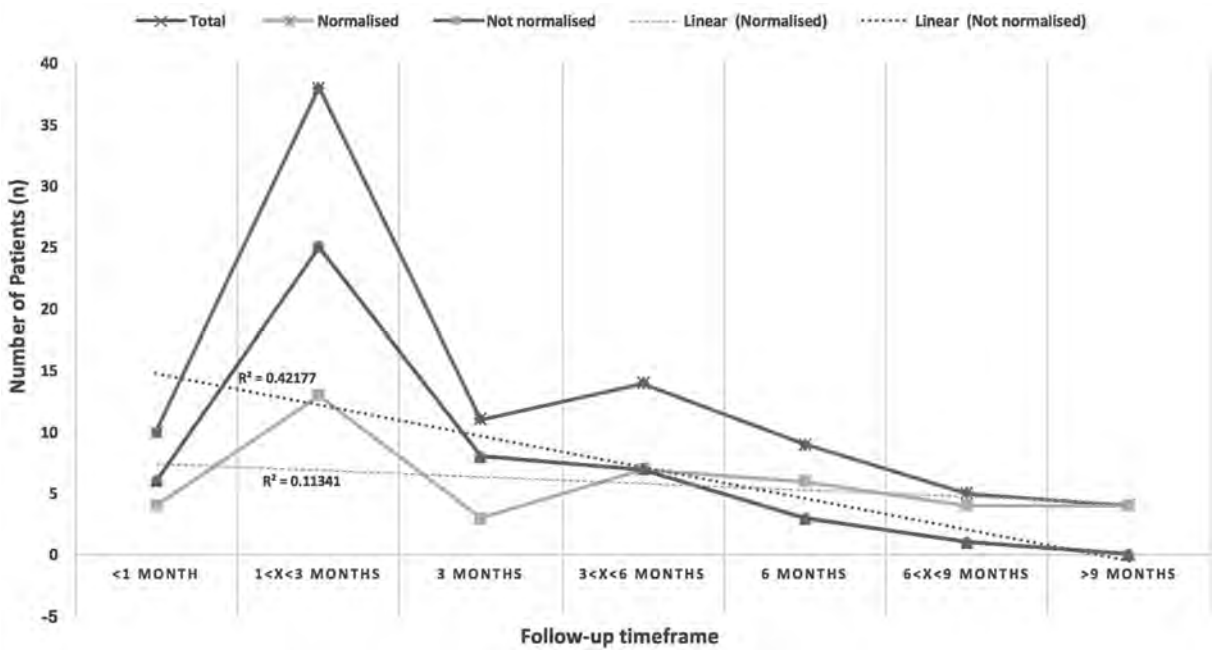
Introduction and objectives Paediatric empyema is becoming an increasingly common disease. Currently, there is little high-grade evidence to better support medical professionals in terms of effective radiological follow-up when assessing chest x-ray resolution. As a result, there is a lack of consensus as to exactly when this investigation modality is most appropriate, thus, clinical practice varies greatly amongst centres, not only leading to dispute but also inefficiencies within an already burdened NHS.

The primary objective was to investigate chest x-ray resolution looking at residual radiological deficits to assess normalisation whilst measuring the follow-up timeframe for each patient, especially at 3 and 6 months.
Methods Firstly, a specific patient list was collected by the coding department at Alder Hey Children's Hospital searching for a primary diagnosis of empyema between September 2013 - August 2018 inclusive. The data was retrospectively examined using CARESTREAM PACS and MEDITECH V5 + V6 to record timing and presence of residual radiological deficits at the follow-up chest x-ray. Additionally, a modified PRISMA flowchart allowed efficient discarding of irrelevant data ensuring accuracy for the aims of this study. Statistical analysis as



Abstract P65 Figure 1

regression coefficients was performed using Analysis Toolpak and GraphPad Prism 8.0 software.

Results 91 patients (48 Male, 43 Female, *M*age=5 years) with an age range of 0–16 years were identified. Practice outcomes showed that only 12% (n=11) of patients had chest x-ray imaging at 3 months, 3 showing normalisation whilst remaining 8 had residual radiological deficits. At 6 months, 6 out of 9 normalised whilst 3 had not. The proportion of normalised chest x-rays increased from 1<x<3 months to >9 months, R^2=0.11341, whilst abnormal results decreased until all of the chest x-rays were normal at >9 months follow-up, R^2=0.42177 respectively.

Conclusion Overall, outcomes have been positive in providing statistical evidence showing clear associations between timeframe and residual deficits on chest x-ray imaging. With a struggling NHS urging to streamline our guidelines, this study provides a necessary insight as to exactly when this imaging is most appropriate, creating a foundation for better local protocols; reducing fiscal burden whilst improving clinical practice.

P66 PAEDIATRIC PNEUMONIA – LITERATURE REVIEW OF PROTEOMICS OF AIRWAY BIOFLUIDS TO IDENTIFY NEW DIAGNOSTIC BIOMARKERS

J Twynam-Perkins, S Cunningham, D Dockrell. *University of Edinburgh, Edinburgh, UK*

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Introduction and objective Current diagnostics poorly identify children with lower respiratory tract infection (LRTI) that require treatment with antibiotics (dominant bacterial) resulting in antibiotic overtreatment and, at population level, resistance $_1$. Proteomics has been employed as an unbiased approach that could be utilised in biomarker discovery in children with LRTI. The objective of this review was to identify and assess studies employing a proteomic approach to examine airway bio-fluids for discriminating the cause of paediatric LRTI.

Method Embase, Medline and WoS searched with terms ''Lower Respiratory Tract Infection' or 'Pneumonia' or 'Bronchiolitis' or 'Chest Infection'' and 'proteomics' limited to under 18s. Inclusion criteria; containing paediatric patients with community acquired LRTI, use of proteomics to investigate airway bio-fluids, were applied. Studies assessed using QUADAS criteria.

Results 35 records identified of which 32 were excluded. Three studies met inclusion criteria (one identified from reference screening). One examined pleural fluid in children with complicated effusions secondary to community acquired pneumonia. Two examined broncho-alveolar lavage fluid in children; one of any respiratory infection, the other those with malignancies not responding to antibiotics.

All studies were of moderate quality when QUADAS criteria applied. A variety of issues introduced potential biases. All had relatively small sample sizes (17 – 57 patients). Patient sampling was convenience or unstated. A precise case definition was provided in only one study. Sample preparation varied across all three studies (: two high abundance protein depletion, one desalination). None used a protease inhibitor. Two used 2DEGELMS proteomic approach, one MALDITOF-MS.

Two studies identified proteins discriminating cases and controls.

Discussion No paediatric study has used proteomic approaches for an unbiased discrimination of bacterial pneumonia requiring antibiotics, from a viral dominant pneumonia that does not. The number of studies identified is too small to draw conclusions on sample processing or proteomic method.

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P67 CHARACTERISTICS AND AETIOLOGY OF NON-CF BRONCHIECTASIS IN EAST LONDON CHILDREN

SMN Brown, C Pao, R Smith. *Barts Health NHS Trust, London, UK*

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Introduction Worldwide, non-cystic fibrosis bronchiectasis is a significant cause of morbidity and mortality, particularly in indigenous communities, and prevalence is higher than cystic fibrosis (CF). Despite this, research into non-CF bronchiectasis is limited. Often the aetiology is unknown and presumed to be secondary to a significant respiratory infection. We sought to characterise our cohort of non-CF bronchiectasis patients with regard to aetiology and disease progression.

Method We identified children within our service with a radiological diagnosis of non-CF bronchiectasis through a retrospective review of patient notes. We excluded those with a confirmed diagnosis of primary ciliary dyskinesia

Results We identified 15 children with non-CF bronchiectasis. Patient details are outlined in table 1. All patients except one had undergone a chest CT scan in the past 2 years (with the interval between scans being at least 2 years). All patients had stable image findings with no disease progression. One patient had resolution of bronchiectasis (secondary to inhaled peanut). Staph aureus was the most frequently encountered pathogen - reported in 40% [6] patients over the past year.

Conclusion This is a limited data set but highlights some areas of note worth further exploration. The aetiology was varied but a significant proportion had historical aspiration or infantile respiratory infection. It is therefore worth considering aspiration as a potential aetiology in these patients. 33% of patients had been admitted to hospital over the past year and FEV1 was quite varied implying a spectrum of disease severity. There was no evidence of radiological disease progression suggesting that disease stability with appropriate management is possible.

Abstract P67 Table 1 Patient characteristics and aetiology of bronchiectasis

Aetiology	Number of children (n=15)
Severe infantile respiratory infection	3
Historical aspiration	4
Endobronchial TB	1
Peanut inhalation	1
Adenovirus with obliterative bronchiolitis	1
Unclear	3 (one with IgA deficiency)
Eosinophilic lung disease	1
Familial bronchiectasis with ABPA	1
Patient Characteristics	**Results (% or median with IQR)**
Female (%)	53
Age at diagnosis (years)	5 [4–13]
Recent FEV1 (% predicted)	74 [64–111]
Hospital admission over the past year (%)	33 [5]
Nebulised hypertonic saline (%)	47 [7]
Prophylactic azithromycin (%)	80 [12]
Antacid (%)	73 [11]
Steroid inhalers (%)	33 [5]

P68 THE MANAGEMENT OF ACUTE WHEEZE- WHAT DO PAEDIATRIC TRAINEES DO?

L Duthie, V Currie, P Nagakumar. *Birmingham Children's Hospital, Birmingham, UK*

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Background Current guidelines of acute management of wheeze in children are open to interpretation (Keeley:2018). Individual clinician preference and many 'local guidelines' influence the initial management by the frontline paediatric trainees. We hypothesised that there is greater variation in practice with acute preschool wheeze than the school age children with acute asthma.

Methods Online survey of paediatric trainees in West Midlands using three clinical scenarios of children of different ages presenting with acute wheeze. Trainees were asked to select the most appropriate management plan out of giving inhalers, nebulisers or 'back to back therapy'. Following reassessment trainees were then asked for the next line of treatment

Results 82 responses from ST1-ST8 trainees between March and July 2019. 85% were managing at least one child with wheeze every day.66% of respondents had a minimum of 3 years of paediatric experience.

In a pre-school child with wheeze and saturations of 94%, 77% of trainees gave 10 puffs of salbutamol as initial treatment. 34% would give 2 further bronchodilators 'back to back' after initial improvement.

In both cases of older children with asthma, half of trainees gave a nebuliser an initial therapy despite the oxygen saturations >92% at presentation.

20% of respondents understand the term 'back to back' to mean an interval of between 15 and 30 minutes.

97% of trainees give written wheeze information to families with 87.5% opting for 3 day salbutamol weaning plan at discharge.

Conclusions Contrary to our hypothesis, the survey demonstrates that there is more consistency in the initial management of preschool wheeze compared to older children with asthma.

This may reflect the service pressures to decide about admitting or discharging the child rather than an uncertainty about clinical situation.

In older children where clinical assessment is more predictable, surprisingly, half of the trainees administered nebulised bronchodilators despite normal oxygen saturations. Older children may have had inhalers for a period of time (not acknowledged in current BTS guidelines) prompting trainees to take a different approach.

Discharging children with a Salbutamol weaning plan is unique to the UK practice (Levy:2018) which needs to be addressed by prospective studies.

P69 THE UNCERTAIN ROLE OF SPIROMETRY IN MANAGING CHILDHOOD ASTHMA IN THE UK 2019

SW Turner. *University of Aberdeen, Aberdeen, UK*

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Introduction Asthma guidelines recommend that spirometry should be used for monitoring the condition in children. Surprisingly there is no link between rising or falling spirometry

and treatment change. Here the feasibility and acceptability of a 'spirometry trial' was explored.

Methods Principle investigators (PIs) on an ongoing asthma clinical trial were contacted asking 'Would your centre be able to take part in a randomised controlled trial where patients would be randomised to treatment by spirometry plus symptoms versus symptoms only?'

Results All 34 PIs replied. 26 centres would be happy to recruit patients but 8 centres would not recruit. Tertiary centres accounted for 42% (11) of centres able to recruit and 63% (5) of centres unable to recruit. In addition to the distinction between tertiary and DGH centres there were at least two themes which emerged from the centres. First, there was considerable variation in practice. Some centres were using spirometry routinely and considered it a useful test, especially among young adults, whereas other centres were not regularly using spirometry:

'We would be uneasy about the lack of spirometry as there are many who under-report symptoms and we often treat on the basis of risk using FEV_1.' Tertiary centre clinician (TCC).

'Our centre always performs spirometry as part of chest patient assessment.' TCC.

'Spirometry is not in such routine use here that would preclude interest in a trial'. DGHC.

'Our local team aren't particularly wedded to spirometry so we're happy to randomise'. DGHC.

A second theme was a willingness to determine what the role of spirometry was in asthma management.

'I happen to believe firmly that every child with asthma should have spirometry on every visit, but in the spirit of 'no action without evidence', count XXXX in.' TCC.

'We agree we sometimes get into a rut with what we think we should be doing and happy to challenge the dogma'. DGHC.

Conclusion This survey gives insight into the inconsistency among clinicians of the role of spirometry in managing childhood asthma. The time is ripe for a formal evaluation of the role of spirometry in guiding asthma treatment.

P70 A COMPARISON OF THE MEAN COOPERATION TIME AMONG PATIENTS ON JET NEBULIZATION WITH AND WITHOUT VISUAL DISTRACTION

W Bancoro. *Chong Hua Hospital, Cebu City, Philippines*

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Background Aerosol therapy by jet nebulization is common in our paediatric practice. However, the efficacy of the drug will depend on proper delivery which is affected by patient's cooperation to treatment. Visual distraction can improve cooperation time, thus, improving the delivery and the efficacy of the drug.

Methods This is a randomized, non blinded prospective study among 120 paediatric patients age 6 months to 24 months old.

Results There is a significant increase in the cooperation time of patients with visual distraction as compared to patients without visual distraction during je nebulization (p value ≤0.05). There is no significant difference in the nebulization time between the two groups (p value=0.130).

Conclusion Visual distraction using animated cartoon video increases the cooperation time in paediatric patients during jet nebulization

Abstract P70 Table 1 Demographic profile of paediatric patients included in the study

Characteristics	Children with Cartoon Movies as the Visual Distraction, n_1=60		Children without any Visual Distraction, n_2=60	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Age, in year				
<1	23	38.33	25	41.67
1	20	33.33	20	33.33
2	17	28.33	15	25.00
Sex				
Male	30	50.00	27	45.00
Female	30	50.00	33	55.00

Abstract P70 Table 2 Mean cooperation and nebulization time among paediatric patients in the Control and test group.

	Children with Cartoon Movies as the Visual Distraction, n_1=60		Children without any Visual Distraction, n_2=60		Mean Difference		T-Value	P-Value
	Mean	SD	Mean	SD				
Nebulization Time	9.11	1.76	8.69	1.20	0.418	1.53	0.130**	
Cooperating Time	3.39	1.19	1.28	0.87	2.107	7.52	0.000**	

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P71 EMBEDDING PAEDIATRIC PPIE IN NON-INVASIVE VENTILATION INTERFACE DESIGN

[1]NJ Barker, [1]HE Elphick, [2]H Reed, [2]M Willox, [3]K Jeays-Ward, [4]P Metherall, [3]A McCarthy. *[1]Sheffield Children's NHS Foundation Trust, Sheffield, UK; [2]Sheffield Hallam University, Sheffield, UK; [3]NIHR Devices for Dignity MedTech Co-operative, Sheffield, UK; [4]Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK*

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Introduction Non-invasive ventilation (NIV) masks that fit well are difficult to find for children who are small or have atypical facial features. Poorly fitted masks create problems e.g. discomfort, non-adherence and facial deformity. Our project aims to design and produce masks that fit well. Children's voices are vital, but not often heard, in respiratory research projects.

Aims We constructed a patient and public involvement and engagement (PPIE) program designed to:

1. Understand the problems children and families experience with NIV and establish their wants and needs

2. Provide an inclusive and creative environment for non–constrained thinking
3. Get actionable feedback and ideas for improvements from a diverse patient group

Method We created a method focussed on planning, innovation and participation (the PIP model). Session activities were designed to enable parents and children of all ages and abilities to participate. Examples include:

- Archery target activity – a method for realising the relative importance of patient's requirement (prioritisation).
- Graphic scribe recording – to reflect back to the children that they had been heard/understood and stimulate creative ideas.
- Use of technology – making short videos to help families understand concepts.

Outcomes Our priorities and design brief changed as a result of the PPIE.

The graphic scribe outputs formed part of the creative process whilst providing a unique and lasting resource.

We are confident that we will produce NIV interfaces that are fit for real life purpose and that people will want to trial.

Key messages

- For respiratory research to be truly successful, PPIE should be woven throughout a project, from concept to completion.
- It needs to be genuine and aligned with research aims.
- Time and effort spent enabling participation and creatively planning for inclusivity is rewarded by generating richer and more valuable information.

Lung cancer diagnostics: challenges and solutions

P72 PREVALENCE AND OUTCOMES OF UNEXPECTED FINDINGS IN THE LIVERPOOL HEALTHY LUNG PROJECT (LHLP)

[1]Y Cheng, [2]JK Field, [3]E Gaynor, [3]M Timoney, [3]R Arvanitis, [4]C McCann, [2]S Hill, [2]D Fidoe, [2]S Mason, [4]M Ledson. *[1]West China Hospital, Sichuan University, Sichuan, China*; *[2]University of Liverpool, Liverpool, UK*; *[3]Liverpool Clinical Commissioning Group, Liverpool, UK*; *[4]Liverpool Heart and Chest Hospital, Liverpool, UK*

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Background It is considered that early intervention of the clinical significant unexpected findings (UFs) would have a major impact on patients' health. However, how to best differentiate the level of significance of these UFs requires further investigation.

Methods The radiological reports for the Liverpool Health Lung Project (LHLP) were captured as part of the NHS clinical reporting system. Radiologists flag an alert to a UF if it is considered to pose a significant adverse health impact (namely alerted UFs [AUFs]). In addition, we also used the term 'potentially significant UFs (PUFs)' which is commonly used in other studies and defined as incidental findings requiring further follow-up or evaluation. The diagnostics, outcomes and related adverse events of the PUFs and AUFs were followed up for the LHLP to 30 May 2019. The attitudes towards the reporting of UFs were also investigated.

Results From Apr 2016 to Mar 2019, 3486 participants have undergone baseline LDCT screening, of which 319 had a repeat CT scan. 130 patients (3.7%) had 132 AUFs, and another 207 patients (6.0%) had 213 extra PUFs (Table below for the outcomes of the AUFs). Seventeen malignancies were diagnosed in total (14 in the AUFs and 3 in the PUFs), including 13 (0.37%) extra-pulmonary and four pulmonary cancers. Only two patients experienced postoperative complications in the PUF group. Two out of the ten deaths died from AUF-related causes.

Conclusion Radiologists have an important role in reporting, interpretation and communication of incidental findings in lung cancer CT screening projects. The clinical findings identified in the AUF group had a significant clinical impact; however, the PUF findings need to be reassessed.

Abstract P72 Table 1 Outcomes of the alerted significant unexpected findings as per organ system in the liverpool healthy lung project

Lesion site	Description on the index scan	Total	Resolved/ improved	Persistent/ stable/ refractory	Progressed
Pulmonary	**Inflammation/ infection**	**41 (100%)**	**22 (53.7%)**	**11 (26.8%)**	**3 (7.3%)**
	Atelectasis/ consolidation	20 (48.8%)	10 (50.0%)	5 (25.0%)	2 (10.0%)
	Focal/patchy changes	14 (34.2%)	8 (57.1%)	4 (28.6%)	1 (7.1%)
	Bronchiectasis	5 (12.2%)	3 (60.0%)	1 (20.0%)	0 (0.0%)
	Special infection	2 (4.9%)	1 (50.0%)	1 (50.0%)	0 (0.0%)
	Non-infection	**23 (100%)**	**9 (39.1%)**	**7 (30.4%)**	**6 (26.1%)**
	Interstitial lung diseases	16 (69.5%)	4 (25.0%)	6 (37.5%)	5 (31.3%)
	Endotracheal/ endobronchial lesions	4 (17.4%)	3 (75.0%)	0 (0.0%)	1 (25.0%)
	Other	3 (13.0%)	2 (66.7%)	1 (33.3%)	0 (0.0%)
Extra-pulmonary	**Suspected malignancy ***	**31 (100%)**	**13 (35.5%)**	**7 (29.0%)**	**11 (35.5%)**
	Lymph node	7 (22.6%)	2 (28.6%)	0 (0.0%)	5 (71.4%)
	Kidney	7 (22.6%)	3 (42.8%)	1 (14.4%)	3 (42.8%)
	Serous membranes & cavities	7 (22.6%)	1 (14.3%)	5 (71.4%)	1 (14.3%)
	Digestive system	4 (12.9%)	3 (75.0%)	0 (0.0%)	1 (25.0%)
	Breast	3 (9.7%)	2 (66.7%)	0 (0.0%)	1 (33.3%)
	Musculoskeleton	2 (6.5%)	2 (100.0%)	0 (0.0%)	0 (0.0%)
	Endocrine glands	1 (3.2%)	0 (0.0%)	1 (100.0%)	0 (0.0%)
	Non-malignancy *	**36 (100%)**	**13 (36.1%)**	**16 (44.4%)**	**5 (13.9%)**
	Aortic dilations/ aneurysms	10 (27.8%)	0 (0.0%)	7 (70.0%)	3 (30.0%)
	Digestive	8 (22.2%)	5 (62.5%)	3 (37.5%)	0 (0.0%)
	Serous membrane and cavities	7 (19.4%)	2 (28.6%)	4 (57.2%)	1 (14.3%)
	Kidney	5 (13.9%)	4 (80.0%)	1 (20.0%)	0 (0.0%)
	Musculoskeleton	4 (11.1%)	1 (25.0%)	1 (25.0%)	0 (0.0%)
	Endocrine glands	2 (5.6%)	1 (50.0%)	0 (0.0%)	1 (50.0%)

* The categorisations of outcomes: "Benign", "Indeterminate" and "Malignant" for the suspected extra-pulmonary malignancies; and "Discharged", "Under surveillance/investigation" and "Intervention" for the extra-pulmonary non-malignant lesions.

P73 IMPLICATIONS AND OUTCOMES OF CLINICAL AND RADIOLOGICAL INCIDENTAL LUNG CANCER SCREENING FINDINGS FOR PRIMARY CARE – RESULTS FROM A PILOT SCREENING STUDY

[1]EC Bartlett, [1]S Kemp, [2]J Derbyshire, [2]K Morris, [1]J Addis, [1]C Ridge, [1]S Mirsadraee, [1]S Padley, [1]SR Desai, [1]A Devaraj. *[1]Royal Brompton and Harefield NHS Foundation Trust, London, UK; [2]Royal Marsden Partners Cancer Alliance, London, UK*

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Background Pilot lung cancer screening programmes in England have utilised a lung health check (LHC) model, comprising a nurse-led respiratory consultation, spirometry and a lung cancer risk calculation. We report the short-term outcomes of recommendations made to primary care for management of non-cancer incidental findings in a screening pilot.

Methods 1542 participants from 17 general practice (GP) surgeries attended for a LHC between August 2018 and April 2019. Lung nodules, significant incidental lung findings on computed tomography (CT), unexplained respiratory symptoms, and suspected non-lung malignancies were managed within the screening programme. Participants with: i) 'red-flag' symptoms without lung cancer, ii) unexplained obstructive spirometry and respiratory symptoms, iii) significant coronary artery calcification (CAC) on CT, who were not known to have previously undergone cardiovascular risk stratification, and iv) significant, but non-urgent, non-lung incidental findings on CT, were referred to primary care. GP records were evaluated to establish outcomes.

Results 165 primary care recommendations were made in 157/1542 (10.2%) individuals. Results below are from 16 GP practices and will be updated at the time of presentation. 49/1542 (3.2%) were referred to their GP for suspected undiagnosed chronic obstructive pulmonary disease (COPD), of whom 19/49 (38.8%) had a community-based respiratory review. 12/49 (24.5%) were newly diagnosed with COPD, and 5/49 (10.2%) commenced inhaler therapy. Of 52/1145 (4.5%) scanned participants with heavy CAC but without known ischaemic heart disease, 26/52 (50.0%) had a QRISK2 score (all >10%). Lipid-lowering therapy was commenced in 21/52 (40.4%). Echocardiography was recommended for 22/1542 (1.4%) participants with suspected cardiac disease, largely aortic valve calcification. 7/22 (31.8%) underwent echocardiography. Only 1/22 (4.5%) was deemed to require intervention for significant aortic stenosis. 7/1542 (0.5%) recommendations were made for other non-urgent/non-cardiothoracic incidental findings; none required further intervention.

Conclusions A minority of participants required primary care management for incidental findings based on the West London lung screening study protocol. Although not all recommendations were implemented, incidental findings infrequently led to changes to patient management overall. Changes to patient management most commonly occurred as a result of recommendations for assessment for COPD and cardiovascular risk.

P74 OUTCOME OF NODULES DETECTED DURING A HEALTHY LUNG SCREENING PROJECT

S Raghunath, F Frost, F Kutubudin, A Mciver, M Walshaw, M Ledson. *Liverpool Heart and Chest Hospital, Liverpool, UK*

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Introduction The Liverpool Healthy Lung Programme (LHLP) was designed to improve respiratory health and diagnose disease at an early stage. However, such programmes often produce unexpected findings, including nodules that require follow-up. We wished to look at the outcome for this subset of patients.

Methods We identified all patients attending the LHLP who were subsequently referred to our centre for nodule surveillance, and recorded the outcome in terms of imaging and ultimate diagnosis for those who have undergone repeat scans.

Results 191 patients were referred for nodule surveillance over a two year period (81, 3-month and 110, 12-month scans) : 42 still await an initial 12-month scan. Of those undergoing a 3-month scan, 16 required further scans (range 2–5), 1 had malignancy, and 7 have ongoing surveillance. Of those undergoing an initial 12-month scan, malignancy was excluded in 62 (3 required further scans), it was diagnosed in 2, and the remainder continue surveillance.

Overall, 135/149 patients have completed nodule surveillance with no increase in size and require no further follow up. Of these, malignancy was ruled out in 124 (91.8%) after only a single further scan. 3 cancers (1,Stage III squamous cell carcinoma treated with radiotherapy, 1, Stage IV small cell lung carcinoma managed palliatively, and 1 Stage I large cell neuroendocrine cancer resected) were diagnosed.

Discussion Nodules detected during screening represent a challenge for screening programmes given that many are benign and patients may be exposed to unnecessary investigation and anxiety. Good nodule guidance has reduced the percentage of scans which enter surveillance. Our data confirms a low cancer detection rate (2.5%) in nodules referred from the LHLP setting. Reassuringly cancer could be excluded in 92% of patients after only one further scan, suggesting the harms from this approach are minimal for the vast majority of patients.

P75 EFFECTIVENESS OF STRAIGHT TO TEST AND POST CT SCAN TRIAGE OF LUNG CANCER PATIENTS

MA Pittman, E Capuano, B Yung. *Basildon and Thurrock Hospital, Basildon, UK*

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Background The National Optimal Lung Cancer Pathway is designed to speed the time from referral to treatment, and thus improve outcomes for patients with lung cancer. We present the experience of a District General Hospital implementing changes to the pathway for lung cancer pathway in light of this. Prior to August 2017 patients referred with potential lung cancer were all seen in a Consultant clinic, often without any investigations. Patients are now offered a CT slot by a pathway navigator immediately when referred, which are all discussed in a multi-disciplinary setting and triaged to one of three options: Lung cancer clinic, routine appointment, or discharge. Patients with scans concerning for lung cancer are given ring fenced appointments for PET scan and lung function tests, which occur on the same day to minimise patient journeys. A retrospective study was conducted to assess the impact of the new method of working.

Methods Patients referred using the old pathway (June & July 2017) with the new pathway (Aug & Sept 2018). The effect

on Consultant time was evaluated. Patients discharged without being seen for a 13 week period from 27–12–18 were also reviewed.

Results See table 1 for time from referral to diagnosis & treatment, and effect on consultant time. There were 52 patients (14% of referrals) discharged on the basis of a normal CT and no concerning symptoms during 13 weeks from 27–12–18. In every case the GP and patient had been informed. Of the 52 patients only 1 was subsequently re-referred routinely.

Abstract P75 Table 1 Time from referral to diagnosis & treatment and effect on consultant time

Time from referral:	June & July 2017	Aug & Sept 2018
Number of GP referrals	**139**	**119**
Mean time to benign diagnosis (Days)	**29.1**	**12.9**
Number with cancer	**26 (18.7%)**	**31 (26.1%)**
Mean time to cancer diagnosis (Days)	**56.6**	**34.8**
Mean time to treatment (Days)	**89.0**	**48.4**
Treated within 62 days	**38.6%**	**58.9%**
Consultant time:		
Clinic time seeing urgent patients	28 x 30 mins=14	One clinic=4
Radiology Consultant MDT prep	0	4
Respiratory Consultant admin	2	4
Clinic time seeing routine patients	0	14 x 20 mins=4.6
Total Consultant time (Hours)	**16**	**16.6**

Discussion Straight to CT scan for lung cancer patients clearly improves time to diagnosis and treatment; and also allows safe discharge of patients without the need to be seen in an out-patient clinic setting. Consultant time was not significantly influenced by the changes, as time spent on the MDT was offset by a reduction in required clinic time. As many clinics had previously been undertaken as additional sessions, the costs are likely to be at least neutral. This example of a move towards the National Optimal Lung Cancer Pathway has demonstrated significant patient benefits, without significant additional costs.

P76 IS A NORMAL CT THORAX SUFFICIENT TO EXCLUDE THORACIC MALIGNANCY IN PATIENTS REFERRED TO FAST-TRACK CLINIC WITH HAEMOPTYSIS? – DATA FROM EIGHT YEARS OF REFERRALS TO A LARGE NHS TEACHING HOSPITAL

[1]JA Quinn, [1]WL Chia, [2]RS Raju, [1]MEJ Callister, [1]MPT Kennedy. *[1]Leeds Teaching Hospitals NHS Trust, Leeds, UK; [2]Buckinghamshire Healthcare NHS Trust, Aylesbury, UK*

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Introduction and objectives Unexplained haemoptysis is a red-flag symptom prompting CT imaging to exclude lung cancer. Patients with normal scans often undergo bronchoscopy despite evidence suggesting the yield is minimal.[1] We sought to determine if a normal CT thorax was sufficient to exclude a diagnosis of thoracic malignancy.

Methods We retrospectively analysed patients referred to our fast-track service between 2008–2016 and identified 834 patients presenting with haemoptysis, including 370 from a previous dataset.[2] We collected data on demographics, smoking history, upper airway symptoms, haemoptysis and reviewed radiology and bronchoscopy reports, where performed. All patients were followed-up for at least two years. We determined whether patients were diagnosed with lung cancer at time of referral or during follow-up (after 1 year).

Results Patients were grouped according to CT and bronchoscopy results. CT results were categorised as normal, benign findings, probable cancer or not performed.

In 403 patients with a normal CT thorax, 46 underwent bronchoscopy. One patient, with symptoms that warranted a fast-track ENT referral, was found to have a pharyngeal cancer. No other patients were diagnosed with lung cancer within one year; 4 patients were diagnosed with lung cancer at later dates (intervals of 636–1379 days from initial CT).

In 304 patients with a benign CT, 69 underwent bronchoscopy. One patient with a CT reported as having an endobronchial abnormality, likely secretions, was found to have cancer. No other patients were diagnosed with lung cancer within one year. 1 patient was diagnosed with cancer at a later date (interval 774 days). Nodule surveillance led to a cancer diagnosis in a further 7 patients, including one initially in the probable cancer group.

44 patients were discharged following a normal chest X-ray, with no cancers detected during follow-up.

Abstract P76 Table 1

CT Group	Bronchoscopy	No. of patients	Cancer diagnosis ≤1 year	Cancer diagnosis >1 year
Normal	Performed	46	1[a]	1
	Not performed	357	0	3
	Total	403	1	4
Benign	Performed	69	1[b]	1
	Not performed	235	0	6
	Total	304	1	7
Cancer	Performed	45	29[c]	1
	Not performed	38	32	0
	Total	83	61	1
Not performed	Performed	1	0	0
	Not performed	43	0	0
	Total	44	0	0

[a] **pharyngeal tumour** [b] **endobronchial abnormality on CT reported as secretions** [c] **20 patients had tumour identified during bronchoscopy**

Conclusions Intrathoracic malignancy was adequately excluded following a normal CT thorax or a CT showing benign changes. Clinicians should enquire about upper airways symptoms and have a low threshold for bronchoscopy in the context of endobronchial abnormalities in patients presenting with haemoptysis. Rates of cancer in the follow-up period are consistent with new cancer rates in high risk patients.

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1.. DOI:10.1183/1393003.congress-2017.PA4274
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P77 USE OF THE NEW SOUTH WEST CHEST X-RAY REPORTING TOOL (SW CXR RT) TO ASSIST IMPLEMENTATION OF THE NATIONAL OPTIMAL LUNG CANCER PATHWAY (NOLCP)

[1]C Pearce, [2]S Alaee, [3]P Sugden, [3]S Foster, [2]H Steer, [1]T Hall, [1]V Masani. *[1]Royal United Hospital, Bath, UK; [2]Gloucestershire Royal Hospital, Gloucester, UK; [3]Musgrove Park Hospital, Taunton, UK*

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Introduction and objectives The National Optimal Lung Cancer Pathway (NOLCP) recommends 'reflex' CT scans for patients whose chest X-rays (CXRs) identify changes suggestive of lung cancer. It is recommended that a CT scan is performed on the same day of the CXR or within 72 hours. The Southwest Lung Cancer Alliance introduced the 'Southwest chest X-ray reporting tool' (SW CXR RT) to help identify patients requiring reflex CT scans, and therefore streamline the first part of the NOLCP. The SW CXR RT identifies 3 categories; CX1 (normal CXR), CX2 (abnormal pathology of uncertain significance), CX3 (CXR highly suggestive of lung cancer). We audited the efficacy of using the SW CXR RT in identifying patients with a new diagnosis of lung cancer, subsequently managed via the NOLCP.

Methods Results from 3 Trusts were collated over an 8 month period (1st June 2018–31st January 2019). The diagnoses of patients with CX3 reports and subsequent reflex CT scans were reviewed.

Results 448 patients underwent CXRs with subsequent CX3 reports; all of whom subsequently had reflex CT scans. The 448 reflex CT scans identified the following diagnoses: 153 (34%) newly diagnosed of lung cancers, 28 (6%) non-cancer thoracic malignancy, 61 (14%) community acquired pneumonia, and 206 (46%) other diagnoses.

153 patients with newly diagnosed lung cancer were classified as follows; 52 (34%) adenocarcinoma, 28 (18%) squamous cell, 15 (10%) other non-small cell cancer, 14 (9%) small cell cancer, 34 (22%) clinico-radiologically diagnosed with lung cancer, 10 (7%) with lung metastases.

In total 153/448 (34%) patients receiving a reflex CT scan were subsequently diagnosed with lung cancer; and 181/448 (40%) were diagnosed with a malignant condition.

Conclusions Introduction of the SW CXR RT helped facilitate reflex CT scanning, with 40% of patients subsequently diagnosed with a malignant condition. The true positive rate for malignancy in patients with CX3 reports was less than anticipated. Subjectively, radiologists differ in their threshold for scoring a CXR as CX3. Further work should audit CX3 reporting and ongoing feedback to radiologists should improve the rate of true positives in this group.

P78 THE ROLE OF COMPUTER-ASSISTED RADIOGRAPHER REPORTING IN LUNG CANCER SCREENING PROGRAMMES

[1]H Hall, [1]M Ruparel, [2]S Quaife, [2]JL Dickson, [1]C Horst, [1]S Tisi, [3]J Batty, [4]N Woznitza, [3]A Ahmed, [4]S Burke, [3]P Shaw, [4]MJ Soo, [3]M Taylor, [5]N Navani, [6]A Bhowmik, [7]DR Baldwin, [8]SW Duffy, [3]A Nair, [9]A Devaraj, [1]SM Janes. *[1]Lungs for Living Research Centre, UCL Respiratory, University College London, London, UK; [2]Research Department of Behavioural Science and Health, University College London, London, UK; [3]Department of Radiology, University College Hospital, London, UK; [4]Department of Radiology, Homerton University Hospital, London, UK; [5]Department of Thoracic Medicine, University College Hospital, London, UK; [6]Department of Thoracic Medicine, Homerton University Hospital, London, UK; [7]Respiratory Medicine Unit, David Evans Research Centre, Nottingham University Hospitals, Nottingham, UK; [8]Wolfson Institute of Preventive Medicine, Barts and The London School of Medicine and Dentistry, Queen Mary University, London, UK; [9]Department of Radiology, Royal Brompton Hospital, London, UK*

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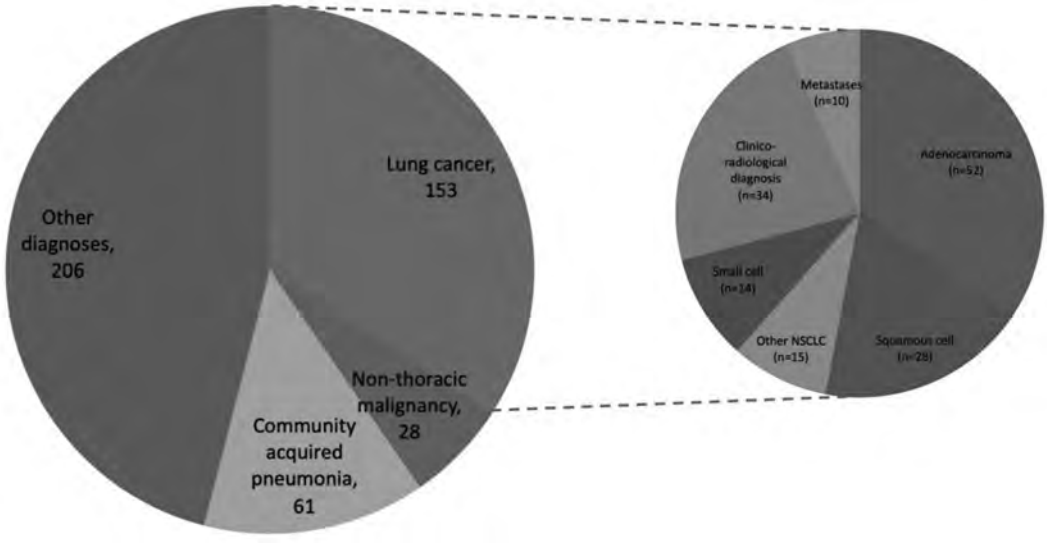
Introduction and objectives The success of lung cancer screening (LCS) with low-dose CT (LDCT) depends critically on delivering timely, accurate radiology reports. Its anticipated widespread introduction will place a significant burden on current thoracic radiologist capacity, mandating innovative solutions. We explored the role that trained radiographers, using computer-assisted nodule detection (CADe) software, might have in LCS reporting pathways.

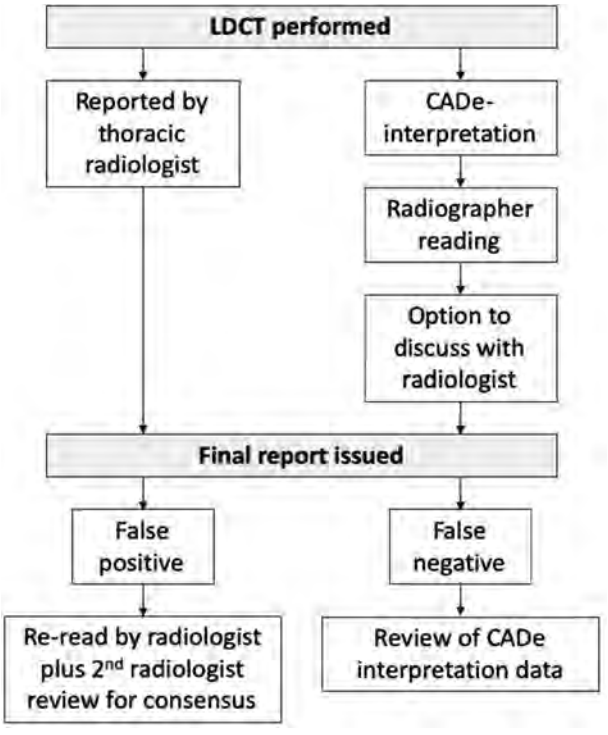
Methods 770 LDCTs performed as part of the Lung Screen Uptake trial (LSUT) were retrospectively reported by two radiographers (R1 and R2) using the Veolity™ CADe software. Radiographers could request the opinion of the study radiologist about uncertain findings. The original



Abstract P77 Figure 1

radiologists' reports (read without CADe) were considered the reference standard. Studies were categorised as 'positive' (nodule or mass requiring nodule surveillance or MDT referral), 'negative' (no intrapulmonary findings requiring further imaging) or 'ill-defined' (indistinct focal abnormality requiring surveillance, e.g. consolidation). Reported outcomes were compared to the reference standard, with any discrepant (i.e. radiographer-only reported) nodules re-reviewed by both study radiologist and a second independent radiologist, and verified as either 'true' or 'false positive' (figure 1). Secondary outcomes included scan-reading times and identification of incidental findings.

Results The reference standard dataset included 163 'positive', 35 'ill-defined', and 572 'negative' studies, and 34 confirmed lung cancers. R1 and R2 requested radiologist confirmation for 6.5% and 10.4% of studies respectively. Following verification of discrepant nodules, reporting sensitivity varied significantly between radiographers at 67.3% (R1) and 74.0% (R2) for all 'positive' studies (OR 2.27, p=0.03): 77.4% and 93.9% for confirmed cancers. The majority of 'missed' lesions arose from inappropriate rejection of CADe-detected findings rather than being missed altogether. The radiographer plus CADe reading combination highlighted ten nodules previously dismissed by the study radiologist, that were subsequently recalled for further surveillance. Allowing for these, the rates of false positive reporting were 7.9% (R1) and 6.2% (R2).



Abstract P78 Figure 1 LDCT reporting and management of discrepant findings

Conclusions Individual performance varied significantly between the two radiographers, but the overall results suggest inadequate sensitivity to recommend this strategy. As per previous observations elsewhere, using CADe software in LCS reporting pathways is likely to reduce reporting times whilst increasing reader sensitivity.

P79 INCIDENCE OF BRAIN METASTASES AT DIAGNOSIS IN OTHERWISE STAGE I NON-SMALL CELL LUNG CANCER

HA Farne, T Banks, SA Bloch, CL Ross. *Imperial College Healthcare NHS Trust, London, UK*

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Introduction Recently updated NICE guidelines advise against offering 'brain imaging to people with clinical stage I non-small cell lung cancer (NSCLC) who have no neurological symptoms and are having treatment with curative intent'.[1] The rationale given is low prevalence of asymptomatic brain metastases in this group, quoting a prevalence of 4%, with brain imaging delaying potentially curative treatment and incurring additional costs. Proponents of brain imaging argue that the presence of brain metastases significantly changes the treatment plan and thus 4% feels uncomfortably high.

There is little data on the incidence of brain metastases at diagnosis in otherwise stage I disease. We have historically performed brain imaging at diagnosis on all stage I patients potentially suitable for radical treatment. In this review of our practice, we sought to assess the impact of the proposed changes in our population.

Methods We identified patients with stage I disease, and stage I revised to stage IV disease solely on the basis of brain metastases (i.e. N0 M1b), from a prospectively gathered database of patients diagnosed with lung cancer in our trust between 1st Jan 2014 and 30th April 2019. For the latter group, we looked for neurological symptoms at diagnosis in case notes. We additionally reviewed the case notes to confirm the histology and, where the staging had been changed in the database, we re-reviewed the relevant investigations.

Results 313 patients had stage I NSCLC and 6 had stage IV NSCLC on the basis of isolated brain metastases, all with neurological symptoms, giving a prevalence of 1.9% (6/313). Excluding those without histological confirmation (suggesting they would not be candidates for radical therapy) gave a prevalence of 1.1% (3/264). No asymptomatic patients (0%) were found to have brain metastases at diagnosis.

Conclusions The prevalence of in our population was lower than that quoted by NICE and supports the guidance that in stage I NSCLC, presenting without neurological symptoms, the benefits of routine bran imaging are too low to justify the cost.

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P80 THE ROLE OF PHYSICIAN-LED SUPRACLAVICULAR NODE SAMPLING IN THE HISTOLOGICAL DIAGNOSIS OF LUNG CANCER

R Patel, G Tsaknis, M Naeem, R Reddy. *Kettering General Hospital, Kettering, UK*

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Introduction In suspected lung cancer patients, supraclavicular lymph node (SCN) sampling is one of the least invasive methods for obtaining tissue for histology. In our hospital we operate a physician-led ultrasound guided biopsy (USG) service, performing a wide range of diagnostic procedures, including USG SCN sampling. In this retrospective analysis we evaluated

the impact of a physician-led biopsy service on the proportion of lung cancer patients who obtained a histological diagnosis through SCN sampling.

Methods At our hospital, suspected lung cancer patients who had radiologically reported SCNs on CT chest or those suspected to have SCNs by lung cancer physicians (after reviewing CT imaging) were chosen for an ultrasound scan (USS) of the neck. This was followed by SCN sampling (either fine needle aspiration or/and biopsy) if nodes were present. All patients with a histological diagnosis of lung cancer in 2018 were reviewed to assess the diagnostic method used. We did this by reviewing our local database, results reporting system and procedures logbook.

Results 133 patients with a histological diagnosis of lung cancer in 2018 were included in the study. Table 1 summarises the results. SCN sampling confirmed malignancy in 21 cases (16% of all cases). Radiologists reported the presence of SCNs in 17 cases, of which malignancy was confirmed by SCN sampling in 11 cases. Of the remaining 116 cases, physicians suspected SCNs in 32 patients. 25 patients underwent USS neck with 16 undergoing SCN sampling; malignancy was confirmed in additional 10 cases. Of the 7 that did not have USS neck, diagnosis was achieved in 5 through other USG procedures. In the cohort where SCNs were not reported by radiologists, SCN sampling also upstaged the lung cancer in 2 patients and avoided unnecessary staging investigations (e.g. PET-CT) in 3 patients.

Abstract P80 Table 1 Summary of results

	Number of cases	Number undergoing USS neck	Number undergoing SCN sampling	Number of lung cancers confirmed by SCN sampling (Diagnostic yield)
Histologically confirmed lung cancer cases	133	41	29	21 (72%)
Patients with CT reporting presence of SCNs	17	16	13	11 (85%)
Patients with CT not mentioning presence of SCNs	116	25	16	10 (63%)

Conclusion This study suggests that a dedicated physician-led biopsy service can increase the number of patients who obtained a histological diagnosis with SCN sampling. Active review of CT imaging by physicians could significantly improve the identification of small SCNs on CT scans, as radiologists may not report nodes under 1cm in size.

P81 BEDSIDE MEASUREMENT OF EXHALED BREATH CONDENSATE HYDROGEN PEROXIDE DIFFERENTIATES LUNG CANCER AND INTERSTITIAL LUNG DISEASE FROM HEALTHY CONTROLS

DM Lodge, D Neville, T Brown, H Rupani, KS Babu, L Bishop, E Heiden, J Gates, J Longstaff, J Winter, S Begum, AJ Chauhan. *Queen Alexandra Hospital, Portsmouth, UK*

10.1136/thorax-2019-BTSabstracts2019.224

Introduction and objectives Lung Cancer and Interstitial Lung Disease (ILD) are prevalent conditions that have a poor prognosis, often due to a delay in diagnosis which limits management options. Inflammation and oxidative stress are processes that occur early in the course of disease within both of these conditions, with hydrogen peroxide one by-product of these inflammatory processes. Using a novel handheld device (Inflammacheck™), we sought to determine whether bedside measurement of Hydrogen Peroxide in Exhaled Breath Condensate (EBC H_2O_2) could differentiate patients with lung cancer or ILD from healthy controls.

Methods 16 patients with a confirmed diagnosis of lung cancer and 20 patients with ILD were recruited from outpatient clinics in secondary care, alongside 25 healthy participants. Participants completed two measurements of EBC H_2O_2 using the Inflammacheck™ device. Data including recent radiology, spirometry and blood tests were also recorded, along with disease-specific information including performance status, and cancer stage or ILD GAP (Gender, Age, Physiology) score.

Results EBC H_2O_2 levels were significantly increased in lung cancer patients (mean 3.21μM, SD ±1.52) compared to healthy controls (mean 1.56μM, SD ±1.70) ($p=0.03$). EBC H_2O_2 levels were also significantly increased in ILD patients (mean 3.26μM, SD ±1.15) compared to healthy controls ($p=0.001$). Sensitivity and specificity analysis demonstrated an excellent ability of EBC H_2O_2 to differentiate between patients with cancer (ROC 0.837, CI 0.68 to 0.99) or patients with ILD (ROC 0.817, CI 0.67 to 0.97) and healthy controls.

There was no significant difference in EBC H_2O_2 levels across TNM stage, overall stage or histological type for lung cancer patients ($p>0.05$), or between ILD classification or GAP index in ILD patients ($p>0.05$).

Conclusion We have demonstrated that levels of exhaled breath condensate hydrogen peroxide are significantly elevated in patients with lung cancer and ILD compared with healthy controls. Bedside measurement of EBC H_2O_2 could present a new tool in the diagnosis of lung cancer and ILD. Further studies with larger patient cohorts are required to confirm this observation, and clarify the potential role of EBC H_2O_2 in clinical care.

P82 EVALUATION OF THE LENT AND PROMISE SCORE FOR MALIGNANT PLEURAL MESOTHELIOMA BY HISTOLOGICAL SUBTYPE

R Banka, R Ferris, A Hung, P Gkogkou, E Mishra. *Norfolk and Norwich University Hospital, Norwich, UK*

10.1136/thorax-2019-BTSabstracts2019.225

Introduction The LENT and PROMISE scores are prognostic scores developed to predict prognosis in patients with malignant pleural effusions (MPE) including mesothelioma. Previous work has demonstrated that the LENT score underestimates survival in subtypes of patients with lung adenocarcinoma.

Aim To evaluate the LENT and clinical PROMISE score in a cohort of patients presenting with MPE secondary to mesothelioma (MPM) by histological subtype.

Methods Records were retrospectively reviewed from January 1, 2011- December 31, 2018 and January 1, 2013 –

December 31, 2018 for patients with non-epithelioid and epithelioid mesothelioma respectively who presented with MPE. Patients who were alive at the time of data analysis were included for PROMISE score analysis only. Only patients with complete data available to calculate LENT/PROMISE score were included in analysis.

Results 142 patients were diagnosed with MPE and MPM. Complete data was available to analyse LENT and PROMISE score in 99 and 136 patients respectively. The overall median survival (n=122) was 315 days (IQR 167–538). The median survival was significantly different for different histological subtypes: sarcomatoid, (n=27) 191 days (IQR 120–349); biphasic (n=21) 282 days (IQR 135–473); and epithelioid (n=70) 481 days (IQR 236–620)(p=0.008). Most patients with sarcomatoid MPE had a low risk LENT score despite poor survival (table 1). The PROMISE score did not differentiate between patients with MPM, with 121/136 (89%) scoring 0–20 (3 month mortality <25%) (table 1).

Abstract P82 Table 1 Survival in patients divided by histological subtype based on LENT and PROMISE score

LENT SCORE	Total N=96/99	Median survival in days (IQR)
Epithelioid		
Low	39	537 (370–718)
Moderate	16	206 (32–278)
Biphasic		
Low	17	304 (135–479)
Moderate	2	170 (112–227)
Sarcomatoid		
Low	17	191 (125–318)
Moderate	5	75 (46–141)
PROMISE SCORE	**N=132/136**	**3 month mortality (%)**
Epithelioid	N=88	
0–20	78	1 (1)
21–27	8	4 (50)
28–35	2	2 (100)
Biphasic	N=22	
0–20	20	2 (10)
21–27	1	1 (100)
28–35	1	1 (100)
Sarcomatoid	N=22	
0–20	20	4 (20)
21–27	2	1 (50)
28–35	0	-

Conclusion In our sample, patients divided into significantly different survival groups based on histology. The LENT score misclassified sarcomatoid MPM patients as being in a low mortality group. The PROMISE score failed to differentiate between patients with MPM.

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P83 EARLY EXPERIENCE OF MULTIMODALLY DIRECTED SLIM/ULTRASLIM BRONCHOSCOPY AT A UK CENTRE

[1]V Chew, [1]HJ Carlin, [2]K Dasgupta, [1]J Dunleavy, [1]V Jeebun. *[1]Department of Respiratory Medicine, University Hospital of North Tees, Stockton-on-Tees, UK; [2]Department of Pathology, University Hospital of North Tees, Stockton-on-Tees, UK*

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Background We set up a multimodally directed slim and ultraslim bronchoscopy service at our institution in December 2018 to aid in the diagnosis of hard to reach peripheral lung lesions. This service uses a combination of virtual bronchoscopic navigation (VBN) software, radial probe endobronchial ultrasound (RP-EBUS) with or without guide sheath (GS), 2D fluoroscopy and either a slim (2.0 mm working channel) or ultraslim (1.7 mm) bronchoscope.

Methods We performed a retrospective analysis of the first 20 consecutive cases referred to this service. In all patients VBN, RP-EBUS and 2D fluoroscopy were used in combination. The choice of a slim or ultraslim bronchoscope was at the discretion of the operator and usually guided by the location of the lesion. All procedures were performed under conscious sedation. Tissue sampling included bronchial lavage, brushings using either a 1.5 mm or 1.9 mm cytology brush, and transbronchial biopsy using a 1.5 mm or ≥1.9 mm forceps. Size selection was based on the use of GS or the bronchoscope used. Patients with a non-malignant diagnosis were referred on for further investigations or surveillance for at least 3 months.

Results The mean age was 71 ±8 years.

4 out of 9 patients with non-malignant cells were true negative for malignancy on follow up CT; 5 were deemed to be false negative. The overall diagnostic accuracy was 75% in our cohort. The sensitivity for diagnosing malignancy was 73% with a cancer prevalence of 80%.

All patients tolerated the procedure well. Other than one small post-procedure pneumothorax (treated conservatively) there were no significant complications.

Abstract P83 Table 1 Lesion characteristics and sampling results

Mean size (mm)	25± 15
<20	9/20 (45%)
20–30	7/20 (35%)
≥30	4/20 (20%)
Location	
RUL	9/20 (45%)
RML	2/20 (10%)
RLL	3/20 (15%)
LUL	4/20 (20%)
LLL	2/20 (10%)
Pathological diagnosis	
Malignancy	11/20 (55%)
Adenocarcinoma	3/20 (15%)
Squamous	2/20 (10%)
Small cell	1/20 (5%)
NSCLC NOS	4/20 (20%)
Carcinoid	1/20 (5%)
Non-malignant tissue	9/20 (45%)
Inflammatory cells	3/20 (15%)
Atypical cells	2/20 (10%)
Normal cells	4/20 (20%)

The use of VBN significantly reduced procedural time, with directed navigation to the area of abnormality which was confirmed on RP-EBUS in all cases.

Whilst use of larger biopsy forceps or brush to improve diagnostic yield necessitates the removal of the GS for sampling (and may preclude use of the ultraslim scope), concurrent use of fluoroscopy helped to confirm the same location was being consistently sampled.

Conclusions Our initial experience of multimodally directed slim/ultraslim bronchoscopy is very promising with a high diagnostic accuracy in the sampling of peripheral lung lesions.

P84 THE EFFECT OF ESTABLISHING SINGLE SITE DIAGNOSTIC SERVICES IN IMPROVING LUNG CANCER PATHWAY TIMELINES, TO HELP IMPLEMENT THE NATIONAL OPTIMAL LUNG CANCER PATHWAY (NOLCP)

K Millington, C Marchand, J Walters, V Masani. *Royal United Hospital, Bath, UK*

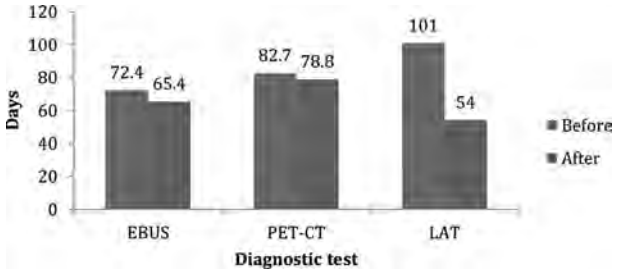
10.1136/thorax-2019-BTSabstracts2019.227

Lung cancer is the leading cause of cancer death in the UK. The National Optimal Lung Cancer Pathway (NOLCP) has been developed to improve timelines to diagnosis (28 days), time-to-treatment (49 days), and survival. The NOLCP presents appropriately challenging timelines, which may be difficult to achieve if diagnostic tests are performed in several different trusts. In order to adopt the NOLCP, our district general hospital introduced and re-organised services to facilitate all diagnostic tests being performed on a single site.

We studied the effects of establishing all services on one site to facilitate the NOLCP. In particular we studied improvements in timelines for newly established Endobronchial Ultrasound (EBUS), local PET-CT and local anaesthetic thoracoscopy (LAT) services.

Methods Patient data was obtained from the cancer registry for all patients undergoing EBUS, PET-CT or LAT investigations. Data was collected over a 24-month period for each investigation (12-month periods before and after service introduction). Baseline patient demographics, investigations, and diagnosis were collected.

Results 375 patients were investigated by the Lung Multidisciplinary Team (MDT) over the study period. 156 patients were investigated prior to the establishment of local diagnostic services and 219 after the introduction of these services. We assessed the effect of introducing new local services on the referral to treatment times for these patients (Figure 1). The results identified reductions in all pathways for patients receiving new locally performed diagnostic tests. The timeline improvements were as follows: EBUS performed 7 days earlier, PET-CT 3.9 days performed earlier, LAT 31.7 days performed earlier.



Abstract P84 Figure 1 Comparison of referral to treatment times for patients after introducing local diagnostic services

Discussion Introduction of local diagnostic services, located on a single site, improved referral to treatment times for patients newly diagnosed with lung cancer. We believe it is likely these improvements are related to an increase in diagnostic capacity and improved efficiencies in the diagnostic pathway. These improvements have facilitated application of the NOLCP.

P85 A RETROSPECTIVE ANALYSIS OF FIVE YEARS OF REFERRALS FOR HAEMOPTYSIS UNDER THE TWO-WEEK-WAIT PATHWAY TO A UNIVERSITY TEACHING HOSPITAL

F Hameed, J Kang, F Gleeson, J Wrightson, A Moore, A Sykes. *Oxford University Hospitals NHS Foundation Trust, Oxford, UK*

10.1136/thorax-2019-BTSabstracts2019.228

Background Patients with haemoptysis are often referred via the two-week-wait (2ww) suspected lung cancer pathway. CXR has poor sensitivity and most patients undergo a Computed Tomography (CT) scan. Previous studies have suggested that CT may miss small lesions in up to 5% of the cancer cases leading to fibreoptic bronchoscopy (FOB) also frequently being performed.[1] We performed a retrospective analysis of five years of patients presenting with haemoptysis of unknown cause to Oxford University Hospitals NHS Foundation Trust (OUHFT), to determine the utility of CT and FOB.

Study hypothesis In patients with haemoptysis and normal CT chest, FOB does not identify further cancers.

Aims To evaluate the utilisation of CT and FOB in patients with haemoptysis referred via two-week-wait pathway.

Methods A retrospective non-randomised analysis was conducted of a total of 402 patients who were referred to OUHFT between 2013 and 2017 with haemoptysis of unknown cause. The records were reviewed and findings of CT, FOB and final diagnosis assessed.

Results A total of 402 patient records were reviewed. Mean age 62.58 years (SD 14.20), males 65.4%, females 34.6%, mean smoking pack-years 22.29 (SD 25.52), 26.4% current smokers, 47.5% ex-smokers and 26.1% non-smokers. Of 402 cases, 34.6% (n=139) had normal CT and 65.4% (n=263) had abnormal CT. Of 263, the common CT results were infective features in 73, features of malignancy in 41 and bronchiectasis in 20. Of 402 cases, FOB was done in 140. Of these, 90 cases had normal FOB and a cancer was diagnosed in 11. Of these 11, all had definite or possible features of malignancy already identified on CT. There were no additional cancers found by FOB in patients having had a normal CT. When it comes to final diagnosis, the common findings were idiopathic haemoptysis in 33.3% (n=134),infection in 32.8% (n=132) and primary or metastatic lung cancer in 9.5% (n=38).

Conclusion In conclusion, in our study, FOB did not reveal a malignancy or a significant non-malignant abnormality, if the CT was normal. We recommend that assessment of haemoptysis in outpatient setting should mainly rely on clinical and radiological assessment and bronchoscopy should only be considered on individual basis rather than being considered routine.

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Biologics in asthma

P86 DOES ADHERENCE TO ICS/LABA THERAPY CHANGE FOLLOWING INITIATION OF BENRALIZUMAB IN THE TREATMENT OF SEVERE ASTHMA AND DOES THIS AFFECT OUTCOME?

G d'Ancona, S Bains, P Bakrania, L Green, M Fernandes, C Roxas, L Thomson, L Osman, K Stewart-Knight, J Dhariwal, AM Nanzer, J Kavanagh, DJ Jackson, BD Kent. *Guy's Severe Asthma Centre, Guy's and St. Thomas' NHS Trust, London, UK*

10.1136/thorax-2019-BTSabstracts2019.229

Introduction and objectives Benralizumab is used in severe eosinophilic asthma (SEA), in addition to other optimised therapies, to improve disease control and reduce exacerbation frequency. It is unknown if SEA patients alter their usage of inhaled therapies, including inhaled corticosteroids (ICS) and short acting B-agonists (SABA), following initiation of Benralizumab. We have previously reported an increased risk of exacerbations in Mepolizumab patients who are poorly adherent to maintenance ICS, but it is unknown if a reduction in ICS adherence alters clinical outcomes whilst on Benralizumab.

Methods We assessed SEA patients who had completed at least 24 weeks of Benralizumab therapy, and measured if inhaler use changed before and after its initiation. We also investigated whether a reduction in ICS use affected outcomes. Adherence, expressed as the Medicines Possession Ratio (MPR), was calculated from primary care prescription records. The MPR is a ratio of the number of doses issued on prescription/number that would be expected to be used. Good adherence was defined as a usage ratio $\geq$0.8, poor adherence was an MPR <0.5.

Results The adherence of 83 patients receiving Benralizumab was assessed. 59% were female, age 51.8±13.9 years, 47% had adult onset disease, 75% were atopic and 60% were receiving maintenance oral corticosteroids (OCS). Whilst on Benralizumab, the overall ICS-containing annualised MPR reduced from 0.92±0.42 to 0.81±0.36 (p=0.063). A reduction was seen in the absolute numbers of both ICS inhalers (11.0±5.1 vs 8.8±3.9; p=0.002) and SABA inhalers (14.3 ±13.3 vs 9.9±10.1; p=0.001) collected, equivalent to an average reduction from 7.8 doses of salbutamol/day before Benralizumab to 5.4 doses/day after. Post-initiation of Benralizumab, 20 patients (24.1%) had poor adherence to ICS. There was no difference in baseline MPR between those with subsequent poor and good ICS adherence (0.91±0.53 vs 0.96 ±0.38; p=0.71), and no significant differences at 24 weeks in changes in FeNO level, lung function, ACQ scores, OCS dose or exacerbation frequency. See table 1.

Conclusions Usage of ICS and SABA decreased on Benralizumab therapy, and previous adherence was not a predictor of on-treatment adherence. This diminished ICS use was not associated with a significant difference in the number of exacerbations or other outcome measures.

Abstract P86 Table 1 Clinical outcomes in adherent vs non-adherent patients

	Good ICS Adherence	Poor ICS Adherence	p value
Baseline MPR	0.96±0.38	0.91±0.53	0.71
FEV1% Δ (%)	9.3±28.4	-0.42±30.9	0.25
FeNO reduction (ppb)	2.3±44.2	23.1±83.5	0.33
ACQ reduction	1.0±1.9	0.7±1.5	0.54
OCS reduction (mg/day)	9.5±15.0	6.8±17.2	0.60
Annualised exacerbation frequency	1.2±2.0	1.4±2.3	0.74

P87 REDUCED LONG-TERM CUMULATIVE OCS EXPOSURE FOR BENRALIZUMAB-TREATED PATIENTS WITH SEVERE ASTHMA

[1]D Shaw, [2]A Menzies-Gow, [3]A Bourdin, [4]P Barker, [5]E Garcia Gil. *[1]Nottingham City Hospital, Nottingham, UK; [2]Royal Brompton Hospital, London, UK; [3]Hôpital Arnaud de Villeneuve, Montpellier, France; [4]AstraZeneca, Gaithersburg, USA; [5]AstraZeneca, Barcelona, Spain*

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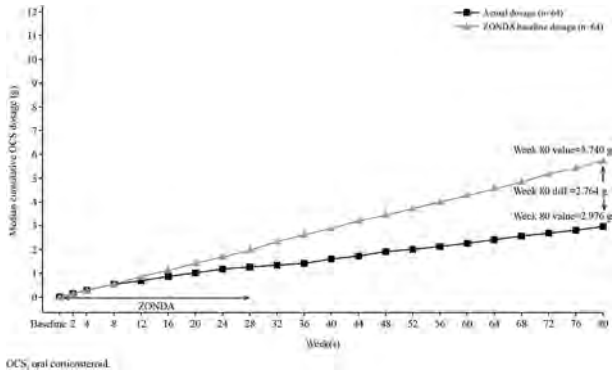
Introduction and objectives Cumulative systemic corticosteroid exposure is associated with adverse health-related outcomes.[1] In the 28-week ZONDA trial of patients with severe asthma, benralizumab treatment resulted in a 75% reduction from baseline in maintenance oral corticosteroid (OCS) dosage, compared with 25% for placebo.[2] We examined the impact this OCS dosage reduction might have on OCS exposure over 1.5 years for patients with severe asthma.

Methods OCS maintenance dosage data were collected for patients treated with benralizumab 30 mg (every 8 weeks; first three doses every 4 weeks) in ZONDA (baseline, n=73; Week 28, n=68) and followed for up to another 52 weeks (Week 40, n=64; Week 52, n=58; Week 80, n=30). For patients with incomplete data, OCS exposure was projected based on last recorded dosage. Exposure from rescue OCS use was not included in this analysis. We compared estimated median cumulative OCS exposure over 1.5 years for benralizumab-treated patients with estimated exposure if those patients had remained on their ZONDA baseline OCS dosages. In ZONDA, only patients receiving baseline OCS ≤12.5 mg/day could eliminate OCS use. Therefore, we also estimated median cumulative OCS exposure for patients with baseline OCS ≤12.5 and >12.5 mg/day.

Results Median cumulative OCS exposure was estimated at 2.976 g for patients receiving benralizumab and 5.740 g if those patients had remained on their baseline OCS dosages,



Abstract P87 Figure 1 Median cumulative OCS exposure over 1.5 years for Benralizumab-Treated patients compared with patients continuing on study-entry OCS dosages

leading to an estimated median cumulative OCS exposure reduction of 2.764 g over 1.5 years (figure). For patients receiving baseline OCS ≤12.5 and >12.5 mg/day, the median cumulative OCS exposure associated with benralizumab at 1.5 years was 0.865 g and 5.114 g, respectively, with a corresponding reduction compared with remaining on baseline OCS dosages of 4.740 g and 6.116 g, respectively.

Conclusions Benralizumab treatment enables patients with severe asthma to reduce long-term OCS exposure. Cumulative systemic corticosteroid dose-response for most treatment-associated adverse outcomes is reported to begin at cumulative exposures of 1.0–<2.5 g.[1] Therefore, the estimated cumulative OCS exposure reduction achieved with benralizumab is likely to result in significant reduction in adverse outcome risk for patients.

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P88 REAL-WORLD EFFECTIVENESS OF ANTI-IL-5/5R THERAPIES IN SEVERE ATOPIC EOSINOPHILIC ASTHMATICS ELIGIBLE FOR ANTI-IGE THERAPY

DJ Jackson, J Kavanagh, C Roxas, G D'Ancona, L Green, L Thomson, M Fernandes, J Dhariwal, AM Nanzer, BD Kent. *Guy's Severe Asthma Centre, Guy's Hospital, Guy's and St Thomas' NHS Trust, London, UK*

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Introduction A significant proportion of adult patients with severe eosinophilic asthma (SEA) have evidence of both atopic and eosinophilic airways inflammation and meet eligibility criteria for all 4 NICE-approved biologic therapies. In the absence of randomised head-to-head studies comparing omalizumab and an anti-IL5/5R therapy, physicians lack a robust evidence base for choosing between these two classes of treatment. To date there are no real-world effectiveness data reporting clinical outcomes of mepolizumab and benralizumab in patients also eligible for omalizumab.

Methods We retrospectively assessed all SEA patients at our tertiary asthma centre treated with either mepolizumab or benralizumab for a minimum of 24 weeks. Eligibility criteria for omalizumab, including whether patients could be dosed adequately based on weight and IgE levels, were recorded. Clinical outcomes at 24 weeks were compared between patients eligible and ineligible for omalizumab.

Results One hundred and fifty-seven patients (46.7% female, mean age 51.7±14.3, 58.9% atopic) treated with either mepolizumab or benralizumab for at least 24 weeks were included in this analysis. 65/157 (41.4%) would have also been eligible for omalizumab at the time of biologic initiation. No baseline differences in blood eosinophils, total IgE, FeNO, FEV1, ACQ6, mAQLQ, or exacerbation rate were observed between eligible and ineligible groups. An atopic phenotype was more common with omalizumab-eligible patients and an adult-onset phenotype was more common in ineligible patients (both p<0.001). At 24 weeks significant improvements were observed in the overall cohort in exacerbation rates, ACQ6, mAQLQ and reductions in prednisolone exposure with anti-IL5/5R therapies (all P<0.05), however, no significant differences between omalizumab-eligible and -ineligible groups were

Abstract P88 Table 1

Baseline Characteristics	All (n=157)	Eligible for Omalizumab (n=65)	Ineligible for Omalizumab (n=92)	P value
Age (years)	51.73 ± 14.27	50.60 ± 14.05	53.18 ± 13.77	0.252
Female subjects	92 (46.7%)	36 (55.4%)	56 (60.9%)	0.492
Weight (kg)	82.82 ± 18.08	83.15 ± 20.01	83.09 ± 16.53	0.767
BMI (kg/m^2)	29.99 ± 6.36	30.09 ± 6.93	30.10 ± 5.83	0.650
Atopy†	116 (58.9%)	65 (100%)	51 (55.4%)	<0.001
IgE	203 (70–496)	244 (99–425)	172 (55–738)	0.660
Previous Omalizumab treatment	22 (14.0%)	18 (27.7%)	4 (4.4%)	<0.001
Adult onset disease (≥ 18 years)	88 (44.7%)	23 (35.4%)	65 (70.7%)	<0.001
Nasal polyposis	59 (29.9%)	22 (33.8%)	37 (40.2%)	0.504
Smoking history	n=89	n=58	n=85	0.812
Never smoker	93 (47.2%)	38 (65.5%)	55 (64.7%)	
Ex-smoker	46 (23.4%)	19 (32.8%)	27 (31.8%)	
Current smoker	4 (2.0%)	1 (1.7%)	3 (3.5%)	
Peak blood eosinophil count in the year preceding mepolizumab (cells x10^9)	0.6 (0.4–0.9)	0.6 (0.5–0.73)	0.6 (0.4–1.03)	0.510
Baseline blood eosinophil count (cells x10^9)	0.2 (0.4–0.9)	0.2 (0.1–0.5)	0.2 (0.0–0.4)	0.604
FeNO (ppb)	43.0 (26.0–72.0)	46.5 (24.0–68.3)	42.5 (26–78.5)	0.999
Exacerbation rate in the year preceding mepolizumab	4.73 ± 3.28	4.83 ± 3.49	4.49 ± 3.00	0.436
High-dose ICS/LABA treatment	157 (100%)	65 (100%)	92 (100%)	1.000
mOCS treatment at baseline	100	39 (60.0%)	61 (66.3%)	0.501
Median mOCS dose (prednisolone, mg/day)	10 (5–15)	10 (5–12.5)	10 (6–15)	0.668
Mepolizumab treatment	64 (32.5%)	22 (33.8%)	42 (45.7%)	0.187
Benralizumab treatment	93 (47.2%)	43 (66.2%)	50 (54.3%)	0.187
FEV1 (% predicted)	62.77 ± 20.60	61.15 ± 22.39	64.35 ± 19.06	0.284
ACQ-6	2.84 ± 1.34	2.95 ± 1.30	2.74 ± 1.35	0.176
Mini-AQLQ	3.69 ± 1.42	3.50 ± 1.39	3.88 ± 1.46	0.073
Changes from baseline to 24 weeks	**All (n=157)**	**Eligible for Omalizumab (n=65)**	**Ineligible for Omalizumab (n=92)**	**P value**
Median% reduction in (annualised) exacerbation rate	-64 (-100 to 0)	-69 (-100 to 0)	-100 (-100 to 1)	0.291
Median% reduction in mOCS (prednisolone, mg) n=100)	-75 (-100 to -40)	-90 (-100 to -50)	-88 (-100 to -46)	0.805
Δ FEV1 (% predicted)	3.2 ± 14.0	2.3 ± 13.6	3.8 ± 14.2	0.501
Δ ACQ-6	-0.58 ± 1.24	-0.49 ± 1.09	-0.64 ± 1.35	0.481
Δ Mini-AQLQ	0.89 ± 1.46	0.74 ± 1.33	0.99 ± 1.53	0.298
Δ FeNO (ppb)	1 (-19 to 14)	0 (-20 to 13)	1 (-20 to 16)	0.878
Δ Blood eosinophils (cells x10^9)	-0.1 (-0.3 to 0.0)	-0.1 (-0.3 to 0.0)	-0.1 (-0.4 to 0.0)	0.237

seen in any clinical outcome measure evaluated (see table for full results).

Conclusion In a large cohort of 157 patients with SEA, 41% are eligible for both an anti-IgE and anti-IL-5/5R approach. In a real-world setting, the clinical effectiveness of mepolizumab and benralizumab does not appear to be influenced by eligibility for omalizumab therapy. It remains unclear which SEA patients may respond better to an anti-IgE vs anti-IL5/5R approach when both treatments are an option.

P89 REAL-WORLD 1 YEAR EFFECTIVENESS OF BENRALIZUMAB IN SEVERE EOSINOPHILIC ASTHMA

J Kavanagh, C Roxas, L Thomson, M Fernandes, L Green, G d'Ancona, J Dhariwal, AM Nanzer, BD Kent, DJ Jackson. *Guy's Severe Asthma Centre, Guy's Hospital, London, UK*

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Introduction Benralizumab is an anti-IL5R monoclonal antibody licensed for patients with severe eosinophilic asthma (SEA). Phase 3 clinical trials demonstrated significant reductions in exacerbation rates and in maintenance oral corticosteroid (mOCS) use. However, relatively low exacerbation rates in placebo treated subjects post-baseline highlight that many subjects were likely to have moderate rather than severe asthma once adherence to inhaled therapy and other factors were corrected. There is currently a paucity of real-world data in SEA confirming the effectiveness of benralizumab.

Methods We performed a retrospective review of all SEA patients in a regional severe asthma centre who had received a minimum of 12 months benralizumab treatment. All participants had blood eosinophils of $^{3}0.4x10^{9}$ despite adequate adherence to ICS/LABA. At each benralizumab dose blood eosinophils, fraction exhaled nitric oxide (FeNO), spirometry, asthma control questionnaire (ACQ6), mini-asthma quality of life questionnaire (mini-AQLQ) and exacerbations were recorded.

Results Forty-three patients were included in this analysis (65% female, age 50.95±13.82, BMI 30.67±7.17). The median annual exacerbation rate fell by 75% from 4.0 (IQR 3.0–6.0) to 1.0 (IQR 0.0–2.0), p<0.01. ACQ6 improved by 0.90 from 3.20±1.45 to 2.30±1.31, p0.001. Mini-AQLQ improved by 0.93 from 3.19±1.49 to 4.12±1.50, p<0.001, both exceeding the MCID of 0.5. FEV1 and FeNO did not significantly change. Seventy percent of patients required mOCS at baseline. Of these, just over half (53.6%) were able to discontinue mOCS entirely by one year. The median dose of prednisolone fell from 10 mg (IQR 5–15 mg) at baseline to 0 mg (0–5 mg) at one year (p<0.001) representing a 100% reduction.

Conclusion In the largest real-world effectiveness dataset to date of benralizumab in a SEA we report a 75% reduction in exacerbations and a median reduction of 100% in mOCS use at 1 year. Our cohort appeared more severe than the asthma cohort recruited to the phase 3 benralizumab program with a higher proportion on mOCS, higher baseline exacerbation rate and higher ACQ scores despite confirmed adherence to background treatment.

Abstract P89 Table 1

N=43	Baseline	1 year	P value
Age (years)	50.95 ± 13.82		
Female subjects	28 (65.1%)		
Weight (kg)	83.23 ± 18.83		
BMI (kg/m^2)	30.67 ± 7.17		
Atopy	34 (79.1%)		
Adult onset disease (≥ 18 years)	22 (51.2%)		
Nasal polyposis	10 (23.3%)		
Smoking history (n=40)	30 (75%)		
Never smoker	10 (25%)		
Ex-smoker	0 (0%)		
Current smoker			
Co-morbid COPD	4 (9.3%)		
Peak blood eosinophil count in the year preceding anti-IL5/R (x10^9)	1.0 (0–0.8)		
Blood eosinophil count (x10^9)	0.1 (0.1–0.3)	0.0 (0.0–0.0)	0.023
FeNO (ppb)	48.0 (25.5–78.0)	46 (35.8–75.8)	0.202
Annual exacerbation rate	4 (3–6)	1 (0–2)	<0.001
Median prednisolone dose in patients on mOCS at baseline (mg/day)	10 (5–15)	0 (0–5)	<0.001
FEV1 (% predicted)	61.76 ± 20.43	63.05 ± 24.94	0.496
ACQ-6	3.20 ± 1.45	2.30 ± 1.31	0.001
Mini-AQLQ	3.19 ± 1.49	4.12 ± 1.50	<0.001

ABBREVIATIONS: ACQ6 = Asthma Control Questionnaire 6; BMI = Body Mass Index; mOCS = maintenance Oral Corticosteroid; Mini-AQLQ = Mini Asthma Quality of Life Questionnaire; ppb = parts per billion
Values quoted are a mean when normally distributed (± standard distribution) or median when data is non-parametric (interquartile range, IQR).

P90 STEROID DOSE REDUCTION AND WEIGHT LOSS IN PATIENTS WITH SEVERE ASTHMA WHO RESPOND TO MEPOLIZUMAB

[1]N Thomas, [1]B Hama, [2]L Elsey, [2]C Ustabasi, [2]L Maguire, [2]S Fowler, [2]T Pantin, [2]D Allen, [2]G Tavernier, [2]R Niven. *[1]University of Manchester, Manchester, UK; [2]United Hospital South Manchester NHS Foundation Trust, Manchester, UK*

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Background Mepolizumab, a human monoclonal antibody, blocks interleukin-5, a major contributor to airway inflammation in eosinophilic asthma. Mepolizumab has been shown to reduce exacerbations rate and steroid burden in severe asthma. Existing patients first started treatment 2 years ago and here we report outcome data for patients with severe asthma commenced on 100 mg subcutaneously every 4-weeks for a minimum of 6 months.

Methods Data from patients completing at least 6 months of treatment with mepolizumab are reported. 'Responders' were defined as having at least a 50% reduction in their daily steroid dose at 12 months. Each variable measured was checked for normality of distribution and longitudinal changes were analysed using paired sample tests accordingly, t-tests for parametric data and Wilcoxon tests for non-parametric data.

Results Patients with severe adult asthma were included (n=194), 64.9% female, mean (SD) age 51.09 (12.13) yrs, FEV1 (n=159) 64.45 (21.63)% predicted, baseline daily dose (n=182) 10 (0–60)mg oral prednisolone. 74% (n=85) of patients were identified as responders, (though this figure does not include patients who did not reach 6 months of treatment). Of the patients who had sputum samples taken at 12 months, 15% (n=2) of responders (n=13) and 62% (n=5) of non-responders (n=8) were sputum eosinophil positive. All of these paired sample tests for AQLQ, ACQ, blood eosinophils, oral corticosteroids and weight show improvement with clinical significance of P<0.01. Prednisolone dose decreased by a

Abstract P90 Table 1

		Responders		Non-Responders	
		Baseline	12 months	Baseline	12 months
AQLQ	mean	3.24	4.45	2.61	2.95
	SD	1.59	1.73	1.15	1.15
	P value		*<0.01**		*0.1*
ACQ	mean	3.15	2.46	3.99	3.65
	SD	1.47	1.7	1.46	1.18
	P value		*<0.01**		*0.24*
Blood Eosinophils (x10^9 cells/l)	median	0.44	0.04	0.4	0.03
	min-max	0-1.21	0-0.24	0.03-6.40	0-0.13
	P value		*<0.01**		*<0.01**
Oral Corticosteroids (mg)	median	15	5	12.5	11.25
	min-max	0-60	0-15	0-40	3.0-40
	P value		*<0.01**		*<0.01**
Weight (kg)	mean	88.7	81.06	85.78	88.1
	SD	19.17	21.76	18.47	20.62
	P value		*0.009**		*0.12*
FeNO (ppb)	median	27	28	22	34.5
	min-max	4-171	5-189	4-142	7-206
	P value		*0.213*		*0.024**
% Predicted FEV1	mean	68.7	69.45	56.16	55.85
	SD	20.1	19.2	23.92	19.92
	P value		*0.67*		*0.92*

mean of 10 mg in responders and weight decreased by 7 kg. FeNO increased only in non-responders by a mean of 12ppb and there was no change in FEV_1.

Conclusions As well as a significant reduction in mean oral corticosteroid dose and patient weight, sputum eosinophilia was strongly associated with clinical response and may be useful at predicting those who are not responsive at 6 months and may need to switch to a second-line biologic agent.

P91 A REVIEW OF SEVERE ASTHMA PATIENTS' ADHERENCE TO PREVENTER INHALERS AFTER 12 MONTHS OF MEPOLIZUMAB

L Elsey, LJ Holmes, K Johnson, R Niven. *Manchester University NHS Foundation Trust, Manchester, UK*

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In 2018, the Severe Asthma team at Wythenshawe Hospital assessed adherence to preventer inhalers in long-tern omalizumab patients and found that 50.6% of patients were non-adherent [(1)]. In response, service improvements focussed on patient education and closer monitoring of adherence were implemented. All patients initiating on biologic therapies now have an education session with the Severe Asthma Pharmacist where the importance of adherence is highlighted. The Severe Asthma nurses reiterate this at each visit and adherence is reassessed after 12 months on biologics.

To assess the impact of these service improvements we reviewed the adherence of 50 patients who had received 12 months of mepolizumab. In line with the North West Severe Asthma Network criteria for biologic approval, a patient was classified as adherent if they had collected over 80% (10/12) of prescriptions for their preventer inhaler, from their GP. In addition, ACQ-7 scores, forced exhaled nitric oxide (FENO) and forced expiratory volume ($FEV_{1)}$ at baseline and 12 months in the adherent vs non-adherent groups were compared.

10% (5/50) of patients had collected less than 80% of their preventer inhaler prescriptions in the last 12 months. In the non-adherent group ACQ-7 scores had risen at 12 months, indicating poorer asthma control. FENO increased in both groups. FEV1 had fallen in the adherent group.

In conclusion, the results indicate that the service improvements we have implemented have led to improved collection of prescriptions for preventer inhalers. Non-adherent patients demonstrated a decrease in asthma control through a rise in their ACQ-7 scores. However, the median

Abstract P91 Table 1 Median values at baseline and 12 month in adherent and non-adherent groups

	Adherent group	Non-adherent group
Baseline FEV1 (litres)	2.66 (IQR 1.33)	2.4 (IQR 1.52)
Current FEV1 (litres)	1.75 (IQR 1.14)	2.41 (IQR 1.66)
Baseline ACQ-7	4 (IQR 2.15)	2 (IQR 2.84)
Current ACQ-7	3.57 (IQR 1.93)	2.8 (IQR 3.08)
Baseline FENO (ppb)	22 (IQR 31)	16 (IQR 15)
Current FENO (ppb)	31 (IQR 28.5)	22 (IQR36)

ACQ-7 and FENO score are better in the non-adherent group compared to the adherent group. These results compare to those seen in the omalizumab adherence review. This raises the question of whether non-adherence is related to patients' illness perception and a belief that they are better controlled and therefore do not require their preventer inhalers. In these patients the perceptions and practicalities approach (PAPA®) can be used to make targeted interventions to improve adherence.

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P92 EFFECTIVENESS AND SAFETY OF MEPOLIZUMAB IN REAL-WORLD CLINICAL PRACTICE: UK PATIENT OUTCOMES FROM THE REALITI-A STUDY

[1]WAF Kerr, [2]TW Harrison, [1]K Loveday, [3]S Joksaite, [4]N Kwon. *[1]Respiratory Medical Affairs, GSK, Uxbridge, UK; [2]Nottingham NIHR Biomedical Research Centre, Nottingham, UK; [3]Clinical Statistics, RandD Projects Clinical Platforms and Sciences, GSK, Uxbridge, UK; [4]Respiratory Medical Franchise, GSK, Brentford, UK*

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Introduction and objectives REALITI-A is a prospective, open label, observational cohort study designed to collect observational data in real-world settings from severe eosinophilic asthma (SEA) patients treated with mepolizumab. The study aims to describe the effectiveness and safety of mepolizumab in real-world clinical practice. In this interim analysis, we describe the 12-month outcomes from the United Kingdom (UK) patients enrolled in the study.

Methods REALITI-A is a 2 y, global, prospective, single-arm, observational cohort study enrolling pts with SEA and newly prescribed mepolizumab 100 mg SC at physician's discretion. Data were collected at routine healthcare visits; 1 y pre-exposure data were collected retrospectively at enrolment. Primary endpoint was rate of clinically significant exacerbations (CSEs; requiring OCS and/or emergency room [ER] visit/hospitalisation). Exacerbations requiring ER visit/hospitalisation and maintenance OCS (mOCS) use were key secondary endpoints; treatment-related AEs were reported. This interim analysis includes 136 pts enrolled in the UK with 1y post-exposure data.

Results 136 treated pts from a total of 368 were enrolled in the UK and included in this analysis (mean age, 51y; 65% female; geometric mean blood eosinophil count, 265 cells/μL; smoker: former 34%/current 2%, never 64%; 69% current mOCS). The rate ratio (RR) of CSEs was 0.41 (95%CI 0.36,0.47; 6.19 [pre-] reduced to 2.54 [post exposure] events/y); RR of exacerbations requiring hospitalisation/ER visits was 0.26 (0.19,0.35; 1.65 reduced to 0.42 events/y). mOCS data were available for 89 (baseline) and 77 (Wk 53–56) pts. Median mOCS dose reduced from 10 to 5 mg/day at Wk 53–56; 26% (20/77) stopped OCS. 35 (26%) pts had on-treatment AEs and 2 (1%) had serious AEs; there were no fatal AEs.

Conclusions Significant reductions in exacerbations and OCS use with mepolizumab in clinical trials translate to a UK real-world setting. This provides assurances of the effectiveness and safety of mepolizumab in a discrete population with a high burden of disease.

P93 RESPONSE TO RESLIZUMAB IN SEVERE ASTHMA PATIENTS UNRESPONSIVE TO MEPOLIZUMAB OR WITH SUSPECTED VASCULITIS

B Hama, N Thomas, L Elsey, K Hince, R Waye, D Allen, L Holmes, T Pantin, G Tavernier, S Fowler, R Niven. *Wythenshawe Hospital, Manchester, UK*

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Introduction Reslizumab is the second biologic available targeting Interleukin 5 (IL5), for the management of severe eosinophilic asthma. We use it in patients who have failed to respond to mepolizumab or with suspected vasculitis.

Aims To determine the efficacy of reslizumab in reducing steroid dose and exacerbation rate (as well as e.g.: blood eosinophils, FEV1, weight) in patients previously unresponsive to mepolizumab (with proven persistent airway eosinophilia), or in selected anti-IL5-naive patients with suspected vasculitis.

Methods Maintenance prednisolone dose and exacerbation history were prospectively recorded at baseline (Bas) and at six months (6M), along with weight, blood eosinophils, lung function, Asthma Quality of Life Questionnaire (AQLQ), Asthma Control Questionnaire (ACQ), fractional concentration of expired nitric oxide (FeNO). The data were analysed retrospectively. In view of the small number of patients descriptive statistics only are reported.

Results Between January 2018 and April 2019, 17 severe asthma patients had received at least one reslizumab infusion: nine of these were anti-IL5-naive and eight had previously been unresponsive to mepolizumab. This latter group had worse AQLQ (2.6), exacerbations (4.5) and lung function (53% predicted) at baseline compared to the naive group (3.2, 1 and 59% respectively).

Sixteen patients completed at least six months treatment, with the remaining patient stopping due to an adverse reaction (rash). In previous mepolizumab-failed patients, reslizumab reduced the median daily prednisolone dose from 20 to 15 mg over 6-months, and from 17.5 to 15 mg in the biologic-naive group.

Summary Reslizumab appears to be an effective medication in reducing prednisolone use in patients who had failed mepolizumab, or who were considered too severe for mepolizumab at the UK licensed dose (patients with suspected of vasculitis). A larger population and for a longer duration of follow-up are needed to confirm these real-life patient findings.

P94 CAN EARLY CHANGES IN ASTHMA CONTROL AND QUALITY OF LIFE PREDICT MEPOLIZUMAB RESPONSE AT 12 MONTHS?

JF Yang, WT Lee, SJ Smith, M Shepherd, J Lei, R Chaudhuri. *Gartnavel General Hospital, Glasgow, UK*

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Background and objectives Mepolizumab is a monoclonal antibody approved for severe refractory eosinophilic asthma. Real-world severe asthma patients treated with mepolizumab have demonstrated a heterogeneity in response with some patients not meeting NICE criteria for oral corticosteroid (OCS) reduction after 12 months of treatment. We aim to identify early predictors of mepolizumab response.

Methods We conducted a retrospective analysis of patients who received mepolizumab for 12 months at a single severe

Abstract P94 Table 1 Change in questionnaire scores and clinical parameters after 3 months of mepolizumab

	n	Overall group	p-value	Responder	Non-responder	p-value
SGRQ	23	**-13.45 (17.00)**	**0.001**	-16.49 (17.07)	-2.50 (12.61)	0.105
ACQ5	30	**-0.87 (1.50)**	**0.004**	-0.85 (1.63)	-0.93 (0.85)	0.905
Mini-AQLQ	18	**1.00 (1.39)**	**0.007**	0.40 (-0.53, 4.47)	3.13 (0.13, 3.40)	0.260
Full AQLQ	12	0.62 (1.00)	0.054	1.20 (-1.70, 1.91)	0.22 (-0.09, 0.63)	0.061
ED5Q5L-VAS	29	**7.14 (15.77)**	**0.021**	8.50 (15.32)	2.86 (17.63)	0.419
FEV1 (L)	31	0.09 (0.39)	0.214	0.17 (0.41)	-0.14 (0.23)	0.053
FEV1 (% of predicted)	31	3.16 (13.56)	0.204	**6.50 (-33.00, 33.00)**	**-5.00 (-18.00, 14.00)**	**0.033**
BEC (x10^9/L)	32	**-0.13 (-0.98, 0.08)**	**<0.001**	-0.13 (-0.98, 0.07)	-0.17 (-0.98, 0.08)	0.965
FeNO (ppb)	25	6.00 (-31.00, 161.00)	0.158	2.00 (-31.00, 161.00)	8.50 (-4.00, 20.00)	0.390

Data shown as mean (SD) where parametric testing was used and median (range) where non-parametric testing was used statistically significant result are highlighted in **bold**.
Abbreviations: SGRQ St. George's Respiratory Questionnaire; ACQ-5, Asthma Control Questionnaire-5; AQLQ, Asthma Quality of Life Questionnaire; VAS, Visual Analogue Scale; FEV, Forced Expiratory Flow; BEC, Blood Eosinophil Count; FeNO, Fractional Exhaled Nitric Oxide.

asthma clinic in the UK. Inhaler adherence was assessed using INCA devices if fractional exhaled nitric oxide (FeNO) was ≥45ppb prior to mepolizumab. Questionnaire scores including St George's Respiratory Questionnaire (SGRQ), Asthma Control Questionnaire (ACQ)-5, full or mini-Asthma Quality of Life Questionnaire (AQLQ) and ED5Q5L-VAS, FeNO, lung function and blood eosinophil count were recorded at baseline and three months. Responders are defined as ≥50% reduction in exacerbations or maintenance OCS dose after 12 months.

Results Thirty-three patients had their response assessed after 12 months of treatment. Mean reduction in maintenance OCS dose and exacerbation number were 43% and 3.4, respectively. 25 (76%) patients were responders and eight (24%) were non-responders. At three months, there was a clinically significant improvement in SGRQ (mean change -13.5±17.0, p=0.001), ACQ-5 (-0.9±1.5, p=0.004), mini-AQLQ (+1.0±1.4, p=0.007) and ED5Q5L-VAS (+7.1±15.8, p=0.021) scores. When scores were compared between responders and non-responders, mean SGRQ reductions were 16.5 and 2.5, respectively (p=0.105). Responders had a median change of 1.2 for full AQLQ score, compared to 0.2 in non-responders (p=0.061). Changes in SGRQ and full AQLQ score reached minimal clinically important differences in responders but not in non-responders. A trend towards greater improvement in FEV1 in responders was observed (+170 ml vs -140 mls, p=0.053). Percentage of predicted FEV1 improved in responders but not in non-responders (+6.5% vs -5%, p=0.033); baseline percentages did not differ significantly between the two groups (58% vs 68%, 95% CI -26.8 to 5.8, p=0.198).

Conclusion In a real-world severe asthma population, changes in SGRQ, full AQLQ and FEV1 are potential early predictors of mepolizumab response. Further analyses with greater patient numbers is needed for confirmation.

P95 BASELINE PREDICTORS OF RESPONSE TO OMALIZUMAB AND MEPOLIZUMAB IN SEVERE ADULT ASTHMA

[1]S Natarajan, [1]C Boddy, [2]A Murphy, [2]P Bradding, [1]S Siddiqui. *[1]Leicester NIHR Biomedical Research Centre (Respiratory theme), Glenfield Hospital, Leicester, UK; [2]University Hospitals of Leicester NHS Trust, Glenfield Hospital, Leicester, UK*

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Introduction and objectives Currently three main classes of biologics are licensed for severe asthma treatment in the UK. These classes target IgE (omalizumab) and IL-5/IL-5R (mepolizumab/reslizumab and benralizumab). The stratification factors that identify response to omalizumab and mepolizumab beyond the licensing criteria are poorly understood in clinical practice. However, the GINA 2019 severe asthma guidelines advocate clinical stratification when >1 biologic choice exists. The study aim was to evaluate the clinical characteristics that can predict response to omalizumab and mepolizumab.

Methods Over a prospective period (April 2017 to July 2019) we evaluated 105 patients initiated on biologic treatment (omalizumab n=27 [GINA 4=9, GINA 5=18 (oral corticosteroids (OCS) median (IQR):10 mg (10–15) and mepolizumab n=78 (GINA 4=13, GINA 5=65 (OCS:12.5 mg (10–15)] at a single severe asthma centre. Omalizumab response was assessed at 16 weeks as per NICE recommendations, and ongoing response at one year; according to MDT defined response markers. Mepolizumab response was assessed based on NICE criteria at 1 year. We looked at the GINA 2019 treatment selection criteria (omalizumab: blood eosinophils ≥260 cells/μl, FeNO ≥20ppb, childhood-onset asthma and mepolizumab: higher blood eosinophils, more exacerbations in the previous year, adult-onset asthma (≥18 years), nasal polyposis) as baseline stratifiers of early and 1 year response using Receiver operator curve analyses (ROC).

Results 35% of patients were eligible for both biologics based on baseline characteristics. When assessing response to biologics [R+ (responder)/R- (non-responder)]: we identified for omalizumab 80.8%/19.2% (16 weeks), 69.2%/30.8% (1 year) response rates and mepolizumab: 71.8%/21.2% (16 weeks), 75.9%/24.1% (1 year) response rates. None of the GINA 2019 baseline stratifiers were predictive of treatment response. The best predictor of response to omalizumab (AUC:0.810, p=0.054) and mepolizumab (AUC:0.746,p=0.006) was exacerbations in the previous year.

Conclusions We have identified that >1:3 patients are eligible for more than one class of biologic. Treatment failure rates in this highly refractory population at 1 year were relatively high with between 20–30% of patients failing therapy. Only exacerbations in the previous year was a significant predictor of treatment response to both biologics. Therefore, more effective decision support tools are required to guide biologic prescribing in clinical practice.

P96 IS LONG-TERM OMALIZUMAB THERAPY ASSOCIATED WITH INCREASED SPUTUM MICROBIOLOGY POSITIVITY?

[1]JPD Griffiths, [1]S Fowler, [1]G Tavernier, [2]D Allen, [1]L Holmes, [2]R Sheehan, [1]R Niven. *[1]University of Manchester, Manchester, UK; [2]Manchester University NHS Foundation Trust, Manchester, UK*

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Background Pseudomonas and other Gram-negative infections in chronic lung disease are associated with high levels of morbidity and mortality and are difficult to treat. Omalizumab has been available for more than 10 years and mepolizumab for the last 2 years as commonly used monoclonal antibodies in the treatment of severe asthma.

Aim To evaluate a clinical suspicion of an increased prevalence of *Pseudomonas spp.*(and other Gram-negative bacteria) seen among our patients on long term omalizumab compared to a comparable population (those treated with mepolizumab).

Methods The patient cohort was being treated at a large severe asthma service with either omalizumab (n=179) or mepolizumab (n=209). Sputum sample results from 01/01/17 to 11/02/19 on the electronic patient records for both groups were compared, along with demographic and disease severity data. Statistical analyses were performed using either Pearson's Chi-squared test or Student's t-test.

Results Comparing the demographic features of the two treatment groups, there was no significant difference in the FEV1 (1.94L in the omalizumab group vs 2.02L, p=0.39) or the proportion of patients with evidence of bronchiectasis on CT (22.5% vs 19.8%, p=0.21). However, the mepolizumab cohort was older (52.2 vs 48.8 years old, p<0.05).

There were 15.8 and 7.9 sputum samples/100 patients/year positive for potentially pathogenic bacteria in the omalizumab and mepolizumab groups respectively (p<0.05), and 3.7 versus 3.0 sputum samples/100 patients/year positive for Gram-negative bacteria (p=0.67).

Of the omalizumab patients, 3.4% and grew Gram-negative bacteria in their sputum over the study period compared to 1.4% of the mepolizumab patients. Three patients (1.7%) grew *Pseudomonas spp.* in the omalizumab group, compared to none in the mepolizumab group.

Abstract P96 Table 1 Percentage of patients taking either omalizumab or mepolizumab who were culture positive for specific bacterial organisms while on treatment from 01/01/17 to 11/02/19 (μ=607.0 treatment days for omalizumab, μ=285.7 treatment days for mepolizumab)

Organism	Omalizumab (n= 179)	Mepolizumab (n=209)
Haemophilus influenza	8.9%	2.4%
Moraxella catarrhalis	2.8%	0.5%
Streptococcus pneumonia	2.2%	1.0%
Staphylococcus aureus	2.8%	0.0%
Pseudomonas aeruginosa	1.7%	0.0%
Klebsiella pneumonia	0.6%	0.0%
Enterobacter cloaca	0.6%	0.0%
Escherichia coli	0.6%	0.5%
Serratia marcescens	0.0%	1.0%
Total Gram Negative Bacteria	**3.4%**	**1.4%**
Total Bacterial	**15.6%**	**6.2%**

Conclusion This retrospective study lends support to a clinical suspicion of an excess of the Gram-negative bacteria and *Pseudomonas spp.*in patients on long term omalizumab.

The cause could be a sampling bias, with more samples being performed on omalizumab patients, longer duration of follow up in a severe asthma service, or a possible switch to an infection phenotype in patients on long term anti-IgE therapy.

This clinical concern needs further evaluation in a multicentre longitudinal real life study.

P97 RITUXIMAB TREATMENT FOR EOSINOPHILIC GRANULOMATOSIS WITH POLYANGIITIS

[1]K Ward, [1]A Douglas, [1]A Tanna, [2]SP McAdoo, [2]C Pusey, [3]PW Ind. *[1]Imperial Healthcare NHS Trust, London, UK; [2]Renal and Vascular Inflammation Section, School of Medicine, Imperial College London, London, UK; [3]National Heart and Lung Institute, Imperial College London, London, UK*

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Introduction Eosinophilic granulomatosis with polyangiitis (EGPA) is a rare form of small vessel vasculitis. Rituximab is a monoclonal antibody directed against CD20 antigen on B cells; randomised clinical trials show it to be effective in vasculitis in ANCA positive patients and those with renal involvement. National Institute for Health and Care Excellence (NICE) guidance allows use of rituximab in some subtypes of small vessel vasculitis: granulomatosis with polyangiitis (GPA) and microscopic polyangiitis (MPA) but not EGPA. There is limited evidence for rituximab use for remission induction and maintenance in EGPA; this is off licence and not funded in England and Wales. Mepolizumab, an IL-5 antagonist (IL5A), is NICE-approved for eosinophilic asthma but not EGPA. A trial of mepolizumab in EGPA has shown more weeks of remission and reduced steroid dose.[1] In England, IL5A therapy is only available in severe asthma centres with limited access and large catchment areas. By contrast, rituximab is available in any hospital with a rheumatologist or nephrologist to prescribe it. Mepolizumab costs approximately £11000 per patient p.a. Biosimilar rituximab is much cheaper at approximately £1000 a dose: patients receive 1–4 doses a year.

Methods We identified all patients with EGPA from clinic records. We cross-referenced the EGPA list with a pharmacy list of all doses of rituximab given to vasculitis patients (either as MabThera or biosimilar Truxima) from 2/4/2008 to 1/6/2019.

Results See Table 1 for full results. We found 8 unique EGPA patients, 4 males and 4 females, age range 49–78 years who had received a total 20 doses of rituximab (2–4 doses/patient) over 7 years 2012–2019. No serious adverse effects of rituximab were reported. No patient had had IL5A treatment and none were receiving other biological agents. Previous patient treatments prior to rituximab included steroids, cyclophosphamide, azathioprine and mycophenolate.

Conclusions We found rituximab to be safe, for remission induction or maintenance in EGPA. We showed steroid sparing in some patients. Eosinophil reduction was gradual with limited effects on lung function. Rituximab is cost effective, compared with current asthma biologics, and

Abstract P97 Table 1 EGPA Patients Treated with Rituximab

Sex	Age	Sites affected at diagnosis	max Eos	ANCA	maintenance Eos	indication for RTX	effect of rituximab
M	64	rhinitis, nasal polyps, cardiac, rash, arthralgia, neuropathy, peritonitis, renal Bx	5.2	Equivocal	0.3–0.4	Relapsing disease	generally better
F	62	Dilated cardiomyopathy, eosinophilia, asthma, rhinitis, skin nodules	4.3	Negative	0.0–0.1	Relapsing disease	improved asthma, improved FEV1, PEF controlled, eos, decreased, pred reduced 10mg to 5mg
F	57	asthma, visual loss, neuropathy (sural nerve biopsy) max sinusitis, rash	5.4	Positive PR3 77	0.4–2.1	Relapsing disease	Eos 0.4-1.1
F	49	rhinosinusitis asthma, prev uveitis (recurrent)	2.2	Positive PR3 13	0.1	Steroid sparing	minimal, initially worse, pred same 7mg
M	78	asthma, pulm eosinophilia, sinus disease, pericardial effusion, weight loss, lethargy	8.8	ANCA	0.1–0.4	Remission induction	in remission, pred reduced
M	53	eyes, joints, rhinitis, asthma, pulmonary haemorrhage	2.7	Positive PR3 593	0–0.4 2014–15	Relapsing disease	on maintenance RTX, Eos remain 0.6-1.0, PR3 99-129
M	52	asthma, rhinosinusitis, pulm eosinophilia, CMR shows eos myocarditis also thrombus	9.0	Negative	0.1–0.3	Remission induction	remains in remission
F	63	asthma, skin Bx (rash) mononeuritis	9.3	Positive MPO25	0.1–0.4	Remission induction	remains in remission

Eos=eosinophils, pred=prednisolone, Rx=treatment, RTX=rituximab, PEX=plasma exchange, MP=methylprednisolone, cyclo=cyclophosphamide, CMR=cardiac MRI, Bx=biopsy, SOB=shortness of breath

requires further assessment in randomised, comparator, clinical trials.

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Malignant pleural disease

P98 INVESTIGATION OF UNILATERAL PLEURAL EFFUSION: WHAT CT SCAN SHOULD BE ORDERED?

[1]TJ Syer, [1]D Arnold, [2]A Edey, [1]N Maskell. [1]*Academic Respiratory Unit, University of Bristol, Bristol, UK*; [2]*Southmead Hospital, North Bristol NHS Trust, Bristol, UK*

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Background The BTS pleural disease guidelines recommend all patients with an undiagnosed unilateral pleural undergo computed tomography (CT) of the thorax with contrast.[1] However, there is no consensus on whether to include the abdomen and pelvis in the initial examination, with the BTS mesothelioma guidelines recommending this as an area that requires further research.[2]

Methods We performed a cross-sectional study using prospectively collected data between March 2008 and September 2018 of patients presenting with an undiagnosed pleural effusion. All patients consented for this study, underwent CT thorax, abdomen and pelvis as part of their standard work up and were followed for 12 months or until death, to ensure a robust diagnosis.

Results 249 patients were included; mean age 72 (IQR 66–80), 167 (67%) male, WHO PS 0–1 (62%), 2–3 (37%), 190 (76%) out-patients, 147 (59%) right sided, 87 (35%) previous asbestos exposure. The final diagnosis was malignancy in 159 (64%).

The CT thorax alone was consistent with the final diagnosis in 171 (69%). There were clinically significant findings below the costophrenic recesses in 59 patients (23.6%).

Including the abdomen increased the diagnostic yield of clinically significant findings by 11.6% (n=29). Within the malignant group additional findings were of a primary tumour (6), upstaging of disease (19) and alternative biopsy sites (2).

Including the pelvis resulted in 30 additional findings (12%), primary tumours (11), upstaging of disease (13) and alternative biopsy sites (3).

14 (5.6%) had an underlying ovarian cancer – 86% would have been missed if only CT chest and abdomen was performed. In females the pelvic CT revealed additional findings in 18 (22%).

Abstract P98 Table 1 Summary of multinomial logistic regression of possible predictive factors for clinically significant findings found in the abdomen and pelvis.(*p-value <0.05)

	Significant Findings by CT cut-off				
	Chest only	**Abdomen**	***p*-value**	**Pelvis**	***p*-value**
Total (n=249)	**190 (76.3)**	**29 (11.6)**		**30 (12.0)**	
Age (range)	73 (26–95)	70 (45–89)	0.193	71 (33–90)	0.137
Sex (%)					
Male	135 (71.1)	20 (69.0)		12 (40.0)	
Female	55 (28.6)	9 (31.0)	0.788	18 (60.0)	0.034*
Effusion Side (%)					
Right	113 (59.5)	17 (58.6)		17 (56.7)	
Left	77 (36.8)	12 (41.4)	0.978	13 (43.3)	0.768
Previous	31 (16.3)	6 (20.7)	0.659	7 (23.3)	0.710
Malignancy (%)					
Asbestos	77 (40.5)	7 (24.1)	0.118	3 (10.0)	0.050
Exposure (%)					

Conclusion CT thorax, abdomen and pelvis has a considerably higher diagnostic yield than more limited sequences in the work up of unilateral pleural effusions and this paper lends support to its inclusion for standard of care.

P99 BEYOND THE PLEURA: BEDSIDE ULTRASOUND EVALUATION OF EXTRAVASCULAR LUNG WATER IN PATIENTS UNDERGOING HAEMODIALYSIS

[1]JP Corcoran, [2]M Hew, [3]B Attwood, [4]M Shyamsundar, [5]S Sutherland, [5]K Ventura, [6]R Benamore, [6]V St Noble, [1]HE Piotrowska, [5]CW Pugh, [7]CB Laursen, [6]FV Gleeson, [1]NM Rahman. *[1]University of Oxford Respiratory Trials Unit, Oxford, UK; [2]Department of Respiratory Medicine, The Alfred Hospital, Melbourne, Australia; [3]Department of Anaesthesia and Critical Care, South Warwickshire NHS Foundation Trust, Warwick, UK; [4]Centre for Experimental Medicine, Queen's University, Belfast, UK; [5]Oxford Kidney Unit, Oxford University Hospitals NHS Foundation Trust, Oxford, UK; [6]Department of Radiology, Oxford University Hospitals NHS Foundation Trust, Oxford, UK; [7]Department of Respiratory Medicine, Odense University Hospital, Odense, Denmark*

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Background There is growing interest in bedside thoracic ultrasound (TUS) beyond assessment of pleural disease or as an adjunct for interventions. TUS is used by some clinicians as an extension of physical examination, assessing the lung with results used to influence clinical decisions. Despite the publication of training curricula and consensus guidelines,[1] there are few objective and robust data to demonstrate the utility of TUS in this area of clinical practice.

Methods 30 patients undergoing haemodialysis were prospectively recruited to an observational cohort study (NCT01949402; REC 13/SC/0319). Patients underwent standardised TUS assessment before, during and after haemodialysis; a total lung B-line score was generated, alongside a binary label of whether appearances were consistent with interstitial syndrome or not. TUS video clips were recorded and scored by two blinded expert clinician sonographers asked to follow consensus statement guidance.[1] Low-dose non-contrast CT thorax pre- and post-dialysis was used as the 'gold standard' radiologic comparison, and completed a questionnaire addressing satisfaction with TUS assessment.

Results TUS detected a progressive reduction in B-line score in most patients undergoing haemodialysis, with moderate correlation with the volume of fluid removed once those patients with minimal B-lines pre-dialysis were discounted (figure 1). By contrast, there was no lung parenchymal change evident on CT pre- and post-dialysis in any of the patients studied. Interobserver agreement was good for total B-line score (ICC 0.63, 95% CI 0.52–0.72) and diagnosing interstitial syndrome (κ=0.60, 95% CI 0.47–0.73). TUS assessment was acceptable to patients, with none considering it time-consuming or unwilling to have it again if needed.

Conclusion This is the first study to demonstrate, using blinded outcome assessment, that TUS can detect variation in the appearance of the lungs, manifest as a B-line score, caused by changes in fluid status during haemodialysis, and that TUS appears to be more sensitive than CT. Further studies are needed to investigate the utility of TUS as a diagnostic tool in this and similar clinical contexts and how it might impact on patient care and outcomes.

Funding Esaote UK; Rosetrees Trust, UK

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P100 VARIATIONS IN THE RATE OF PLEURAL INFECTION REFERRALS AND RELATION TO INFLUENZA HOSPITALISATIONS SEASONAL TRENDS

M Hassan, JP Corcoran, C Daneshvar. *University Hospitals Plymouth, Plymouth, UK*

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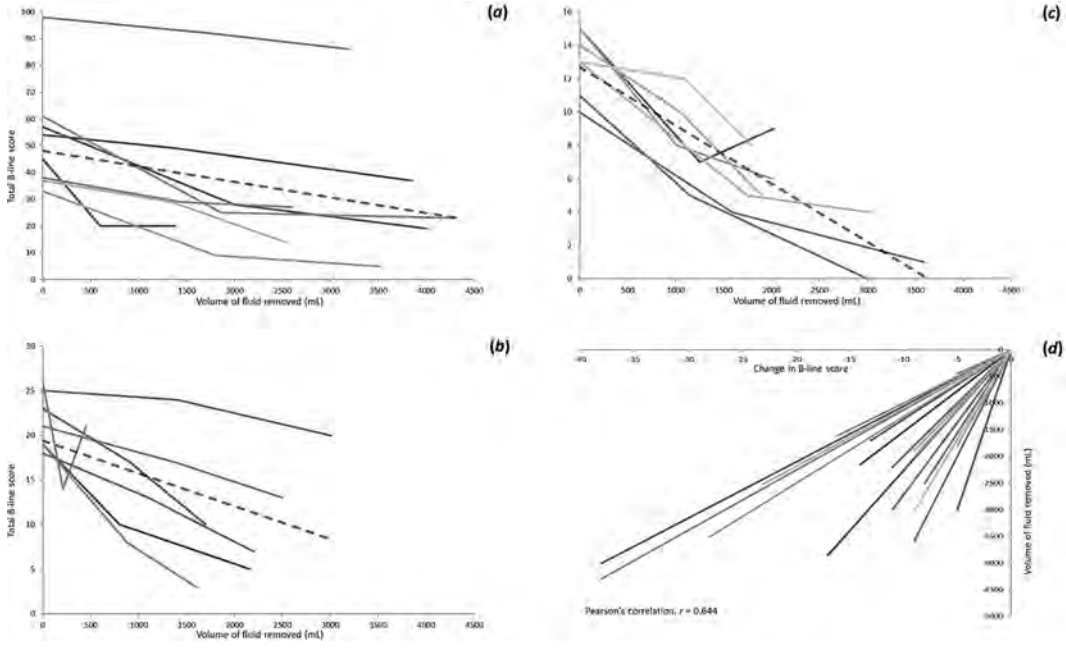
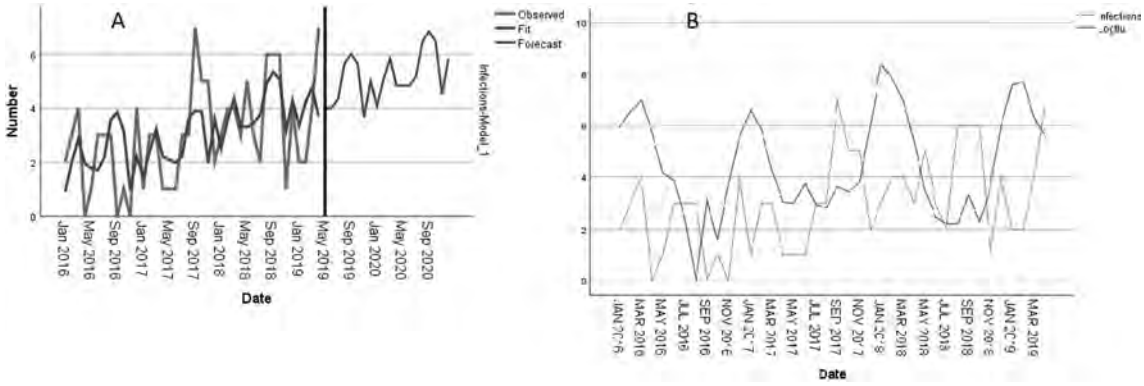
Background Pleural infection is a condition associated with significant morbidity and burden on healthcare resources. This study aimed to investigate whether the rate of pleural infection diagnosis in a tertiary hospital varies with time and whether it is related to the national burden of hospitalisations due to influenza.

Methods The reporting database of our pleural unit was searched for cases of pleural infection defined by the presence of frank pus or a pleural fluid pH <7.2 in the absence of other causes. Exponential smoothing was used to inspect for



Abstract P99 Figure 1



Abstract P100 Figure 1

variations in pleural infection diagnosis and to forecast volume of referrals in the following two years. The monthly rates of influenza hospitalisations in England were retrieved from the website of Public Health England.

Results Between Jan 2016 and May 2019, 121 patients with pleural infection were diagnosed, of which 70 (57.8%) were males. The mean age was 69±13.8 years. In 106/121(88%) of the cases a low pleural fluid pH was noted while 15/121 (12%) had frank empyema. The rates of pleural infection varied by month, but overall a trend was observed for an increase over time (R square of the model 0.311) (Panel A). The log rates of influenza hospitalisations superimposed on pleural infection data did not show a clear direct correlation, but suggests possible peaks of pleural infection diagnosed following seasons of high national influenza rates (Panel B). However, the median (IQR) rate of infection per month during flu and non-flu season were 3 (2–4) and 3 (1–5) respectively.

Conclusion The rate of diagnosis of pleural infection appears to be rising over time, with a degree of temporal variation that could be related to influenza activity.

P101 INFLAMMATORY PLEURAL EFFUSIONS: DIFFERENTIATING THE DIAGNOSIS

[1]D Addala, [1]RM Mercer, [1]Q Lu, [1]G Shepherd, [1]R Varatharajah, [1]A Thayanandan, [1]M Hassan, [1]E Bedawi, [1]D Mccracken, [1]R Asciak, [2]N Rahman. *[1]Oxford University Hospitals, Oxford, UK; [2]Oxford Respiratory Trials Unit, Oxford, UK*

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Introduction Diagnosing pleural infection can be challenging in the clinical setting. Positive microbiology is the gold standard, but pleural fluid culture requires days to establish and can be negative in 40% of patients with pleural infection. Rapid biomarker testing showing low pH, low glucose and very high LDH in pleural fluid is used to diagnose pleural infection in the correct clinical setting.

Objectives To establish the diagnostic accuracy of low pH, low glucose and very high LDH in pleural fluid for pleural infection and establish the common alternative diagnoses leading to this biochemical pattern.

Methods A retrospective analysis of pleural effusion results from a UK tertiary centre over a three year period. Pleural

Abstract P101 Table 1 Frequency of infection versus alternative diagnosis in pleural effusions with either pH<7.2, Glucose<2.2 mmol/L, or LDH>1000 IU/L

Diagnosis		pH or Glucose Low or LDH>1000	All effusions with pH<7.2	All effusion with Glucose<2.2	All effusions with LDH>1000
Infective	**All Infective**	**89 (51%)**	**41 (87%)**	**27 (47%)**	**69 (53%)**
	CPPE	78	38	23	59
	PPE	11	3	3	10
Malignant Pleural Effisusion	**All MPE**	**53 (31%)**	**2 (4%)**	**17 (30%)**	**39 (30%)**
	Lung	16	1	3	9
	Mesothelioma	10	1	5	7
	Breast	5	0	2	3
Other	**All other**	**31 (18%)**	**4 (9%)**	**13 (23%)**	**21 (17%)**
	CTD	6	1	2	5
	Critical illness	7	1	1	6
	Combination	4	2	1	2
Total		173	47	57	129

Abbreviations: Chronic parapneumonic pleural effusion (CPPE), Parapneumonic pleural effusion (PPE), Malignant pleural effusion (MPE), Connective tissue disease (CTD)

fluid results with either pH<7.2, Glucose <2.2 mmol/L or LDH>1000 IU/L (total 173) were assessed to establish the frequency of non-infective final diagnoses and the relative specificity of each parameter calculated for the diagnosis of pleural infection.

Results Of effusions with **either** a low pH, low glucose or LDH>1000 (n=173), the most common causes were infective 51% (n=89), with the most frequent alternative diagnosis malignant pleural effusion (MPE) 31% (n=53). Of note 10% (n=19) had co-existing malignancy and infection. The most common causative MPEs were lung 51%, mesothelioma 32% and breast 16%.

In all pleural effusions with a pH<7.2 (n=47), 13% were non infective diagnoses with 4% MPE. In all pleural effusions with glucose<2.2 (n=57), 53% were due to non-infective diagnoses, and 30% due to MPE. In the cohort with pleural fluid LDH>1000 (n=129), 47% were non infective in aetiology, 30% due to MPE.

Table 1 illustrates further specific diagnoses within each cohort.

Conclusions Pleural effusions with a low pH, low glucose or very high LDH often have a non-infective cause. While it may be appropriate to commence antimicrobial treatment, our results suggest that malignancy should be actively investigated. Pleural fluid pH<7.2 was the most specific marker for pleural infection. Further work is required to establish whether biomarkers such as fluid c-reactive protein and procalcitonin provide added value in diagnosing pleural infection, especially in the cohort of patients with malignancy.

P102 DISCORDANT EXUDATIVE PLEURAL EFFUSIONS: DEMOGRAPHICS AND AETIOLOGY

[1]D Addala, [1]RM Mercer, [1]Q Lu, [1]G Shepherd, [2]O Castro, [1]R Varatharajah, [1]A Thayanandan, [1]M Hassan, [1]E Bedawi, [1]D Mccracken, [1]R Asciak, [1]M Tsikrika, [1]R Hallifax, [2]N Rahman. [1]*Oxford University Hospitals, Oxford, UK*; [2]*Oxford Respiratory Trials Unit, Oxford, UK*

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Introduction Light's criteria is widely utilised to differentiate pleural effusions as exudative or transudative. In a subsect of pleural effusions, there is discordance between protein and lactate dehydrogenase (protein high, LDH low or vice versa). The causes of this biochemical pattern are not well established, nor are the mechanisms well understood.

Objectives To establish the incidence of discordant pleural effusions, and determine demographics and common aetiologies leading to discordance.

Methods We performed a retrospective analysis of initial pleural fluid samples sent between 2015–2017 (n=995) from a UK tertiary centre. 792 of these were exudative based on Light's criteria. These were subdivided into concordant or discordant exudates, with analysis of demographics and final diagnoses in each group. Low protein was defined as <30g/L and low LDH <170IU/L according to local assays.

Results 29% (n= 229) of exudative effusions displayed discordance in either LDH or protein. 33% of these (n=75) had low protein with high LDH and 67% (n= 154) had low LDH with high protein.

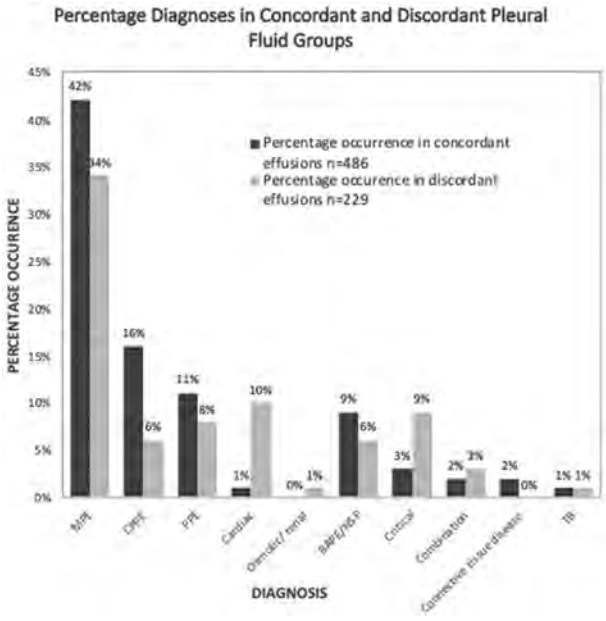
The median age was significantly higher in the discordant group (75 years vs 70 years).

In the discordant group with high protein, the most common diagnoses were malignant pleural effusion (MPE) 38% (n=59), cardiac/osmotic related effusions 13% (n=19), and infection 7% (n=12).

The most common diagnoses in the discordant group with high LDH were infection 37% (n=30), MPE 24% (n=18), and cardiac/osmotic related 7% (n=6).

In the concordant group (n=486), frequent diagnoses were MPE 42% (n=206), Infection 37% (n=132) with cardiac/osmotic related effusions only representing <2% (n=8).

Figure 1 compares the percentage occurrence of specific diagnoses in concordant and discordant groups.



Abstract P102 Figure 1 Frequency of diagnoses within concordant and discordant pleural fluid groups
Abbreviations: Malignant pleural effusion (MPE), chronic parapneumonic pleural effusion (CPPE), parapneumonic pleural effusion (PPE), benign asbestos pleural effusion (BAPE), non specific pleuritis (NSP), post critical illness (critical)

Conclusions A significant proportion of pleural effusions that are initially classified as exudative display discordance between LDH and protein. Discordance occurs in older patients, possibly due to increased capillary permeability with age. Within discordant groups, more effusions occurred secondary to global fluid overloaded states (11% of discordant versus <2% concordant). Further analysis beyond Light's criteria is warranted, particularly with increasing age. In patients with discordant pleural fluid, attention should be paid to cardiac and renal investigations to ensure the correct aetiology is determined.

P103 ANTIBIOTIC USE AND COMORBID PLEURAL INFECTION IN PATIENTS WITH MALIGNANT PLEURAL EFFUSION

[1]V George, [2]R Mercer, [2]E Bedawi, [1]A Dudina, [1]N Rahman. [1]*Oxford Centre for Respiratory Medicine, Oxford University Hospitals, Oxford, UK*; [2]*Oxford Respiratory Trials Unit, Oxford, UK*

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Introduction and objectives Malignant pleural effusion (MPE) affects 15% of all patients with cancer. (1) Despite this, diagnosis can be difficult and patients are often treated with

antibiotics for presumed pleural infection. While many of these cases represent initial misdiagnosis, there is a subset of patients with MPE who have comorbid infection at presentation.

We attempted to quantify the proportion of patients with MPE who receive antibiotics at presentation, and evaluate how many had evidence of pleural infection.

Methods All pleural fluid samples collected at our centre over the 3 years prior to December 31 2017 were retrospectively reviewed. Patients with MPE were examined to identify those that received antibiotics for pleural infection prior to their pathological diagnosis. The pleural fluid chemistry and microbiology and response to treatment were then reviewed.

Results 1352 pleural fluid samples were collected over the 3-year period in 1061 patients. 335 of these individuals were diagnosed with MPE. Preliminary analysis of 67 cases demonstrated that 15 (22%) received antibiotics during hospital presentation with effusion. Of these, none had positive pleural microbiology or macroscopic pus, 1 (6.6%) had a pH <7.20, and 4 (26.6%) had a glucose <3.3 mmol/L.

Three individuals received a 4–6 week course of antibiotics for presumed comorbid empyema, with 1 demonstrating a significant reduction in inflammatory markers. The remaining 12 (80%) received shorter courses of antibiotics, without clear evidence of infection.

Conclusions MPE presents with non-specific symptoms and patients can often have raised inflammatory markers. Even in the tertiary setting our ability to promptly and accurately differentiate malignancy from pleural infection is poor and often leads to unwarranted antibiotic therapy.

This is likely to be associated with diagnostic delay, antibiotic related morbidity and increased healthcare costs. In most cases presumptive treatment is commenced well before the involvement of specialist pleural services. Increased education of frontline staff and new strategies, such as the routine addition of serum procalcitonin and increased acquisition of pleural biopsies, should now be studied.

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P104 COMPUTED TOMOGRAPHY EVIDENCE OF LYMPHANGITIS ASSOCIATED TO MALIGNANT PLEURAL EFFUSION: ITS PREVALENCE AND IMPACT ON SURVIVAL

[1]O Castro-Anon, [1]A Dudina, [1]V George, [1]R Mercer, [1]D McCracken, [1]R Asciak, [1]M Hassan, [1]R Hallifax, [1]N Russel, [2]F Rodriguez-Panadero, [1]N Rahman. *[1]Pleural Unit, Oxford University Hospitals NHS Foundation Trust, Oxford, UK; [2]Unidad Médico-Quirúrgica de Enfermedades Respiratorias, Hospital Universitario Virgen del Rocío. IBiS. CIBER de Enfermedades Respiratorias (CIBERES), Instituto de Salud Carlos III., Seville, Spain*

10.1136/thorax-2019-BTSabstracts2019.247

Introduction For the treatment of malignant pleural effusion (MPE), it is relevant to know prognosis in order to determine the best treatment approach. The general prognosis of patients with lymphangitic carcinomatosis is poor. The prevalence and prognosis of lymphangitis in patients diagnosed with MPE is not known.

Objectives To determine the prevalence of computed tomographic (CT) lymphangitis in patients diagnosed with symptomatic MPE and to assess prognosis. Secondary objective: to evaluate other radiological findings such as trapped lung, thoracic lymphadenopathy, pulmonary nodules, pleural thickening, pleural nodules and pericardial effusion.

Methods This is an observational, retrospective, single-centre study of consecutive patients diagnosed with MPE, between January 2015 and December 2017; the chest CTs were reported by thoracic radiologists. Follow-up occurred until death or at least one year.

Results 298 patients diagnosed with MPE were included (mean age 72; 50.7% women). The LENT score was low in 15.7% cases, moderate in 62.2% and high in 22.1%. Lymphangitis was identified in 10.4% of the cases: 51.6% ipsilateral, 12.9% contralateral and 29% bilateral; its prevalence was higher in patients with lung cancer and breast cancer (19.4%). Other abnormal chest CT findings were noted in 93.9%: 54.4% thoracic lymphadenopathy, 52.5% pulmonary nodules, 48.5% pleural thickening, 35,8% pleural nodularity, 21.4% trapped lung, 18.5% lung mass, 12.5% emphysema and 9.1% pericardial effusion. 250 patients (85.9%) died: 29 with lymphangitis (93.5%) and 221 without lymphangitis (85%). Lymphangitis was associated with a higher mortality within one month after diagnosis (p=0.036) but it was not after 3 months (p=0.073), 6 months (p=0.230) and one year (p=0.196). The presence of thoracic lymphadenopathy (p=0.030) and pulmonary nodules (p=0.004) had an increased risk of mortality.

Conclusions Lymphangitis accounted for approximately 10% of patients with MPE and it was associated with poor survival only within one month. Other abnormal chest CT findings were noticed frequently; those patients with thoracic lymphadenopathy and pulmonary nodules had poor prognosis. Prospective studies are needed to confirm the impact on survival of lymphangitis in patients with MPE.

Acknowledge European Respiratory Society (ERS CTF201804–00345).

P105 DOES THE EXTENT OF PLEURAL INVOLVEMENT BY MALIGNANCY AFFECT PLEURODESIS OUTCOME IN PATIENTS WITH PLEURAL EFFUSION? A SYSTEMATIC REVIEW

[1]M Hassan, [2]M Gadallah, [3]E Harriss, [1]JP Corcoran, [4]NM Rahman. *[1]University Hospitals Plymouth, Plymouth, UK; [2]Alexandria Faculty of Medicine, Alexandria, Egypt; [3]Bodleian Healthcare Libraries, Oxford, UK; [4]University of Oxford, Oxford, UK*

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Background The British Thoracic Society Pleural guidelines recommend attempting pleurodesis in patients with malignant pleural effusion (MPE) whose chest X-rays show evidence of less than 50% lung entrapment,[1] suggesting that more extensive entrapment would predict pleurodesis failure. It is not clear, however, how far the extent of pleural involvement by malignancy affects pleurodesis outcome.

Methods A systematic review of papers available on PubMed, Embase and Cochrane databases published in English on the subject of pleurodesis was carried out(protocol CRD42018115874). Only papers with clear definition of pleurodesis success with 20 or more patients were included.

Results The search returned 972 titles. Six papers (reporting on 1155 patients) studying MPE due to different primaries contained data on the relation between tumour burden

Abstract P105 Table 1

Author	No	Study Design	Agent	% success	Direction of effect
Sanchez-Armengol 1993	125	Prospective	talc	87%	No significant correlation between tumour score and time to recurrence of effusion
Viallat 1996	327	Retrospective	talc	90.2%	Massive cancer involvement of pleural cited as main cause of failure
Antony 2004	23	Retrospective	talc	70%	Successful pleurodesis (low tumour burden score 60%, high score 40%), Failed pleurodesis (all high score)
Bielsa 2011	563	Retrospective	talc and doxycycline	87 and 78%	Pleural tumour burden score associated with success with OR of 0.81 (0.68-0.98)
Hatata 2016	30	Prospective	doxycycline	86.4%	Tumour burden score had no effect on success (no stats)
Arellano-Orden 2017	87	Prospective	talc	69%	Higher visceral burden associated with failure in 53% ($p < 0.04$)

assessed during thoracoscopic examination of the pleural cavity. Five of the included papers utilised a score developed previously.[2] Table 1 summarises the included studies and the effect measures reported. There was no uniform way of interpreting the results of the pleural burden score.

Conclusion Only papers of retrospective design linked higher pleural tumour burden with pleurodesis failure. More robust evidence is required from prospectively designed studies.

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P106 CLINICAL OUTCOMES OF PATIENTS DIAGNOSED WITH NON-SPECIFIC PLEURITIS FOLLOWING MEDICAL THORACOSCOPY

[1]Z Lin, [1]T Rajaratnam, [2]K Slaven, [3]S Karia, [4]T Pulimood, [4]M Knolle, [4]J Herre. *[1]University of Cambridge, Cambridge, UK; [2]Mesothelioma Service, Royal Papworth Hospital, Cambridge, UK; [3]Department of Radiology, Addenbrookes Hospital, Cambridge, UK; [4]Department of Respiratory Medicine, Addenbrookes Hospital, Cambridge, UK*

10.1136/thorax-2019-BTSabstracts2019.249

Background Medical thoracoscopy (MT) is the gold standard investigation for exudative pleural effusions of cryptic origin. A diagnosis of non-specific pleuritis (NSP) however has unclear long-term outcomes, with some NSP patients harbouring occult mesotheliomas. The reported percentage of pleural malignancy following NSP ranges from 3–18% in studies with varied MT and biopsy approaches.

Objectives We retrospectively analysed the rate of pleural malignancy following an NSP diagnosis from a standardised MT procedure in a UK population from the east of England, a region with a high recorded mesothelioma rate.

Methods Between March 2009 to March 2019, 729 patients with exudative pleural effusions underwent standardised rigid MT. Full thickness biopsies were taken from multiple sites. We defined NSP by the same histological criteria described by Davies et al. 2010.

Results A definitive diagnosis was reached in 689 patients (95%). Patients with known malignancies, CTDs and TB were then excluded. 213 patients (29%) were diagnosed with NSP and followed up for a mean of 40±31 months (range 0–114). 13 (6%) subsequently developed mesotheliomas and 1 an adenocarcinoma after a mean interval of 135±128 days. The false negative rate for pleural malignancy was 2.86%.

Conclusion This is the largest single centre series of patient outcomes for NSP described to date. The percentage of false negatives was lower than predicted from most previous studies. We speculate this could be due to differences in population including asbestos exposure, sample size, diagnostic latency, biopsy approach and/or histological analysis. There is a need to develop better risk stratification for future malignancy in NSP to allow targeted follow-up of patients. We are pursuing immunohistological means of doing this.

P107 DESIGNING AN OPTIMUM PLEURAL PATHWAY: IMPACT OF ONE STOP PLEURAL CLINIC AND RADIOGRAPHER PATHWAY ON TIME TO DIAGNOSIS

R Banka, C Hardy, C Twose, R Tovell, E Smerdon, L Idris, E Mishra. *Norfolk and Norwich University Hospital, Norwich, UK*

10.1136/thorax-2019-BTSabstracts2019.250

Introduction The 'radiographer pathway' was set up in 2017 at Norfolk and Norwich University Hospital to expedite access to pleural services. This pathway consists of initial radiographer review of all chest X-rays and, if the X-ray shows a significant effusion, the radiographer refers directly to the on call respiratory registrar. One stop pleural clinics were also developed, where patients undergo respiratory review and initial intervention (aspiration/ultrasound guided biopsy) at a single appointment.

Aim This audit aimed to assess the time from X-ray to diagnosis for patients with a new pleural effusion referred via different pathways – GP, tertiary and radiographer and those attending a one stop pleural clinic.
Methods Retrospective review of prospectively collected database of patients referred to Pleural Clinic with an undiagnosed pleural effusion from January 2018 to April 2019.
Results 110 new referrals were received. The median time from X-ray to diagnosis for patients referred via the radiographer pathway was significantly less than for GP and tertiary (15, 45 and 27 days respectively, $p<0.001$) (Table 1). Thirty-two patients needed further biopsies (thoracoscopy/computer tomography guided) for definitive diagnosis. Sixty-four out of 110 patients came to a one stop pleural clinic. The median time from x-ray to diagnosis for patients attending a one stop pleural clinic compared to those who had separate respiratory review and intervention was 25 (IQR 15–39) and 36 days (IQR 25–53) respectively. For patients diagnosed with a malignant pleural effusion, the 62 day pathway was breached in 3/20 (15%), 6/16 (38%) and 10/22 (45%) patients referred via the radiographer, tertiary and GP pathway respectively.

Abstract P107 Table 1 Summary of time in days through different points in the patient pathway for patients referred via GP, tertiary and radiographer pathways for patients with a final diagnosis of either malignant or non-malignant pleural effusions

	GP	Tertiary	Radiographer
Number of patients	45	35	30
One stop pleural clinic	21	27	16
	Median time, days (interquartile range)		
X-ray to referral	8 (2–13)	3 (0–16)	0 (0–0)
Referral to respiratory review	13 (8–18)	7 (5–11)	0 (0–5)
Respiratory review to initial intervention	3 (0–7)	0 (0–0)	0 (0–7)
Initial intervention to diagnosis	14 (3–27)	4 (2–20)	7 (2–13)
X-ray to diagnosis	45 (28–57)	27 (15–42)	15 (9–23)
Malignant pleural effusion			
Number of patients	22	16	20
	Median time, days (interquartile range)		
X-ray to referral	5 (1–12)	6 (0–17)	0 (0–0)
Referral to respiratory review	11 (7–16)	6 (4–7)	0 (0–5)
Respiratory review to initial intervention	0 (0–5)	0 (0–0)	2 (0–7)
Initial intervention to diagnosis	16 (4–27)	8 (3–17)	7 (3–15)
X-ray to diagnosis	38 (27–52)	26 (12–43)	19 (12–22)
Benign pleural effusion			
Number of patients	23	19	10
	Median time, days (interquartile range)		
X-ray to referral	9 (2–15)	1 (0–16)	0 (0–0)
Referral to respiratory review	14 (11–21)	10 (6–16)	0 (0–4)
Respiratory review to initial intervention	5 (0–9)	0 (0–5)	0 (0–4)
Initial intervention to diagnosis	9 (2–24)	3 (2–16)	6 (2–9)
X-ray to diagnosis	50 (35–59)	35 (17–41)	11 (9–22)

Discussion Referral via the radiographer pathway lead to earlier diagnosis as compared to referrals via the GP and tertiary pathways and had lesser breach of the 62 day pathway for malignant effusions.

P108 SURVIVAL OUTCOMES IN PATIENTS WITH HIGH RISK LENT MALIGNANT PLEURAL EFFUSIONS MANAGED WITH INDWELLING PLEURAL CATHETER INTERVENTION; A SPECIALIST CENTRE EXPERIENCE

HS Hardeep Kalsi, M Park, H Owles, S Wyndham, C Ross. *Imperial College Healthcare NHS Trust, London, UK*

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Introduction Management of malignant pleural disease has advanced over the past decade with the role of a pleural specialist service becoming increasingly essential in efforts to optimise patient care. The use of indwelling pleural catheters (IPC) has changed the arena in which malignant pleural effusions (MPE) can be managed, allowing more patient autonomy and less use of hospital resources. The LENT scoring system, validated in 2014, is often used to guide decision making in patients with MPE. Current ATS recommendations suggest IPCs are not suitable in individuals with a 'very short survival' prognosis however this determination is variable and is an example of where the LENT scoring system may be involved.
Methods Retrospective analysis was carried out on patients who underwent IPC insertion at our institution between 2016 and 2019. All patients were seen in the specialist pleural service and underwent subsequent intervention. Data collected included primary cancer diagnosis, date of first pleural aspiration, LENT score, observed complications, IPC removal date if applicable and date of death to calculate survival time.
Results 58 patients underwent successful IPC insertion of which 5 were for non-malignant disease (2/5 refractory heart failure, 3/5 advanced liver cirrhosis). The remaining 53 patients all had a confirmed pathological diagnosis of malignant pleural effusion. At the time of submission, 8 patients remained alive and were excluded from analysis leaving a remaining 45 cases. Using LENT assessment 13/45 classed as high risk, 31/45 as moderate and 1/45 as low. The observed average survival time in high risk patients was 122 days and median 93 days. This was notably higher than the anticipated 44 days predicted median survival time noted in the literature.
Conclusion Our data suggests that high risk patients according to LENT assessment were more likely to live longer following IPC intervention and aftercare. This suggests that use of prognostic assessment tools may be ineffective in this sub-group and should be employed with caution. The improved patient outcomes reinforce the benefit of a dynamic responsive pleural service. They may also reflect upon the increased recognition of tumour heterogeneity alongside the recent advent of novel molecular based therapies.

P109 THE EFFECT OF PLEURAL FLUID ON SURVIVAL IN PATIENTS WITH A MALIGNANT PLEURAL EFFUSION

N Sreejith, R Mercer, Q Lu, G Shepherd, D Addala, O Castro, R Vartharajah, A Thayanandan, M Hassan, E Bedawi, R Asciak, M Tsikrika, R Hallifax, NM Rahman. *Oxford University Hopsitals, Oxford, UK*

10.1136/thorax-2019-BTSabstracts2019.252

Background Malignant pleural effusions (MPEs) are a sign of advanced malignant disease associated with high mortality and poor clinical outcome. Management of MPEs focuses on achieving symptomatic and radiological control of pleural

fluid. Recent in vitro evidence has implicated the presence of even small volumes of pleural fluid in mesothelioma progression.[1] This analysis investigated whether the presence of pleural fluid is associated with poorer survival in all MPE.

Methods A review of all patients diagnosed with MPE between 2015–2017 was performed. Patients were grouped as either having achieved fluid control or not from initial radiological diagnosis until death. Kaplan Meier and Cox regression analysis was performed to assess the effect of a) achieving fluid control and b) duration of fluid, on patient survival.

Results Analysis of the first 100 patients in our data set included 20 mesotheliomas, 27 breast, 4 gynaecological, 8 GI, 31 lung and 10 other cancers. 27 patients achieved fluid control before death and 70 did not. The group with fluid control comprised of those with IPC removal (3), successful pleurodesis (18) and resolution without pleurodesis (6), whereas the group without fluid control included those with ongoing IPC drainage (21), stable without intervention (2) and no resolution (47) at death. Three had no radiology after the initial aspiration and were thus excluded. Fluid control was associated with greater survival in Kaplan Meier survival curve analysis ($p=0.009$). Similarly, the Cox regression analysis demonstrated that successful control is associated with survival ($p<0.001$). However, patients who were exposed to pleural fluid for a longer duration had an increased survival ($p<0.001$).

Conclusion Our findings suggest an association between pleural fluid control and greater survival. However, a statistically significant association was also found between time exposed to pleural fluid and greater survival. We cannot exclude the possibility of unknown confounders, and time dependant analysis may demonstrate different results. Further investigations with similar subgroups such as 'ongoing IPC drainage vs. IPC removal' may prove useful, and further analysis are ongoing.

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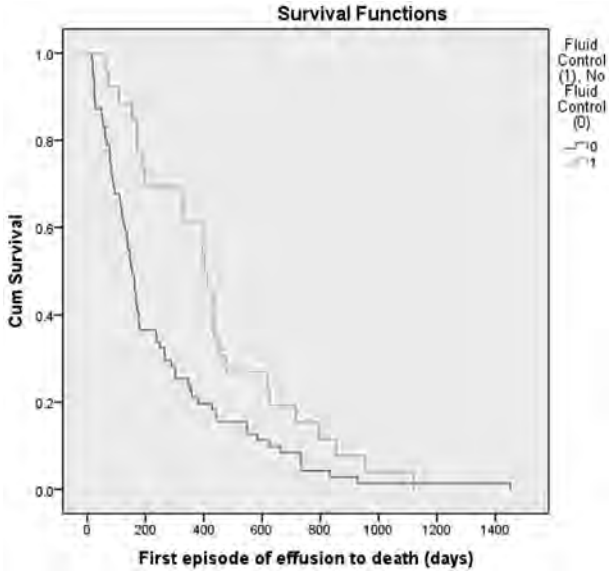


Abstract P109 Figure 1 Kalplan-meier plot showing survival in fluid control vs. no fluid control patient groups

P110 ESTABLISHING A PLEURAL NURSE SERVICE

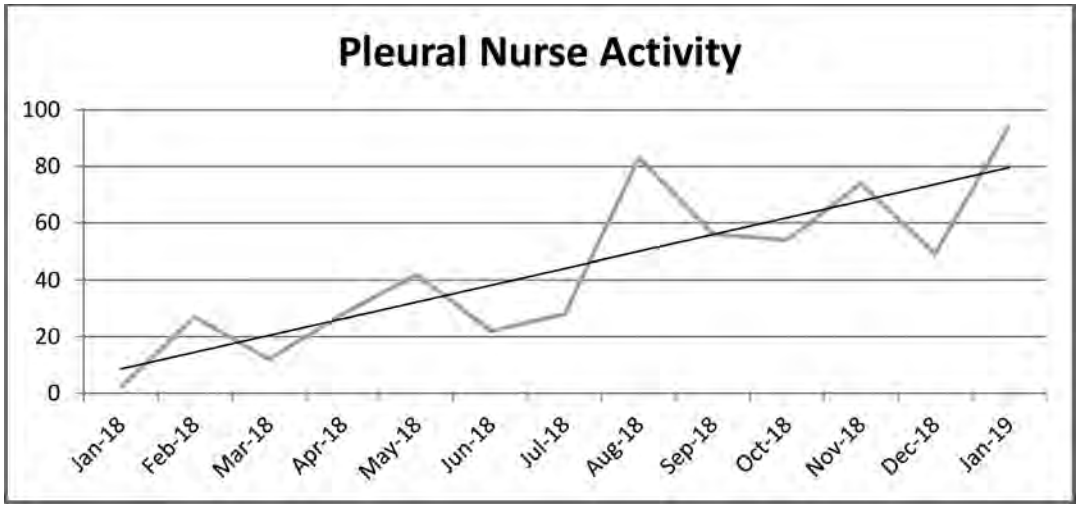
A LeBon, RJ Hallifax, T Nicholson, L Curry, J Park. *Royal Berkshire Hospital, Reading, UK*

10.1136/thorax-2019-BTSabstracts2019.253

Introduction In 2016 a retrospective review of pleural procedures was undertaken to identify possible areas for improvement. In 2017, funding was approved for a nurse-led pleural service and appointed to in December 2017. Following an initial training period, the pleural nurse has been an independent practitioner since August 2018. We report key performance indicators from 2018 and the first 6 months of 2019.

Methods Pleural procedural contacts and activity were prospectively collected from January 2018 and compared to data from 2016. Records of number and source of referrals, type of procedure and indication were reviewed. In addition, patients were surveyed to collect feedback on their experience of the service.

Results Pleural activity has been demonstrated to have increased this year; 241 to June 2019; 278 in 2018 and 287 in 2016. At least 52 admissions were avoided as a result of acute referrals being managed on pleural lists as an outpatient



Abstract P110 Figure 1 Pleural Nurse Activity Jan 2018-Jan 2019

during 2018 and the first 6 months of 2019. A higher proportion of procedures were performed as a daycase in 2018 (42% vs 25%).

Pleural nurse activity increased throughout 2018, including pleural procedures, inpatient ward reviews, telephone advice and follow-up (Figure 1). We have doubled the amount of junior doctor training opportunities and are providing more day case IPC insertions in 2019. Fewer consultant hours were required to deliver the service. Patient feedback has been positive, with 100% of patients surveyed knowing the correct person to contact with queries, improved from an initial 25%.

Discussion The development of the pleural nurse role has successfully streamlined the service as a single point of contact for referrals and patients. This has led to increased outpatient work, saved admissions to hospital and saved consultant time; thereby delivering cost savings to the trust. Pleural activity has increased in the first 6 months of this year; this reflects a genuine increase in procedural work in addition to improved data capture and coding. More importantly, the patient experience of our service has improved.

P111 CHEST DRAIN TROUBLESHOOTING BY TRAINEE PHYSICIANS: AN EASILY DELIVERABLE MULTI-COMPONENT TRAINING MODULE

T Patel, A Munro, G Hettiarachchi, R Sarkar. *Medway Maritime Hospital, Gillingham, UK*

10.1136/thorax-2019-BTSabstracts2019.254

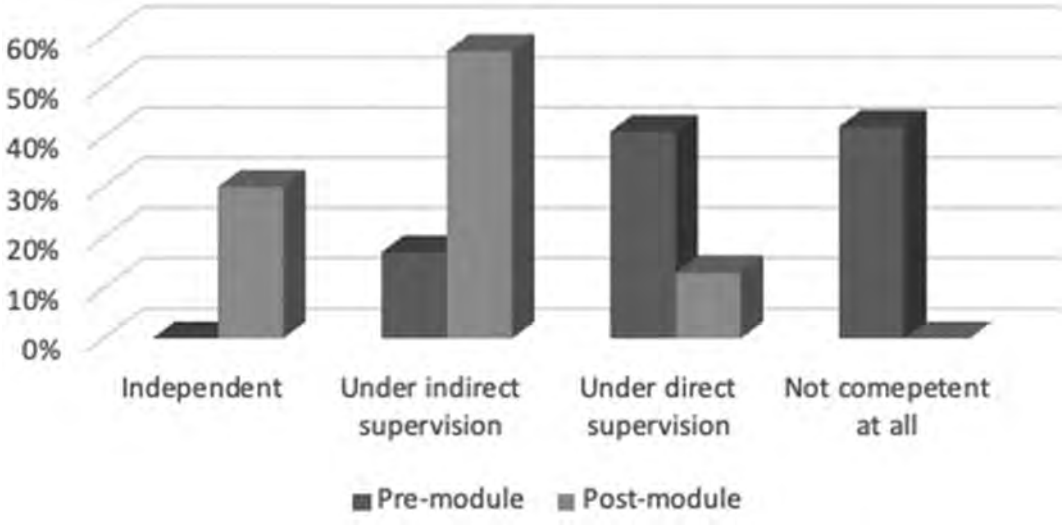
Introduction Intercostal chest drains (ICD) are a common medical intervention used in acute medical wards, respiratory wards and sometimes in surgical wards. Despite this, sound understanding of troubleshooting chest drain related issues could be lacking among junior medical staff.

Objective We aimed to develop a comprehensive educational module for ICD troubleshooting aimed at Foundation doctors.

Methods The training module, with a duration of 2 hours, was planned in 4 different components: 1. A Lecture including a video explaining steps looking after an ICD, detailed assessment of an ICD circuit and common problems. 2. A low fidelity simulation, aided by a working ICD model, explaining ICD troubleshooting, both for pneumothorax and pleural effusion. 3. High fidelity simulation, followed by debrief, based on a real life recent hospital scenario, where the trainees could practice the knowledge they have just gained, alongside utilising team based skills relevant for the scenario. 4. An end-of-session summary of the knowledge/skill gained, and a clinical scenario based quiz to guide the trainees to address their knowledge gaps they might still have. Pre and post-module Likert scale (scale of 1–10, 1=not confident at all, 10=fully confident) questionnaire were used to measure trainees' confidence and competence of ICD management.

Results Thirty-eight foundation doctors took part in the module. In answering how confident they felt in managing an acutely hypoxic patient with an ICD, the average pre-module score on Likert scale were 3/10 in both FY1 and FY2 groups, rising to 7/10 in each group in the post-module questionnaire. Answering how they felt in general troubleshooting on ICD, in pre-module questionnaire, 41% felt not-at-all competent, 41% wanted direct supervision and 17% felt they could manage under indirect supervision. Post-module, 30% felt independent, 57% could manage under indirect supervision and only 13% still felt that they needed direct supervision. They also felt significantly more confident in identifying the cause of deterioration in a patient with ICD, if the aetiology was related to ICD circuit. They felt the high fidelity simulation consolidated the learning.

Conclusion A short 2 hour multi-component training module, that includes traditional teaching methods, alongside low and high fidelity simulation, could be a useful method to build confidence around ICD management amongst trainee doctors.



Abstract P111 Figure 1 Pre and post-module confidence level on ICD trouble shooting

Pulmonary hypertension: advances in diagnosis and treatment

P112 ADDRESSING THE PROBLEM OF VARIANTS OF UNCERTAIN SIGNIFICANCE IN GENETIC DIAGNOSIS OF VASCULAR PULMONARY DISEASE: A ROLE FOR TRANSCRIPT EXPRESSION IN BLOOD MONOCYTES?

[1]AYL Shurr, [1]C Maurer, [1]IG Turbin, [1]M Bernabeu-Herrero, [2]M Aldred, [1]D Patel, [1]CL Shovlin. *[1]NHLI Cardiovascular Sciences, Imperial College London, London, UK; [2]University of Indianapolis, Indianapolis, USA*

10.1136/thorax-2019-BTSabstracts2019.255

Introduction and objectives Variants of uncertain significance (VUS) represent an increasing issue for NHS diagnostics, as they are not clinically actionable for patients and their families. ACMG-AMP guidance[1] emphasises that *in-vitro* evidence is often required to validate computational predictions. Ahead of the introduction of the National Genomic Test Directory, the objective was to use hereditary haemorrhagic telangiectasia (HHT) to quantify the unmet need and provide proof-of-concept for a functional assay deliverable within clinical diagnostic laboratories.

Methods Clinically reported missense variants in HHT-causing genes were examined within the HHT Mutation Database,[2] ClinVar[3] and in reports for patients reviewed in our clinical HHT service. Blood monocytes isolated from HHT patients and controls were cultured overnight to upregulate endoglin, and experimentally treated with various stimuli prior to RNA extraction, cDNA synthesis and quantitative reverse transcriptase PCR.

Results Of 389 missense variants currently listed on the HHT Mutation Database (254 *ACVRL1*, 110 *ENG*, 25 *SMAD4*), 285 (73.3%) are classified as a VUS or equivalent ('pending classification'). Similarly in ClinVar, of 192 missense variants listed (80 *ACVRL1*, 93 *ENG*, 19 *SMAD4*), 113 (58.9%) are classified as a VUS or having 'conflicting interpretations for pathogenicity'. Evaluating patient reports received from our institution, where since 1999 genetic tests have been reported by 4 different NHS laboratories, 24 missense variants were classified as pathogenic/likely pathogenic, suitable for predictive familial testing. However, following ACMG-AMP guidelines[1], 8 (33.3%) have since been re-classified as being VUS or equivalent by the HHT Mutation Database[2] and/or ClinVar[3]. Monocytes from 16 HHT patients and 4 controls have been isolated for transcript analyses. Using normalised ID1 expression as a readout, differential responses following BMP9 and TGFβI stimulation are being assessed for potential differences between controls and different HHT genotypes.

Conclusion Identification of variants within disease-causing genes does not indicate pathogenicity. With an agglomeration of variants pending classification or assigned as a VUS, further functional assays which may reconcile unresolved classifications are crucial to provide ACMG-AMP supportive criterion for pathogenicity assignments. Preliminary results from monocyte readouts support further optimisation of this functional assay for potential use.

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P113 SILDENAFIL IN THE TREATMENT OF GROUP 3 PULMONARY HYPERTENSION

S Sathianandan, C McCabe, K Dimopoulos, A Kempny, C Harries, AU Wells, T Semple, SJ Wort, LC Price. *Royal Brompton Hospital, London, UK*

10.1136/thorax-2019-BTSabstracts2019.256

Introduction and objectives Pulmonary hypertension (PH) in patients with chronic lung diseases (Group 3 PH) confers a worse prognosis. Treatment with pulmonary vasodilators, such as Sildenafil, remains controversial. Whilst some studies report a benefit, few select patients with severe PH (mean pulmonary artery pressure [mPAP] $\geq$35 mmHg) and there are concerns regarding inhibition of hypoxic pulmonary vasoconstriction and impaired gas exchange in this patient group.

Our aim was to assess the short-term outcomes in patients with severe Group 3 PH treated with Sildenafil.

Methods A retrospective review of patients with group 3 PH treated with Sildenafil at a tertiary PH centre. Baseline and follow-up data were collected including haemodynamics from right heart catheterisation (RHC), echocardiography parameters, serum BNP levels, WHO functional class, 6-minute walk distances (6MWD) and EmPHasis-10 (E-10) scores. Sildenafil was initiated at 12.5–25mg TDS. Data are mean±SD or median (range).

Results 22 patients with group 3 PH were reviewed (mean age 65±11 years, 11 males). Underlying diagnoses included COPD (23%), CPFE (27%) and ILD (36%). Baseline lung function (% predicted) was FEV1 69.8±24.1%, FVC 80.8 ±28.2% and TLCO 22±5.5%. The mPAP pre-treatment was 46.1±10 mmHg and pulmonary vascular resistance (PVR) 12 (range 6–23) wood units.

Median follow-up between initiation of Sildenafil and re-assessment was 4 (range 1–26) months. 8 patients had repeat RHCs. There were no statistically significant improvements in haemodynamics (mPAP, cardiac output or PVR), echo findings or BNP.

An improvement in 6MWD was seen, from 235± 66m to 306±65m (p=0.023). 14 patients reported an improvement in symptoms, however the improvement in E-10 scores was minimal and not significant (-2 points, p=0.484) and there was no improvement in WHO functional class.

3 patients experienced adverse effects (deterioration of oxygenation and hypotension).

Conclusions Sildenafil appears to be well tolerated and safe in most patients with an improvement in 6MWD observed. Larger randomised controlled trials with longer follow-up are warranted to assess its use further and identify baseline characteristics of 'responders' versus 'non-responders'. We aim to identify 'responders' in our group and define a phenotype based on data collected above and CT imaging.

P114 THERMOSTABLE INTRAVENOUS EPOPROSTENOL FOR THE TREATMENT OF PULMONARY ARTERIAL HYPERTENSION – A TRANSITION STUDY

A MacLellan, K Carson, M Brewis, M Johnson, M McGettrick, P McCaughey, A Crozier, R Thomson, C Church. *Scottish Pulmonary Vascular Unit, Glasgow, UK*

10.1136/thorax-2019-BTSabstracts2019.257

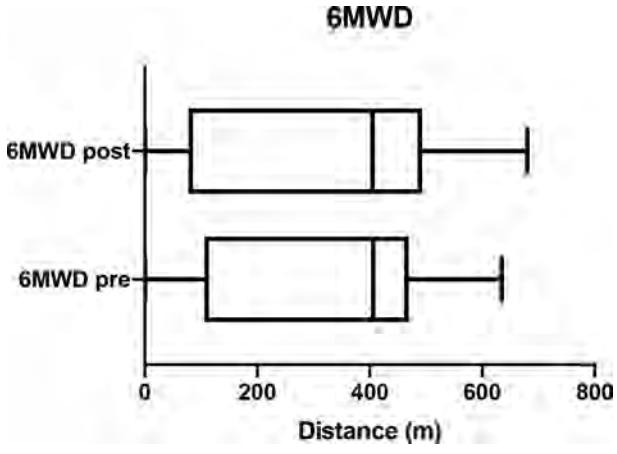
Introduction and objectives Epoprostenol is a synthetic prostacyclin analogue which has been used in the treatment of

pulmonary arterial hypertension (PAH) for a number of years. To date, it has been the only disease targeted therapy to have demonstrated an overall survival benefit for PAH patients (Demerouti et al., 2019). The previously available formulation of epoprostenol (Flolan 10.5) was thermolabile, meaning that it had to be prepared daily by patients and kept on ice to delay degradation. Recently a new formulation (Flolan 12) with greater thermostability has meant that these restrictions are no longer needed.

The objective of our study was to transition patients onto Flolan 12 and examine for any safety issues associated with this transition, as well as looking at impact of quality of life (QoL), 6-minute walk distance (6MWD) and NT-proBNP.

Methods All patients in our unit receiving a stable dose of intravenous epoprostenol for at least 3 months as of November 2016 were included in the study (n=22). Over the next 12 months these patients were transitioned onto Flolan 12. We compared 6MWD, NT-proBNP and QoL measures prior to treatment transition and then at first routine clinical follow-up following transition. QoL was measured using the Emphasis-10 questionnaire. We also utilised a separate questionnaire which focused on the effect of epoprostenol use on activities of daily living. The was completed pre- and post-transition.

Results No safety issues were identified following transition to Flolan 12. No significant changes in QoL, 6MWD (see figure 1) or NT-proBNP were observed across the cohort following transition. All but one of the patients preferred the new formulation of epoprostenol. The one remaining patient expressed no preference.



Abstract P114 Figure 1

Conclusions Analysis of QoL, 6MWD and NT-proBNP has shown no detrimental clinical effects from the transition to the new formulation. The new formulation of epoprostenol has been well received by our patients due to its convenience.

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P115 A SEGMENTAL LPS CHALLENGE STUDY TO INVESTIGATE THE PHARMACODYNAMICS OF A TRPV4 ANTAGONIST (GSK2798745) IN HEALTHY PARTICIPANTS

[1]S Mole, [2]A Harry, [3]A Fowler, [1]S Hotee, [1]J Warburton, [3]S Waite, [1]M Beerahee, [2]D Behm, [4]P Badorrek, [4]M Müller, [4]C Faulenbach, [2]A Lazaar, [4]JM Hohlfeld. *[1]GlaxoSmithKline, Stevenage, UK; [2]GlaxoSmithKline, Upper Providence, USA; [3]GlaxoSmithKline, London, UK; [4]Fraunhofer-Institut fuer Toxikologie und Experimentelle Medizin, Hannover, Germany*

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Introduction and objectives Acute Respiratory Distress Syndrome (ARDS) is associated with increased pulmonary vascular permeability. In the lung, transient receptor potential vanilloid 4 (TRPV4), a Ca2+-permeable cation channel, is a known regulator of endothelial permeability and pulmonary oedema. Segmentally-instilled lipopolysaccharide (LPS) challenge was used as a surrogate injury model to investigate the effects of TRPV4 channel blockade on alveolar-septal barrier permeability.

Methods Healthy participants were randomised 1:1 to receive 2 doses of GSK2798745, a potent and selective TRPV4 channel blocker, or placebo, 12 h apart. The first and second doses were administered orally, respectively, 2 h before and 10 h after LPS instillation; LPS was administered by bronchoscopy. Total protein (TP) and neutrophils, as markers of barrier permeability and inflammation, were measured in bronchoalveolar lavage (BAL) samples collected before and after LPS challenge. The primary endpoint was baseline adjusted TP concentration in BAL at 24 h after LPS challenge. A Bayesian framework was used to estimate the posterior probability of any percentage reduction (GSK2798745 relative to placebo).

Results Forty-seven participants were dosed and 45 completed (22 on GSK2798745 and 23 on placebo). There was no significant effect of GSK2798745 on BAL TP or neutrophils (Table). Overall, GSK2798745 was safe and well tolerated. The study was terminated early after an interim analysis, based on 20 participants in each group; if the study had continued to completion, there was <7% probability of achieving success (defined as =>95% probability of any percentage reduction in BAL TP after GSK2798745).

Abstract P115 Table 1

Percentage reduction in BAL at 24 h after LPS challenge (GSK2798745 v placebo)	Median	SD	95% CrI	Probability of any reduction
Total Protein	8.73	13.45	(–21.41, 31.30)	74%
Neutrophil count	7.31	22.84	(–48.20, 41.64)	63%

Conclusion As expected, the dose regimen of GSK2798745 gave plasma levels predicted to provide ~70–85% TRPV4 inhibition during the 24 h after LPS challenge. At that exposure, GSK2798745 did not affect segmental LPS-mediated elevation of BAL TP or neutrophils. This study does not support GSK2798745, at the exposures observed in this study, as a treatment for alveolar-septal barrier permeability in ARDS patients.

ClinicalTrials. gov Identifier: NCT03511105

P116 EFFECTS OF MACITENTAN ON RIGHT VENTRICULAR REMODELING IN PULMONARY ARTERIAL HYPERTENSION – RESULTS FROM THE REPAIR STUDY INTERIM ANALYSIS

[1]D Kiely, [2]S Rosenkranz, [3]N Galiè, [4]R Channick, [5]E Cottreel, [5]N Martin, [6]A Peacock, [7]A Tawakol, [8]A Torbicki, [9]A Vonk Noordegraaf. *[1]Royal Hallamshire Hospital, Sheffield, UK; [2]University of Cologne, Cologne, Germany; [3]Department of Experimental, Diagnostic and Specialty Medicine – DIMES, University of Bologna, Bologna, Italy; [4]University of California, LA, USA; [5]Actelion Pharmaceuticals Ltd, Allschwil, Switzerland; [6]Scottish Pulmonary Vascular Unit, Glasgow, UK; [7]Massachusetts General Hospital and Harvard Medical School, Boston, USA; [8]Department of Pulmonary Circulation CMKP at European Health Center, Otwock, Poland; [9]VU Medical Center, Amsterdam, The Netherlands*

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Introduction and objectives In pulmonary arterial hypertension (PAH) right ventricular (RV) function is impaired as reflected in a decrease in stroke volume. The REPAIR study aims to evaluate the effect of macitentan on RV structure and function in patients with PAH.

Methods REPAIR (NCT02310672) is a 52-week, open-label, multicenter study evaluating the effect of macitentan on right ventricular (RV) remodeling and function as determined by cardiac magnetic resonance imaging (MRI). Macitentan was initiated as monotherapy or in combination with a phosphodiesterase-type 5 inhibitor. The two primary endpoints were change from baseline at Week 26 in RV stroke volume (RVSV), determined by pulmonary artery flow MRI, and pulmonary vascular resistance (PVR), measured by right heart catheterization. A full evaluation of the RV was also performed using MRI. The results of the pre-specified efficacy interim analysis, performed in the first 42 evaluable patients, are presented.

Results In the interim analysis, at baseline, mean (SD) age was 46.3 (14.9) years, 31 patients were female, median (range) 6-minute walk distance was 376 (180–724) m and patients were WHO functional class II (n=19) or III (n=23). The RVSV was significantly increased and PVR was significantly decreased at Week 26 (Table). As both primary endpoints were met, enrollment in the study was ended.

Abstract P116 Table 1 Change from baseline to Week 26 in RVSV and PVR

		Baseline N=42	Week 26 N=42	Change from baseline to Week 26
RVSV	**Mean (SD), mL**	50.7 (17.5)	67.3 (19.6)	16.6 (16.3)
	Primary efficacy analysis			
	Model-adjusted* LS mean change from baseline to Week 26 (96% CL)	15.2 (9.3, 21.0)		
	P-value (2-sided)	<0.0001		
PVR	**Mean (SD), dyn.sec.cm^{-5}**	900 (458)	540 (312)	-360 (365)
	Primary efficacy analysis			
	Model-adjusted** geometric mean ratio Week 26:baseline (99% CL)	0.63 (0.54, 0.74) [37% reduction]		
	P-value (2-sided)	<0.0001		

*From ANCOVA model on RVSV change from baseline with a factor for PAH treatment strategy and with RVSV at baseline as covariate.
**From ANCOVA model on log-transformed ratio of baseline PVR with a factor for PAH treatment strategy and with log-transformed PVR at baseline as covariate.
CL, confidence limit; LS, least squares; PAH, pulmonary arterial hypertension; PVR, pulmonary vascular resistance; RVSV, right ventricular stroke volume; SD, standard deviation.

Conclusions REPAIR is the first multicenter study in PAH using an MRI variable as a primary endpoint, and showed improvement in RV function with macitentan. These data also demonstrate that RVSV can be used as a primary endpoint to study treatment efficacy in PAH.

P117 MACHINE LEARNING TOOL PROVIDES NEW INSIGHTS INTO RISK ASSESSMENT IN PULMONARY ENDARTERECTOMY

[1]K Bunclark, [2]J Liley, [3]M Newnham, [1]A Ruggiero, [1]JE Cannon, [4]G Coghlan, [5]J Lordan, [6]L Howard, [1]D Jenkins, [7]M Johnson, [8]DG Kiely, [1]C Ng, [1]N Screaton, [1]K Sheares, [1]D Taboada, [1]S Tsui, [9]SJ Wort, [1]J Pepke-Zaba, [2]M Toshner. *[1]Royal Papworth Hospital, Cambridge, UK; [2]University of Cambridge, Cambridge, UK; [3]University of Birmingham, Birmingham, UK; [4]Royal Free Hospital, London, UK; [5]Institute of Cellular Medicine, Newcastle, UK; [6]National Heart Lung Institute, London, UK; [7]Golden Jubilee National Hospital, Glasgow, UK; [8]Sheffield Teaching Hospital, Sheffield, UK; [9]Royal Brompton Hospital, London, UK*

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Background Chronic thromboembolic pulmonary hypertension (CTEPH) is an uncommon disorder characterised by persistent obstruction of the pulmonary arteries by thromboembolic material, usually following an acute pulmonary embolus.[1] Pulmonary endarterectomy (PEA) is the gold standard treatment for eligible patients and is potentially curative.[1]Whilst pre-operative parameters have been associated with post-operative mortality no sytematic method for predicting individualised PEA risk presently exists.

Objectives To identify pre-operative risk factors of 90 day mortality (90DM), five year mortality (5YM) and improvement in self-reported functional status (DQ) following PEA for inclusion in a clinically-implementable risk prediction tool.

Methods Consecutive patients undergoing PEA for CTEPH at Royal Papworth Hospital, UK between 2007 and 2017 were included. Potential pre-operative predictors including patient demographics, medical history and results of functional, physiological and patient self-reported measures were included in a hypothesis-free approach. Three stastical predictive models were considered (linear regression, lasso regression and random forest), each of which were calibrated, fitted and assessed using cross-validation ensuring internal consistency.

Results 1336 individuals were included in risk modelling. 96 patients (6.4%) died within 90 days of hospital discharge and 154 (11.5%) within five years of PEA. Random forest based predictions were more accurate than linear or lasso based. All post-operative outcomes were predicted well from pre-operative variables (90DM: AUROC 0.82 (95% CI 0.78, 0.87); 5YM: C-Index 0.81 (0.76, 0.85); DQ (Spearman's correlation 0.47 (0.43, 0.51)) using random forest modelling. The strongest individual pre-operative predictor of 90DM and 5YM was left atrial dilatation and of DQ, pulmonary vasodilator therapy. Post-hoc analysis confirmed not only excess mortaltiy following PEA in those with left atrial dilatation secondary to diastolic dysfunction but adverse functional, haemodynamic and patient-reported outcomes in this group.

Conclusions Outcomes from PEA can be predicted from pre-operative observations to a clinically useful degree enabling individualised risk prediction. Post-hoc analysis highlights the under-recognised adverse outcomes in those with left atrial dilatation. We present an online application to facilitate use of

these tools. Further work validating our model in other centres will be necessary and aided by the open availability of our methodology.

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P118 DEFINING A MINIMAL CLINICALLY IMPORTANT DIFFERENCE IN CAMPHOR

K Bunclark, N Abraham, S Ali, JE Cannon, K Sheares, N Speed, D Taboada, M Toshner, J Pepke-Zaba. *Royal Papworth Hospital, Cambridge, UK*

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Background The Cambridge Pulmonary Hypertension Outcome Review (CAMPHOR) questionnaire is an internally validated disease-specific patient-reported outcome (PROs) measure. Despite the widespread use of PROs as outcome measures in pulmonary hypertension clinical trials, changes in PRO scores which are deemed clinically relevant to the individual are unknown. We sought to identify the minimal clinically important difference (MCID) in the three CAMPHOR scales; Activities, Symptoms and Quality of Life in Idiopathic Pulmonary Arterial Hypertension (IPAH) using both distributional and anchor-based analyses.

Method Incident cases of IPAH between 2006 and 2018 with CAMPHOR scores available at treatment naïve baseline and one year post diagnosis were included. One-half of the standard deviation and one standard error of measurement were used in distributional analysis. Anchor-based methods used median CAMPHOR score change and receiver curve thresholds associated with a global health status change of 'moderately better'.

Results A total of 129 individuals were included (median age 55, SD 26 yrs). Median CAMPHOR scores at baseline were; Symptoms: 13 (SD 7), Activities: 11 (7) and Quality of Life 10 (7) and at one-year review; Symptoms: 10 (7), Activities: 11 (8) and Quality of Life: 8 (7). Distributional analyses yielded estimates of a MCID for Symptoms of 1.95–3.48, Activities: 2.75–3.67 and Quality of Life: 1.95 – 3.46. Anchor-based approaches yielded MCID estimates for Symptoms of -5.5 to -7.5, Activities: 4.5 to -5.5, and Quality of Life: -0.5 to -4.5. Using a triangulated approach MCIDs were derived for Symptoms: 5 points, Activities 4 points and Quality of Life 3 points. MCIDs predicted change in six-minute walk distance at one year (Activities adjusted $p=0.045$; Symptoms $p=0.004$).

Conclusion This is the first clinical investigation to estimate MCIDs in a pulmonary hypertension specific patient-reported outcome measure and provides a metric for understanding whether statistically significant changes in PRO end-points, are clinically relevant on an individual level.

Abstract P118 Table 1 Change in six-minute walk distance (6MWD) for individuals with Idiopathic Pulmonary Hypertension attaining/not attaining the minimal clinically important difference (MCID) in CAMPHOR scale scores at one-year post diagnosis

	6MWD change (m)	
Symptoms MCID not attained	31.8 ± 75.3	p=0.004
Symptoms MCID attained	78.5 ± 80.9	
Activity MCID not attained	28.5 ± 66.4	p=0.045
Activity MCID attained	101 ± 86.0	
QoL MCID not attained	37.5 ± 80.3	p=0.36
QoL MCID attained	60.0 ± 75.0	

N=129. CAMPHOR indicates Cambridge Pulmonary Hypertension Outcome Review. MCID thresholds were: Symptoms scale, 5 points; Activities, 4 points and Quality of Life, 3 points. Change in six-minute walk distance is change in distance achieved (median ± SD) from treatment-naïve diagnostic baseline to one-year post diagnosis. P-values adjusted for multiple comparisons by false discovery rate.

P119 EVOLVING SURGICAL EXPERTISE AND PATIENT CHOICE IN PULMONARY ENDARTERECTOMY

[1]A Babu, [1]A Ruggiero, [1]JE Cannon, [2]G Coghlan, [3]J Lordan, [4]L Howard, [1]D Jenkins, [5]M Johnson, [6]DG Kiely, [1]C Ng, [1]N Screaton, [1]K Sheares, [1]D Taboada, [1]J Taghavi, [1]M Toshner, [1]S Tsui, [7]SJ Wort, [1]J Pepke-Zaba. *[1]Royal Papworth Hospital, Cambridge, UK; [2]Royal Free Hospital, London, UK; [3]Institute of Cellular Medicine, Newcastle, UK; [4]National Heart and Lung Institute, London, UK; [5]Golden Jubilee National Hospital, Glasgow, UK; [6]Sheffield Teaching Hospitals, Sheffield, UK; [7]Royal Brompton Hospital, London, UK*

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Background Chronic thromboembolic pulmonary hypertension (CTEPH) is a two-compartment model characterized by the thrombofibrotic occlusion of proximal pulmonary arteries with secondary small vessel vasculopathy. Pulmonary endarterectomy (PEA) is the gold standard treatment for eligible patients although a proportion of patients with operable disease decline surgery. Those with distal lesions ineligible for PEA are managed medically, including consideration of balloon pulmonary angioplasty (BPA).

Methods Consecutive treatment-naïve patients discussed at the UK National PEA MDT and diagnosed with CTEPH between 2014 and 2017 were included. Haemodynamic, functional and patient-reported measures at time of MDT discussion were collected from patient records. Survival until July 2019 was recorded from a centralized national resource.

Results 787 patients were diagnosed with technically operable CTEPH with 77% proceeding to surgery. 66 patients were offered but declined PEA, of which 42 were treated with pulmonary vasodilators. Other patients with technically operable CTEPH did not undergo PEA due to limited disease distribution (n=46) or significant co-morbidities (n=67). There were 86 diagnoses of distal CTEPH, 73 received vasodilators and one-third underwent BPA (n=26). There were significant differences in age, baseline haemodynamics and patient-reported outcomes between those who underwent PEA, those offered but declining PEA and those with distal CTEPH, although functional status did not differ. Those offered but declining PEA were significantly older, had less severe haemodynamics and better self-reported functional status than those who underwent PEA. Only age (younger) and cardiac output (higher) were significantly different in those undergoing PEA compared to those with distal CTEPH. Three-year survival was lower in those who declined surgery or had distal CTEPH compared to those undergoing PEA but did not reach statistical significance (p=0.11)

Abstract P119 Table 1 Patient demographics and characteristics

	PEA	PEA offered – patient declined	Distal CTEPH
N	608	66	86
% of all CTEPH patients	77.2%	8.4%	10.9%
Age, years	62 (21)	70 (17)	67 (18)
NYHA class 1/2/3/4,%	0/28/64/8	3/22/72/3	0/18/75/7
Mean PAP, mmHg	44 (16)	37 (18)	44 (13)
PVR, dynes.s.cm^{-5}	658 (474)	499 (639)	696 (541)
PCWP, mmHg	11 (5)	11 (6)	10 (4)
Cardiac Output, l.min^{-1}	4.2 (1.7)	4.4 (1.6)	3.6 (1.5)
Six-minute walk distance, m	310 (209)	284 (118)	337 (155)
CAMPHOR Activity	10 (10)	8 (9)	12 (11)
CAMPHOR Symptoms	13 (10)	7 (6)	13 (12)
CAMPHOR Quality of Life	11 (11)	6 (8)	6 (12)
One year survival,%	92.9	98.4	96.5
Three year survival,%	90.8	83.8	77.6

Definition of abbreviations: PEA = pulmonary endarterectomy; CTEPH = Chronic Thromboembolic Pulmonary Hypertension; NYHA = New York Heart Association; Mean PAP = mean pulmonary artery pressure; PVR = pulmonary vascular resistance; PCWP = pulmonary capillary wedge pressure; CAMPHOR = Cambridge Pulmonary Hypertension Outcome Review questionnaire.
Values are median (IQR) unless otherwise indicated.

Conclusions There has been an increase in operative intervention for CTEPH in the UK which likely reflects evolving surgical expertise.[1] Numbers offered but declining PEA are now lower, and with prognostically less severe disease, compared to previous cohorts making survival comparison difficult.[1] The use of medical therapies and BPA in the management of distal CTEPH has improved medium-term survival of those in this group to comparable with PEA.

P120 INTERNATIONAL SIMILARITIES AND DIFFERENCES IN HEREDITARY HAEMORRHAGIC TELANGIECTASIA (HHT) PATHWAYS REPORTED BY PATIENTS AND CLINICIANS

[1]EJ Boother, [1]SJ von Widekind, [2]M Post, [3]AD Kjeldsen, [2]HJ Mager, [4]F Pagella, [4]C Sabba, [5]U Sure, [4]E Buscarini, [6]S Dupuis-Girod, [1]CL Shovlin. *[1]Imperial College and VASCERN HHT European Reference Centre, London, UK; [2]VASCERN HHT European Reference Centre, Nieuwegein, The Netherlands; [3]VASCERN HHT European Reference Centre, Odense, Denmark; [4]VASCERN HHT European Reference Centre, Crema, Bari and Pavia, Italy; [5]VASCERN HHT European Reference Centre, Essen, Germany; [6]VASCERN HHT European Reference Centre, Lyon, France*

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Introduction and objectives Hereditary haemorrhagic telangiectasia (HHT) results in two separate pulmonary vascular pathologies- pulmonary arteriovenous malformations (PAVMs) and pulmonary arterial hypertension (PAH). The goal of this study was to capture current practice differences in global management of HHT.

Methods Questions regarding PAVMs and pulmonary hypertension were posed to the eight centres within the European Reference Network for HHT (VASCERN) at monthly telecons and supplementary meetings. With ethical approval (16/LO/1909), an online patient questionnaire was developed using Survey Monkey, with 139 non-biased questions to capture data from HHT patients. Participants were recruited following advertisement through global HHT patient support networks. Analyses were performed in R.

Results The eight VASCERN HHT centres in France, Italy, Denmark, Germany, the Netherlands and the UK agreed that genetic testing can be used to screen for HHT, to confirm a diagnosis, or to rule out the diagnosis of HHT if the pathogenic variant is known in the family.[1] All emphasised the importance of screening all patients for pulmonary AVMs.[1 2] None of the eight screened asymptomatic patients for pulmonary hypertension based on French/Dutch series of 3,176 HHT patients, where PAH prevalence was <2%, and pulmonary hypertension when present, was usually part of a broader picture of hepatic AVMs, anaemia, atrial fibrillation and symptoms. 465 patients with self-reported HHT completed the questionnaire and passed preset study filters. The majority were North Americans, with Europeans constituting the second largest group. 320/465 (68.8%) were female. Pulmonary AVMs were reported by 231/465 (49.7%) and hepatic AVMs by 90/465 (19.4%). Twenty-seven individuals (5.7%) reported they had pulmonary hypertension, and 15 of these (55%) reported they had hepatic AVMs. Age at self diagnosis of HHT, medical diagnosis of HHT, medical diagnosis of PAVMs, and happiness with overall management, were similar between North Americans and Europeans. The greatest disparities related to genetic testing: 33/89 (37%) UK families had been gene tested compared to 131/243 (54%) of families in other countries (Fisher exact test p=0.009).

Conclusions International consensus appears to be delivering broadly comparable clinical, but not genetic diagnostics in HHT.

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P121 HAEMORRHAGE ADJUSTED IRON-REQUIREMENTS AND EXERCISE CAPACITY IN HEREDITARY HAEMORRHAGIC TELANGIECTASIA PATIENTS

A Soni, N Badiani, F Gawecki, H Finnamore, C Shovlin. *Imperial College London, London, UK*

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Introduction and objectives Anaemia is a common cause of reduced exercise capacity, including in patients with pulmonary arteriovenous malformations (AVMs), most of whom have hereditary haemorrhagic telangiectasia (HHT). In HHT, low haemoglobin is often attributed to gastrointestinal bleeding. Additionally, more than 90% of HHT patients experience nosebleeds (epistaxis) that can lead to substantial but overlooked blood losses. The goal of this study was to test if greater iron losses, specifically due to HHT nosebleeds was associated with reduced exercise capacity.

Methods Between May 2017 and May 2019, 130 patients with a clinical and/or molecular diagnosis of HHT completed the Veterans Specific Activities Questionnaire (VSAQ) when attending their clinical review. This validated, self-reported patient questionnaire was used to determine exercise capacity by calculating the predicted metabolic equivalents (METs). Nosebleed severity was quantified by frequency, duration and intensity. Iron intake (dietary, tablet and intravenous), blood transfusions, and other treatments and physiological variables were also recorded. The severity of nosebleeds was used in addition to iron reference nutrient intake (RNI) to calculate

haemorrhage adjusted iron requirements (HAIR). Relationships with METS were evaluated by multivariate linear regression.
Results All 130 patients in the study had epistaxis, with some having up to 300 nosebleeds per month, lasting up to 150 minutes each. The median HAIR was 30.8 mgs of iron per day (range 8.7–4075 mg/day), compared to RNIs of 14.8 mg/day for premenopausal females and 8.7 mg/day for males/postmenopausal females. In crude regression analyses, patients with higher HAIR (i.e. higher iron requirements due to nosebleeds) had reduced exercise capacity (METS, p=0.0021). Surprisingly, in crude and HAIR-adjusted regression there was no association between exercise capacity (METS) and use of iron tablets, intravenous iron or blood transfusions. However, using clinical notes descriptor, higher dietary iron intake was associated with greater exercise capacity/METS (p=0.028).
Conclusion HAIR is more discriminatory in identifying HHT patients 'at risk' of iron deficiency than iron RNI. Nosebleeds are associated with reduced exercise capacity, highlighting the need for concurrent investigation of nosebleeds alongside gastrointestinal bleeds in HHT/pulmonary AVM patients with iron-deficiency and/or anaemia. Replicate studies are recommended to confirm these associations.

P122 IDENTIFYING DIFFERENCES BETWEEN PATIENTS WITH PULMONARY ARTERIOVENOUS MALFORMATIONS IN THE PRESENCE AND ABSENCE OF HEREDITARY HAEMORRHAGIC TELANGIECTASIA

N Badiani, A Soni, F Gawecki, C Shovlin. *Imperial College London, London, UK*

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Introduction and objectives Pulmonary arteriovenous malformations (PAVMs) allow right-left shunting of deoxygenated, unprocessed blood from the right ventricle, into the systemic circulation. This can lead to marked hypoxaemia and life-threatening complications including cerebral abscess or stroke, although exercise tolerance is generally well-preserved. Most PAVMs are due to hereditary haemorrhagic telangiectasia (HHT). Our objectives were to test if there are differences between PAVM patients with and without HHT.
Methods Exercise capacity (using the Veterans Specific Activities Questionnaire (VSAQ) and derived metabolic equivalents (METs)), anatomic and physiological variables, and major complications were recorded in sequential patients who presented to our VASCERN European Reference Network Centre between March-2017 and June-2019. HHT was diagnosed in the setting of three Curaçao Criteria or a positive gene test. Differences between PAVM patients with and without HHT were evaluated using STATA-IC v15.0.
Results Of 107 patients with PAVMs who completed the VSAQ, 89 were diagnosed with HHT, 12 had no evidence of HHT, and 6 were of unknown status and therefore excluded. There was no significant difference in basic demographics (median age 51ys), SaO_2(71–99%), or spirometry between HHT and non HHT patients. HHT patients had more PAVMs (median 2 vs 1, p=0.02), but apparently similar rates of stroke (20.2% vs 25.0%, p=0.70) and cerebral abscess compared to patients without HHT. However exercise capacity, determined by METs, tended to be lower in HHT patients compared to those without (median 8.27 vs 10.92 kcal/kg/hour, p=0.087). This was confirmed by crude regression, and the association was strengthened after adjustment for other variables that affect exercise tolerance including age, sex, oxygen saturation (SaO_2) and haemoglobin (adjusted HHT coefficient -3.16 (95%CI -5.14,-1.17, p=0.002).
Conclusions PAVM patients with HHT had lower exercise tolerance than those without. Although expected to reflect the lower haemoglobins seen in HHT patients who are often iron deficient, this trend became stronger after adjustment for age, sex and SaO_2 suggesting other potential influences. In the current cohort, there was no clear trend between HHT diagnosis and incidence of major PAVM-related complications but as this is such an important question for clinical management the study population is being expanded.

P123 CRITICAL ASPECTS IN THE MANAGEMENT OF SUBMASSIVE AND PROXIMAL PULMONARY EMBOLISM (PE): REAL WORLD CLINICAL PRACTICE

S Looi, A Yeo, A Ghareeb, K Whitfield, M Hamad, G Antunes. *James Cook University Hospital, Middlesbrough, UK*

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Introduction and objectives Prompt diagnosis, risk stratification, treatment and follow-up are essential for a favourable outcome in the management of PE. We examined a number of important factors in the management of significant PE from hospital admission to the end of a follow-up period of six months.
Methods A retrospective cross-sectional study was performed in a large tertiary hospital in the North East of England following a review of CT Pulmonary Angiography (CTPA) reports over a 12 month period. Inclusion criteria included: high pre-test probability for PE, central PE defined as thrombus involving the main Pulmonary Artery/total occlusion of the right or left PA/bilateral interlobar artery involvement and hospitalisation for longer than 48 hours. Relevant data was obtained from Health Care Records and cardiology databases while positive CTPAs were reviewed by an interventional radiologist.
Results An acute PE was demonstrated in 258 of the 1999 CTPAs (12.9%). 86 patients met the study criteria but 16 were excluded because of insufficient data. The median age of the cohort was 70 years (range 25–85) of which 57% were males. Unprovoked PE accounted for 71% of cases (n=41). A PE Severity Index (PESI) or simplified PESI score was documented in four cases. Therapeutic anticoagulation therapy was commenced within 4 hours of clinical assessment in 48% (n=31) and prior to CTPA in 72% (n=46). Right ventricular dysfunction was reported on CTPA and/or echocardiography in 82% of cases and further pleuropulmonary investigation or follow-up was required in 19 patients (27%). There was adequate investigation for occult malignancy in 78% of cases. 94% of patients were reviewed post discharge in secondary care with a median time to first appointment of 7 weeks (range 2–27). Discussion related to risks and benefits of extended anticoagulation therapy was documented in 69% of cases.
Conclusions Clinical practice in this cohort of patients for most parameters was modest when benchmarked against published guidance. We propose to introduce a specific PE admission proforma, develop a Trust-wide PE guideline and offer targeted educational events. The results of a recent NCEPOD

survey should provide national data and highlight areas where improvement is required.

P124 CATHETER DIRECTED THROMBOLYSIS FOR ACUTE PULMONARY EMBOLISM: IS IT A SERVICE WORTH SETTING UP?

A Bhamani, K Devadas, U Dawar, S Hossain, A Kabir, K Pannu, DK Mukherjee. *Basildon and Thurrock University Hospitals NHS Foundation Trust, Basildon, UK*

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Background Acute pulmonary embolism (PE) is a common disease with a variable clinical presentation. According to the British Lung Foundation, there were 2300 deaths from PE in 2012, equating to 2% of deaths from lung diseases in the United Kingdom.[1]

While the management of low (small) and high (massive) risk PE is well established, the management of intermediate risk (sub-massive) disease is less certain. This is defined as acute PE without systemic hypotension but with either right ventricular dysfunction or myocardial necrosis.[2]Catheter directed thrombolysis (CDT) has been suggested as a potential treatment modality for such patients to reduce clot burden and right heart strain with lesser bleeding risk. Although CDT services are not well established in the UK, there is emerging evidence to suggest that ultrasound assisted CDT shows significant reduction in RV dilatation compared to anticoagulation alone without increased risk of bleeding.

Methods We conducted an audit to assess the prevalence of acute PE in patients presenting to our District General Hospital and assessed how many had evidence of right heart strain meeting proposed criteria for CDT. Indications for eligibility included PE Severity Index (PESI) class ≥III, troponin >14ng/l, CT ratio of RV: LV >1 and echocardiogram suggestive of pulmonary hypertension.

Results 360 patients underwent CTPA between April and June 2018. There were 60 positive scans. 22 patients met criteria for CDT. The average length of hospital admission for these patients was 12.76 days and 7 patients subsequently died. The most common indicator of right heart strain was PESI class ≥III (n=19) followed by RV: LV ratio >1 (n=14). 4 patients had saddle PE.

Conclusion 22 patients newly diagnosed with acute PE in our DGH would have met proposed criteria for catheter directed thrombolysis over a 3 month period. This equates to 88 patients annually. We believe that this data strengthens the argument for the development of regional hubs providing this service across the UK.

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Lung physiology: something old, something new

P125 USING ADAPTIVE PRINCIPAL COMPONENT ANALYSIS AND AGE-VARYING KERNEL DISTRIBUTIONS TO CHARACTERISE COPD IN DATA COLLECTED BY STRUCTURED LIGHT PLETHYSMOGRAPHY (SLP)

[1]A Grafton, [1]S Motamedi, [1]J Lasenby, [2]R Iles. *[1]Cambridge University Department of Engineering, Cambridge, UK; [2]Evelina London Childrens Hospital, London, UK*

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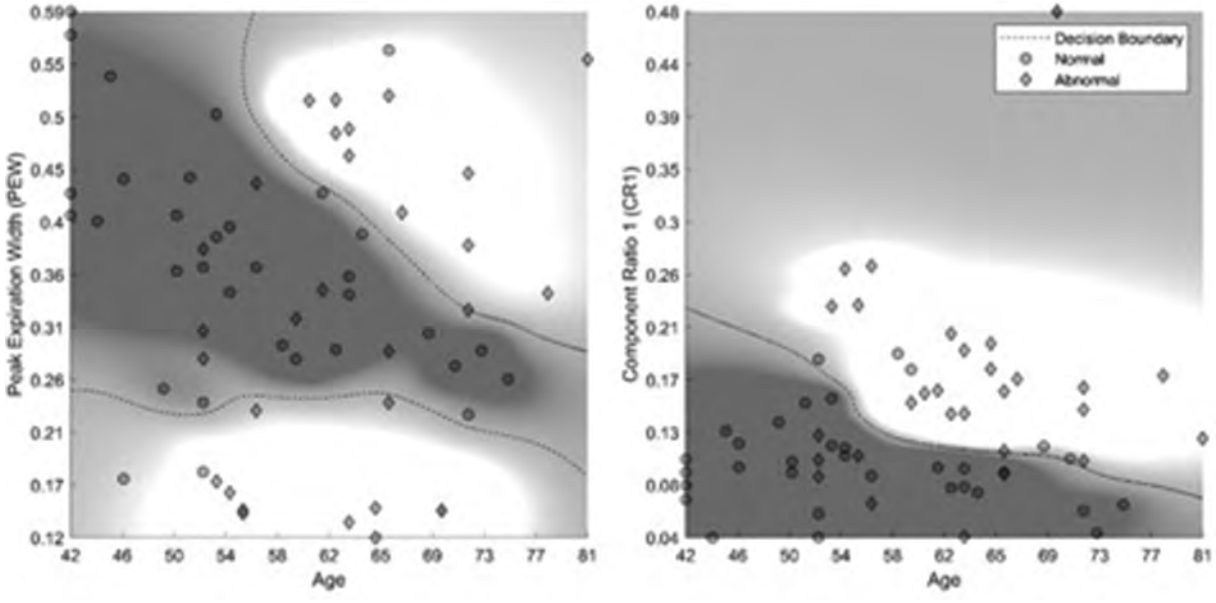
Structured Light Plethysmography (SLP) is a non-invasive, light-based method that enables reconstruction of a patient's anterior chest and abdominal wall. Samples are taken at 30Hz for several minutes for each patient. 30 datasets obtained from patients diagnosed with COPD (labelled abnormal) and 33 without (labelled normal) are available for characterisation. We demonstrate how a classifier may be trained to characterise COPD based on existing samples.

Method SLP data was collected using the Thora-3Di by PneumaCare Ltd, made available from the Pneumacare database.



Abstract P125 Figure 1

Time-varying surfaces are decomposed into their constituent modes via adaptive principal component analysis. This method extracts a mean surface shape and motion modes. We extract measurement indices from the decomposition to classify between normal and abnormal. Indices found to be useful include Peak Expiration Width (PEW), (the fraction of the expiration time that is spent at greater than 60% of the maximum expiration rate), Component Ratio 1 (CR1), (the amplitude of the second motion mode relative to the first, indicating complexity of the breathing pattern), and Displacement at Maximum Flow (DMF), (the fraction of expiration that has occurred at the instant of peak expiration rate).

Two-Dimensional Gaussian Kernel distributions are constructed using a training set of normal and abnormal patient samples for each measurement index, with age as the second dimension. While typical Gaussian Kernel distributions would centre a distribution component on each patient, we place distributions over each pair of patients with the same classification, which corrects for non-uniformity of the distribution of patient ages.

Results Distributions for PEW and CR1 are shown in the figure. Light regions indicate high COPD likelihood. CR1 is typically lower for normal patients; PEW has a normal region, above and below which indicates a higher likelihood of COPD. Best performance is achieved with a voting scheme, where each measurement index distribution votes once. Classification accuracy is 86% using 5-fold cross-validation.

Conclusion We have presented a non-invasive characterisation method for COPD. The method may be performed on captured SLP data to provide additional decision making information for clinicians.

P126 FEMALE COPD PATIENTS HAVE A GREATER PREVALENCE OF A LOW MUSCLE MASS AND WEAKER QUADRICEPS MUSCLES THAN MALE PATIENTS

[1]SA Sathyapala, [2]A Rochester, [1]PR Kemp, [2]C Brightling, [2]M Steiner, [3]MI Polkey. *[1]National Heart and Lung Institute, Imperial College London, London, UK; [2]University of Leicester, Leicester, UK; [3]Royal Brompton and Harefield NHS Foundation Trust, London, UK*

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Introduction We recently reported that, in a cohort of 114 COPD patients, females had lower quadriceps strength and smaller type II muscle fibres than males, even after accounting for normal gender differences in health (Sharanya et al, 2019). Given the association of muscle dysfunction with impaired exercise capacity and mortality in COPD, we sought to confirm this finding in a larger, distinct cohort.

Methods Lung function, body composition (assessed using bioelectrical impedance) and quadriceps maximal voluntary contraction force (QMVC) measurements from 360 COPD patients (120F, 240M) from the COPD-MAP cohort were analysed. Patients were designated as having a low body mass index (BMI) using the WHO threshold of <21 kg/m^2, and a low fat-free mass index (FFMI) using the cut-offs validated for a secondary care COPD population (<15 kg/m^2 in females, 16 kg/m^2 in males, Schols et al 1993 and Mostert et al 2000). MVC was expressed as a percentage predicted using our prediction equations (Seymour et al 2010) that correct for gender and FFM. Comparisons were made using the Mann-Whitney U-test or t-test, and Fisher's exact test with proportions.

Abstract P126 Table 1 Clinical characteristics of COPD-MAP cohort who had quadriceps strength measurements

	Females (n=122)	Males (n=240)	p value
Age (years)	68(11)	70 (10)	0.12
FEV_1 (L)	1.13(0.49)	1.55(0.86)	<0.0001
FEV_1 (% predicted)	59.0(23.1)	53.9 (26.5)	0.04
FVC (% predicted)	93.0 (30.3)	85.8(27.5)	0.0008
FEV_1/FVC	0.50 (0.16)	0.49(0.17	0.16
PaO_2 (kPA)	9.4(1.2)	9.37(1.15)	0.95
$PaCO_2$ (kPA)	4.9(0.8)	5.0(0.8)	0.42
BMI (kg/m^2)	26.2(9.6)	26.8(6.0)	0.92
BMI <21 kg/m^2	14/122 (11.5%)	19/240 (7.9%)	0.33
FFM (kg)	38.8(11.6)	54.2(12.2)	0.16
FFMI (kg/m^2)	15.8(3.3)	18.3(3.9)	<0.0001
% with low FFMI	51/122 (42%)	56/223 (23%)	0.0004
QMVC (% predicted)	64.7(23.6)	74.5(22.8)	0.0002
QMVC/BMI <120%	102/122 (84%)	107/240 (45%)	<0.0001

COPD: Chronic Obstructive Pulmonary Disease, FEV_1 Forced Expiratory Volume in 1 second, FVC: Forced Vital Capacity, PaO_2 and $PaCO_2$: partial pressure of oxygen and carbon dioxide, respectively, in arterial blood, BMI: body mass index, FFM: fat free mass, FFMI: fat free mass index, QMVC, quadriceps maximal voluntary contraction. Values are median and interquartile ranges apart from PaO_2, which are mean and standard deviation values. FEV_1 females n=119, males n=235, FVC: males n=234, TLC females n= 93, males 185, RV females n=95, males =185, PaO2 and PaCO2 females n=70, males 147. Low FFMI (<15 kg/m^2 in females and <16 kg/m^2 in males).

Results Females and males were matched for GOLD stage; however, females had slightly less severe airflow obstruction than males (see Table 1). Despite this, and that similar proportions of females and males had a low BMI, females had a greater prevalence of a low FFMI. Furthermore, females had lower quadriceps strength than males; this could not be explained solely by muscle atrophy as their lower muscle mass was corrected for in calculation of the predicted values. The proportion of female patients with a QMVC/BMI ratio of <120%, which predicts increased mortality (Swallow et al, 2007), was also higher than in males (see table 1).

Conclusions Female COPD patients have a higher prevalence of a low muscle mass than males. Furthermore, females have weaker quadriceps muscles than males, even after accounting for expected gender differences and for their lower muscle mass. Study of why female patients are weaker is required. The data also argues for female COPD patients to be monitored especially closely for these complications in the clinic.

P127 IS FENO A USEFUL MEASURE IN THE ASSESSMENT OF ACUTE EXACERBATIONS OF COPD?

A Price, E Linacre, N Gill, L McDonnell, D Jackson, A Dewar. *Guy's and St Thomas' NHS Foundation Trust, London, UK*

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Introduction and objectives FeNO is a quantitative, non-invasive biomarker of type 2 airway inflammation and is an established tool in the assessment of patients with asthma.[1] However, the role of FeNO in COPD care remains unclear, despite up to 30% of patients with COPD having evidence of eosinophilic airways inflammation.[2] We investigated whether FeNO measurement is feasible in patients with an acute exacerbation of COPD (AECOPD) and whether it was elevated in any patients with a low blood eosinophil count.

Abstract P127 Table 1 Blood eosinophils at presentation and over the previous 2 years, and corresponding FeNO results

	n	FENO <25 (%)	FENO <25 and current smoker	FENO ≥25 (%)	Unable to perform(%)
Presentation peripheral blood eos <0.3	43	20 (46.5)	12	6 (14)	17 (39.5)
Presentation peripheral blood eos ≥0.3	18	6 (33)	4	9 (50)	3 (17
Peripheral blood eos <0.3 last 2 years	22	10 (45)	6	5 (23)	7 (32)
Peripheral blood eos ≥0.3 last 2 years	39	16 (41)	10	10 (26)	13 (33)

Methods FeNO testing was performed on patients who presented to hospital with an AECOPD. Patients with a prior diagnosis of asthma were excluded. FENO was recorded at the patient's bedside within 24 hours of arrival. If the patient was unable to record a result after 5 attempts, they were deemed unable to perform the test. Blood eosinophil count was measured as part of routine blood tests. Time of corticosteroid administration, highest blood eosinophil count in the preceding 2 years, exacerbation history, oral corticosteroid and inhaled steroid exposure were recorded from integrated electronic records.

Results 61 patients were admitted with AECOPD and met criteria for testing. 43 (70%) patients were able to perform the test. FeNO results are reported for each category in Table 1. Six (14%) patients did not have a blood eosinophils ≥0.3 on presentation but were noted to have raised FeNO. 5 (23%) of these had no raised eosinophils over the last 2 years.

Conclusions FeNO test appears feasible in patients with AECOPD, with 70% of patients able to perform the test.

23% of patients with an AECOPD had an elevated FeNO despite blood eosinophils of <0.3. Further research is required to understand the utility of FeNO in the acute setting of a COPD exacerbation and whether it can be used to guide therapy or predict outcomes.

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P128 PRE-OPERATIVE SPIROMETRY IDENTIFIES UNDIAGNOSED LUNG DISEASE IN CARDIAC PATIENTS

R Peat, S Town, S Hawkes, D Price, F Frost, D Wat. *Liverpool Heart and Chest Hospital, Liverpool, UK*

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Background In the UK around 1.2 million people have a formal diagnosis of COPD, however, it is believed that over 2 million more may be living with the disease. Shared risk factors and symptoms exist for cardiovascular disease and COPD. We aimed to assess the utility of pre-operative spirometry to identify undiagnosed obstructive lung disease in patients listed for CABG.

Methods 100 patients performed pre cardiac surgery spirometry according to ATS/ERS guidelines between February and August 2018. Obstruction was defined as FEV_1/FVC <0.7. Reversibility was not performed and no distinction between COPD, asthma, and other obstructive lung disease was made after testing. A detailed search of patient's comprehensive hospital electronic patient record system was performed after patient discharge.

Abstract P128 Table 1 Patient Characteristics

Characteristic	Value	SD
Sex, male/female	57/43	
Age, y	68	15
FEV_1, L	2.32	0.88
FEV_1,% predicted	85%	21
FVC, L	3.23	1.06
FVC% predicted	91%	17
FEV_1/FVC	0.72	11
Spirometric classification, normal/restrictive/ obstructive	41/15/ 44	

Results 43/100 patients (43%) had airflow obstruction, 42 (42%) had normal spirometry and 15 (15%) had restrictive spirometry.

Of the obstructive patients 14/43 (33%) were mild, 25 (58%) moderate, and 4 (9%) were severe. Pre-existing lung disease/abnormality was documented in 18/43 (42%) obstructive patients. COPD was reported in 12 (67%), asthma in 4 (22%), bronchiectasis in 1 and 'obstructive lung function' in 1. Medications prescribed for lung conditions were documented for 14 (33%) patients. Reference to spirometry was shared with a GP in 13 (30%) patients via a discharge letter or other correspondence, or in one case, an onward referral to a chest physician. Of the 13 incidences where some spirometry information was shared, all main spirometric indices (FEV_1, FVC, FEV_1/FVC ratio) or an interpretation of spirometry were only provided on 1 occasion.

Conclusion A high proportion of patients undergoing cardiac surgery had airflow obstruction, many of whom had no diagnosis of respiratory disease. Spirometric findings were poorly disseminated resulting in under-diagnosis in those without established respiratory disease, and potential test duplication in those with an established diagnosis where annual testing may be recommended. The routine sharing of pre-operative spirometry may help reduce missed cases of disease and reduce test duplication with established disease. Opportunities to optimise pulmonary function to improve surgical outcomes may also be present. Targeted screening of CVD may uncover a raised prevalence of respiratory disease such as COPD.

P129 USER EXPERIENCE AND ACCURACY OF CONTINUOUS CARDIO-RESPIRATORY PHYSIOLOGY DATA FROM A WEARABLE PHOTOPLETHYSMOGRAPHY WRISTBAND

G Sneddon, C Carlin. *Queen Elizabeth University Hospital, Glasgow, UK*

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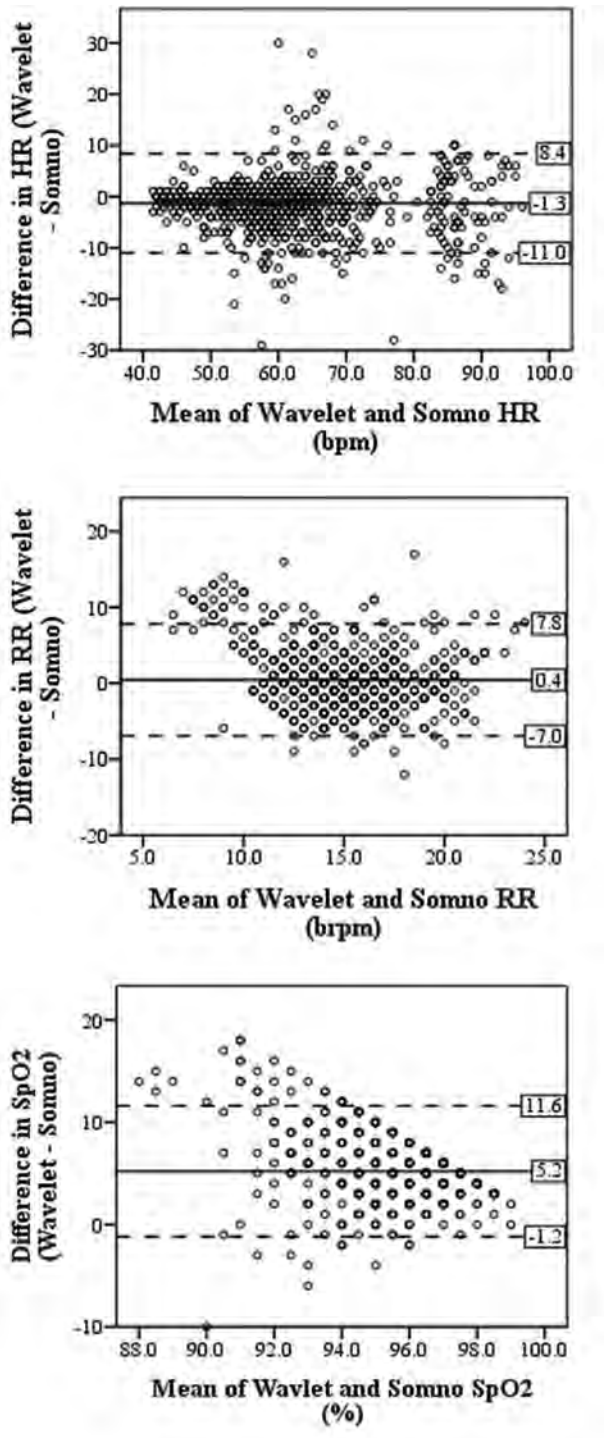
Background Next-generation wearable wristband devices are emerging. Physiology results from these are based on machine-learning derived algorithm's interpreting changes in photoplethysmography (PPG) signals to derive reported heart rate (HR), respiratory rate (RR) and oxygen saturations (SpO2),



Abstract P129 Figure 1 Bland-Altman plots of Wavelet vs SMed measurements

with bluetooth-cloud platform-based connectivity. There are a number of clinical use cases where the ability to accurately remotely monitor respiratory patient's HR, RR and SpO2 would be of potential value. Patient and clinical user testing, and benchmarking of accuracy of physiology measurements vs established sensors is required.

Methods 26 consenting patients attending for in-hospital polysomnography or home polygraphy (Somnomedics, SMed) wore the Wavelet (WaveletHealth) PPG wristband simultaneously for one night. PPG data was sampled over 1 minute periods in 5 minute cycles. HR, RR and SpO2 from PPG and SMed sensors were compared in subjects with successful data returns at time matched points.

Results User experience feedback with Wavelet wearable was notable for problems with wristband fixation, reliability of data recording and reliability of Bluetooth connection/data upload. Device connectivity problems resulted in failed PPG recording in 15 of 26 patients. Comparisons between the Wavelet data and reference sensor showed no statistically significant difference for RR ($p=0.523$) but did for HR and SpO2 ($p<0.001$ for both). Bland-Altman plots revealed infrequent but significant outliers in PPG-HR comparisons, poor agreement of PPG-RR with SMed data at lower respiratory rates and systematic overestimation of PPG-SpO2 by the Wavelet. Each metric shows variation outside a clinically acceptable range.

Conclusions The results from this study suggest that wearable sensor technology for HR, RR and SpO2 remote-monitoring is not yet mature. Further work is required to optimise data acquisition and refine data processing algorithms before actionable insights can be gained. Ongoing collaboration between technology developers and clinicians – to provide real world experience and routine clinical data for algorithm training – is required.

P130 DIRECT ACCESS LUNG FUNCTION SERVICE IN A DISTRICT GENERAL HOSPITAL

M Shahidi, C McGillicuddy. *Buckinghamshire Healthcare NHS Trust, Buckinghamshire, UK*

10.1136/thorax-2019-BTSabstracts2019.273

In our service we found that many patients were being referred to our respiratory outpatient clinic (OPD) because of inconclusive spirometry or breathless. The inconclusive spirometry was generally either due to an unexpected/unexplained restrictive defect or difficulty in determining between asthma and COPD.

We were asked by our local CCG to reduce the numbers of outpatients we were seeing, so following the Hitchingbrooke (Cambridge) model, we set up a direct access lung function pilot project, allowing the GPs to refer for lung function without the need for an outpatient appointment (OPA).

The aim was to see if we could reassure GPs of normal spirometry, clarify diagnoses between COPD & Asthma, help them with the diagnosis of breathlessness and thereby reduce the need for OPAs.

GP surgeries that had recently lost the nurse who provided their spirometry service signed up to the pilot in January 2016 and sent referrals according to the criteria set above. They included a medical and medication summary and were asked if they would be considering a respiratory referral if the service was not available.

Full lung function, including reversibility testing was performed in our lung function lab and the results sent to a Respiratory Consultant for reporting. The consultant reviewed the results, the referral letter and any available imaging and gave basic management advice or reassurance.

The outcomes reported were 'normal, COPD, or asthma'. A significant proportion of pts were found to be breathless due to a high BMI. If a significant abnormality was found, patients were invited for further tests and a Respiratory OPA.

191 patients were put through the pathway from January 2016 – December 2018. 67 were subsequently seen in the Respiratory OPD (35%). 103/191 GPs said they would have referred if this service was not available.

We believe this to be a safe and efficient service. It markedly reduces OPAs and also helps GPs to manage the patients locally. Since the pilot, this service has continued as it has been very popular; however it is yet to be commissioned by the CCG.

P131 RESPIRATORY ABNORMALITIES IN A LOCAL COHORT OF PATIENTS WITH LYSOSOMAL STORAGE DISORDERS

A Shah, N Devani, D Hughes, S Mandal. *Royal Free London NHS Trust, London, UK*

10.1136/thorax-2019-BTSabstracts2019.274

Background Lysosomal storage disorders (LSDs) encompasses a wide range of disorders which have a range of different respiratory manifestations including restrictive and obstructive lung defects, respiratory muscle weakness and sleep disordered breathing. A range of therapeutic options are available, from disease specific enzyme therapy to the use of non-invasive ventilation.[1] The Royal Free Hospital is a national centre for LSD patients and we sought to investigate the respiratory abnormalities in our local cohort.

Method Review of our local LSD patient cohort looking at respiratory physiology testing conducted in the last 2 years including spirometry assessment, sleep studies and respiratory muscle strength testing.

Results 53 patients with LSD were reviewed, (age 33.5± 13.4; 33% female; 74% Caucasian). There was a range of different disorders: Gauchers type 3 (21%); Pompe (32%); Mucopolysaccharidosis (MPS) I (26%); MPS II (10%) and MPS IV (11%). The overall data is summarised in table 1. Forty-four (83%) patients had had lung function in the last 2 years. Patients with MPS had a significantly reduced FEV1 and FVC compared to patients with Gauchers type 3. Seventy-five percent of patients had a sniff nasal inspiratory pressure (SNIP) test of which 25% had a SNIP of ≤40cmH_2O, with no significant difference amongst the groups. Thirty-six percent of patients had limited cardiorespiratory polysomnogrpahy, of which 69% had no evidence of sleep disordered breathing; 21% had mild obstructive sleep apnoea, 5% moderate and 5% severe.

Conclusion In our cohort of patients with LSD, those with MPS have a significant reduction in spirometry compared to Gauchers type 3. There were no differences between the groups in respiratory muscle strength or sleep study data, however, the number of patients who underwent sleep studies was fewer. The data highlights the importance of ensuring all patients with LSD undergo a thorough respiratory assessment and further highlights the need for further research into patients with LSD, respiratory manifestations and differences in the disorders.

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P132 IMPULSE OSCILLOMETRY IN OBSTRUCTIVE SLEEP APNOEA SYNDROME AND ITS RESPONSE TO CPAP: FEASIBILITY AND INSIGHTS INTO PULMONARY MECHANICS

G McDowell, C Carlin. *University of Glasgow, Glasgow, UK*

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Background Obstructive sleep apnoea syndrome (OSAS) is characterised by repeated apnoea's due to partial or total collapse of the upper airway during sleep, resulting in fragmentation of sleep and intrusive daytime somnolence. Intermittent hypoxia in untreated OSAS leads to oxidative stress and airways inflammation in central and peripheral airways. Continuous positive airway pressure ventilation (CPAP) maintains upper airway patency preventing apnoea's. Impulse oscillometry measures lung function and respiratory impedance, including large (R20) and small airways resistance(R5-R20). We used impulse oscillometry to monitor change in pulmonary mechanics in response to long term CPAP therapy in OSAS.

Methods 18 patients with confirmed OSAS had impulse oscillometry readings at baseline and after three months of CPAP therapy.

Results Patient feedback on oscillometry measurements in monitoring therapy is reassuring. A significant decrease in R5-R20 was observed in those adherent to CPAP (p= 0.0547).

Abstract P131 Table 1 Respiratory physiology in patients with Lysosomal Storage Disorders

	Whole group	MPS (Mucopolysaccharidosis) (Type I, II & IV)	Gauchers (Type 3)	Pompe	Comparison between groups p value
	Spirometry				
FEV_1	1.90 ± 0.93	1.37 ± 0.76*	2.53± 0.39*	2.26 ± 0.96	**0.001**
FVC	2.36 ±1.23	1.77 ± 1.11*	2.98 ± 0.52*	2.79±1.34	**0.01**
FEV_1% predicted	70.62 ± 28.31	63.22± 31.25*	86.98 ±10.8*	71.69 ±28.09	**0.026**
FVC% predicted	72.85 ± 29.52	65.59 ±31.74*	89.25 ±13.1*	73.28±30.68	**0.05**
	Respiratory Muscle Strength				
SNIP	64.8 ± 29.4	73.8 ±28.8	69.8 ± 12.9	51.7 ± 31.8	0.303
	Sleep Study				
AHI events/hr	7.2 ± 13.0	5.1 ± 5.4	4.8 ± 7.1	13.0 ± 240.0	NA
ODI	7.9 ± 13.3	6.5 ± 8.3	4.6 ± 6.4	12.7 ± 23.7	NA
Mean SpO2	94.7 ± 1.9	95.0 ± 1.5	95.3 ± 2.1	93.6 ± 2.5	NA

*=significant pairings

Abstract P132 Table 1

	Baseline					3months				
	R5	R5–20	R20	Ax	X5	R5 (% change)	R5–20 (% change)	R20 (% change)	Ax (% change)	X5 (% change)
1	5.18	1.03	4.15	25.88	0.19					
2	6.46	0.14	6.32	1.69	0.65	7.81(+20.9)	-0.23	8.04 (+27.2)	1.17(-30.8)	-0.35 (-154)
3	5.05	1.15	3.9	21	0.32	4.49(-11.1)	0.58(-49.6)	3.91 (+0.3)	11.76(-44)	-0.29 (-191)
4	8.26	2.17	6.09	17.64	1.22	6.33(-23.4)	1.05(-51.6)	5.28 (-13.3)	12.62(-28.5)	-0.15 (-113)
5	7.25	2.93	4.32	48.71	0.99	6.54(-9.8)	2.45(-16.4)	4.09 (-5.3)	25.04(-48.6)	-0.84 (-185)
6	5.22	0.34	4.88	6.67	-0.97	3.96(-24.1)	0.09(-73.5)	3.87 (-20.7)	2.87(-57)	-0.63 (+35.1)
7	3.75	0.05	3.7	8.82	-0.35	3.81(+1.6)	0.44(780)	3.37 (-8.9)	6.6(-25.2)	-1.05 (-200)
8	5.04	0.93	4.11	15.94	-1.78	3.92(-22.2)	0.7(-24.7)	3.22 (-21.7)	14.04(-11.9)	-1.16 (-34.8)
9	6.19	1.26	4.93	17.5	-0.24	4.12(-33.4)	0.69(-45.2)	3.43 (-30.4)	8.78(-49.8)	-1.2 (-400)
10	6.15	2.33	3.82	32.06	2.59					
11	4.24	1.59	2.65	24.38	0.79					
12	6.44	1.13	5.31	26.94	0.67					
13	4.22	1.01	3.21	18.8	0.36	4.02(-4.8)	0.52(-48.5)	3.5 (+9)	7.71(-59)	-0.084 (+76.7)
14	3.17	0.57	2.6	2.69	-0.01	3.47(+9.5)	0.6(+5.3)	2.89 (+11.2)	4.73(+75.8)	-0.49 (-4800)
15	4.5	0.28	4.22	9.04	-0.38	6.21(+38)	1(+257)	5.21 (+23.4)	20.68(+128)	-0.84 (-121)
16	6.39	2.73	3.66	24.68	0.21	6.86(+6.9)	3.23(+18.3)	3.63 (-0.8)	34.14(+38.3)	3.09(+1571)
17	4.8	0.89	3.91	11.93	-0.23					
18	3.33	-0.73	4.06	6.76	1.33					

Reactance measured by X5 and Ax decreased with CPAP adherence, $p=0.0547$ and $p<0.05$, respectively. A decrease in Epworth Sleepiness Score was observed in all patients ($p<0.05$). 9 out of 18 patients were adherent to CPAP therapy, with usage greater than 4 hours for 70% of days or more. Total airways resistance (R5) decreased in those adherent to CPAP therapy and increased in non-adherence.

Conclusion It is feasible to use of Impulse oscillometry to monitor physiology in OSAS. CPAP therapy improves symptom burden. Our results suggest effective CPAP therapy is associated with a reduction in small airways resistence and reactance. This data provides mechanistic insights into the aggravation of asthma and COPD when there is an overlap with OSAS. This justifies further exploration of impulse oscillometry as a bio-marker in disease monitoring in OSAS and other chronic lung disease.

P133 DOES SPIROMETRY ALONE CAPTURE ALL RESPIRATORY ABNORMALITIES ASSOCIATED WITH ABNORMAL LUNG FUNCTION?

R Beech, L Youngs, K Sylvester, M Rutter. *Cambridge University Hospitals, Addenbrookes Hospital, Cambridge, UK*

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Introduction and objectives Respiratory disease is the third biggest cause of death in the UK,[1] and for the first time, NHS England (NHSE) has designated respiratory disease as a clinical priority. The NHSE Long Term Plan highlights earlier and more accurate diagnosis as an objective. To identify respiratory disease earlier, the plan relies on quality performance of spirometry within the primary care setting. However, lung gas exchange abnormalities can be present in lung disease despite normal spirometry.[2] Therefore, some diagnoses may be missed. Our aim was to investigate within a cohort of our patients, the proportion of those with abnormal gas exchange yet normal spirometry, and whose time to first diagnoses may be protracted due to the reliance of spirometry measurement alone.

Methods A retrospective review of all patients attending the lung function laboratory from July 1995–July 2018 was undertaken. Spirometry and Single Breath Gas Transfer were performed to ERS/ATS standards, with ±1.64 standardised residual FEV1%VC Max used to identify normal spirometry and <-1.64 standardised residual used to identify abnormal TLCOc.

Results Of 41,480 visits, 5759 (13.9%) were identified on first presentation as having normal spirometry, yet abnormal gas transfer, once corrected for Hb.

Within the cohort of 5759 patients, 3270 were female and 2489 male, with a median (IQR) age of 63 (24) years. TLCOc median (IQR) standardised residual -2.23 (0.86). FEV1%VC Max median (IQR) standardised residual -0.25 (1.4).

Conclusions We have demonstrated that a large proportion of patients referred to secondary care with symptoms suggestive of respiratory disease have normal spirometry, yet abnormal gas transfer. These results have implications when solely utilising spirometry in order to detect respiratory disease earlier and will ultimately result in a continued protraction of patient diagnosis.

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Respiratory infections: getting it right

P134 PENICILLIN ALLERGY IN PATIENTS BEING TREATED FOR PNEUMONIA-MAKING A CASE FOR QUALITY IMPROVEMENT PROJECT

T Mahendiran, MK Omar, H Moudgil, E Crawford, K Srinivasan, A Makan, N Ahmad. *Shrewsbury and Telford Hospitals, The Princess Royal Hospital, Shropshire, UK*

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Background Penicillin allergy is reported by approximately 10% of the UK population, however only 20% of these actually have a true allergy.[1] In addition, a documented penicillin 'allergy' may be associated with a prolonged length of stay (LOS) related to longer duration of treatment, complications and adverse effects related to second-line antibiotic use.[2]
Aim Our primary aim was to establish a documentation of the type of allergy to Penicillin within a cohort of patients presenting to our hospitals with community acquired pneumonia. Secondary aim was to compare the length of hospital stay, readmission within 30 days, complications and 30-day mortality between patients with and without penicillin allergy.
Method We obtained data on all hospital admissions with a coded diagnosis of Pneumonia for the period covering October-December 2017. We divided this cohort into those with and without penicillin allergy; allergy information being obtained from discharge summaries and local pharmacy information system. Microsoft Excel and *http://vassarstats.net/* was used for statistical evaluation.
Results 308 admissions were coded as pneumonia in this period. We excluded 77 admissions due to lack of data. Of the remaining, 187 had no penicillin allergy and 44 were allergic to penicillin. This gives a prevalence of 19% (44/231), which is higher than the reported prevalence above, of which 95% (42/44) did not have the type of allergy mentioned.

Allergic group was older with a mean age (SD) 75 (15) v 72 (16) years [p value=0.0005], had more females 69% (31/44) v 41% (77/187) [p value=0.02], same LOS 6 days [p value=0.39], more readmissions 20% (9/44) v 16% (29/187) [p value=0.56], no greater complications 20% (9/44) v 20% (37/187) [p value=0.92] and a higher unadjusted overall mortality 14% (6/44) v 10% (18/187) (p value=0.61)
Conclusion Data shows:

1. Poor documentation of the type of allergy to Penicillin. This needs a Quality improvement project as it is likely that most patients may not have a true allergy as shown in previous studies.[1]
2. Allergic group were older, with more females but the other variables were not statistically significant. We would recommend further research in this area to inform future practice.

P135 STUDY OF HOSPITAL ACQUIRED PNEUMONIA IN CHEST TRAUMA PATIENTS

A Jaafar, K Tun. *Newcastle upon Tyne Hospitals NHS Foundation Trust, Newcastle upon Tyne, UK*

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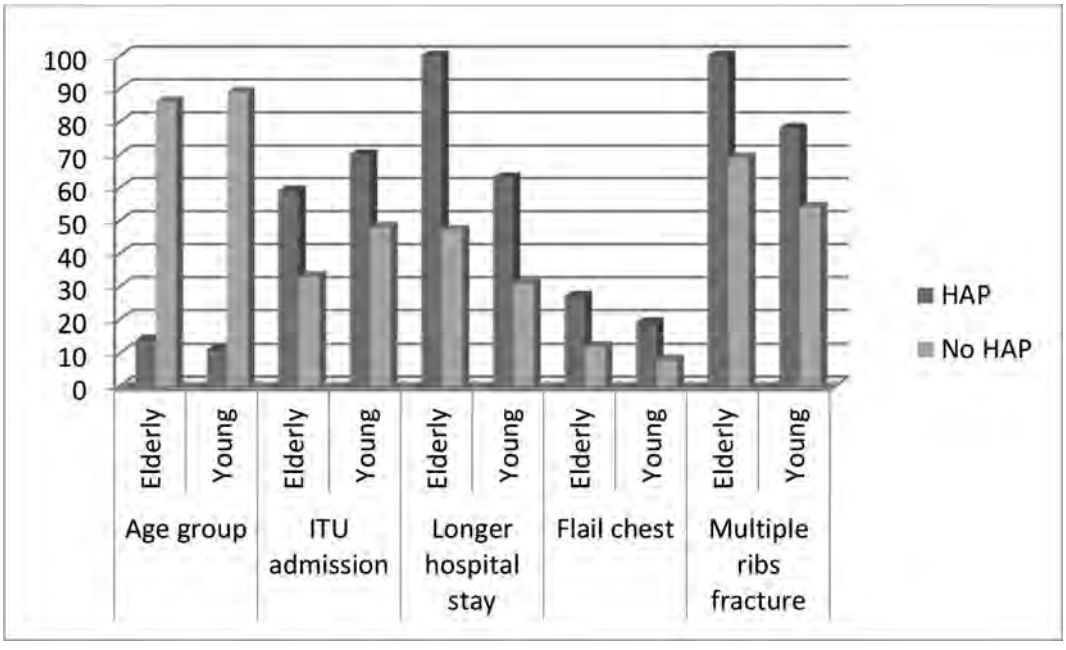
Hospital acquired pneumonia is one of the hospital acquired infections happening after 48 hours of admission and it happens to 0.5% to 1% of general admission. When it comes to chest trauma patients, this study is to find out if there is any increase in the incidence of hospital acquired pneumonia and which factors are related to it. In this study, we looked at the data collected during the period from January, 2015 to December,2016. Sample taken from patients presented after sustaining chest wall injuries and excluded patients died at the scene. The total number of patients was 436 and 408 patients were discharged from the hospital however, 28 patients did not survive from that admission. The data showed fall was the major cause of chest injury in elderly patients (age above 65) and road traffic accident followed by fall was the major cause in young patients. 14 percent of elderly patients



Abstract P135 Figure 1

developed hospital acquired pneumonia and 11 percent of young patients developed it. ITU admission was not significantly related to it (p value of 0.41) and also applied for flail chest (p value of 0.14). However some factors were significantly related to hospital acquired pneumonia. They were long hospital stay (in this study, it meant more than 10 days of admission) (p value of 0.0054) and multiple ribs fracture (more than one rib fracture) (p value of 0.000003). All deceased patients died of reasons not related to hospital acquired pneumonia and non of them developed it during their hospital stay.

P136 MICROBIOLOGICAL TRENDS IN COPD PATIENTS UNDERGOING THORACIC SURGICAL INTERVENTION

[1]J Bowie, [2]K Jeffreys, [3]M Bafadhel, [4]E Belcher. *[1]University of Birmingham, Birmingham, UK; [2]Department of Infectious Disease, Oxford University Hospitals NHS Foundation Trust, Oxford, UK; [3]Respiratory Medicine Unit, Nuffield Dept of Respiratory Medicine, University of Oxford, Oxford, UK; [4]Department of Thoracic Surgery, Oxford University Hospitals NHS Foundation Trust, Oxford, UK*

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Introduction Post-operative respiratory infection is a significant complication of thoracic surgery, associated with significant morbidity and high mortality. Patients undergoing thoracic surgical intervention with underlying lung disease, including COPD, often have chronic infection or colonisation. Peri-procedural microbiological airway sampling can potentially warn of pathogenic infection early in the clinical course, and guide treatment. We studied clinical characteristics and microbiological samples in patients undergoing thoracic intervention at a tertiary teaching hospital between 2012–2019.

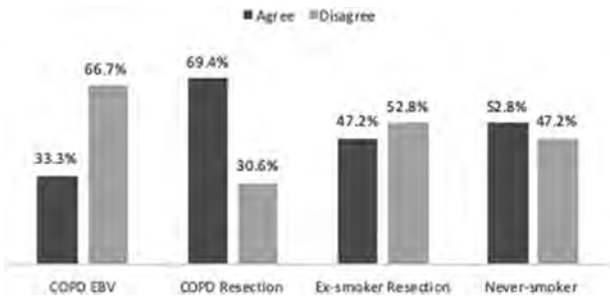
Methods A retrospective case-note review of 224 patients undergoing either lung resection for presumed lung cancer or insertion of endobronchial valves (EBV) was carried out. Data collection included demographics, lung function and microbiology from bronchoscopy at the time of intervention. Agreement between a respiratory physician and thoracic surgeon regarding antibiotic prescribing based on microbiology result was also investigated.

Results Four patient groups were categorised. EBV (n=56), COPD lung resection (n=51), Ex-smokers non-COPD lung resection (n=64) and Never-smokers non-COPD lung resection (n=51). The mean age was 67.3 (SD 10.1). Patients with COPD undergoing EBV insertion had the lowest FEV% predicted (mean 34.9%, SD 13.7) compared to ex-smokers without COPD (mean 93.4%, SD 23.9) and never-smokers without COPD (mean 106.3%, SD 22.5).

Normal respiratory flora made up 73% of the EBV, 79% of the COPD lung resection, 91% of the Ex-smokers lung resection and 84% of the Never smoker groups' positive cultures. Haemophilus influenzae was the commonest pathogen found (29% of pathogenic cultures in the EBV group, compared to 20%, 10% and 15% in the ex-smokers with COPD, ex-smokers without COPD, and never-smoker groups respectively).

When responses from a thoracic surgeon and a respiratory physician regarding treatment decisions based on pathogen identified were considered, the agreement rate varied between 33% and 69%, depending on the patient group (Kappa range from 0 to 0.44).

Conclusion There are differences between the characteristics of microbiological cultures from patients undergoing thoracic surgery, depending on their smoking status, COPD diagnosis and COPD severity. Airway sampling may aid antibiotic decision-making in patients undergoing thoracic surgery however, differences in antibiotic prescribing between clinicians highlights the need for more research into this area and consensus on treatment decisions.



Abstract P136 Figure 1 Clinician agreement on pathogen treatment decisions

P137 WHO GETS A LABORATORY POSITIVE DIAGNOSIS OF MYCOPLASMA PNEUMONIA? A 10 YEAR RETROSPECTIVE ANALYSIS

[1]CA Patteron, [1]M Lipman, [1]DJF Mack, [2]TD McHugh. *[1]Royal Free Hospital NHS Trust, London, UK; [2]Division of Infection and Immunity, University College London, London, UK*

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Background *Mycoplasma pneumoniae* (*Mp*) is thought to cause up to a third of community acquired pneumonias (CAP),[1] but often goes untreated due to use of B-lactams, to which *Mp* is not susceptible, and failure to diagnose due to limitations with current diagnostics. In order to define the extent of this issue, we performed a retrospective analysis on 10 years of data from a large, urban hospital looking at both serological and PCR positive diagnoses of *Mp*, asking who presents with *Mp* and are they managed appropriately?

Methods Laboratory diagnosis of *Mp* was performed using standard protocols and data were collected for PCR and serology on all patients tested for *Mp* between March 2009 – March 2019. Further data for all *Mp* positive cases was extracted from electronic patient records.

Results 19,090 PCR and 4530 serology samples were tested for *Mp*. 340 patients were positive for *Mp* by either method, excluding duplicates. 27 (16%) of the PCR positive patients had serological investigation for *Mp*. 52% (14) were serology and PCR positive. 35 (20%) of the serology positive group also had PCR tested. 31% (11) were positive.

The demographics of our patient group are described in **table 1**. The co-morbidities, investigation results and management of the 167 inpatients are summarised.

Discussion This retrospective analysis has enabled us to begin to describe patients with a microbiological diagnosis of *Mp* infection; s/he was previously fit, in their forties, with raised inflammatory markers, a transaminitis and an abnormal CXR. These characteristics and investigation abnormalities could be used as guidance on who to consider treating for atypical pneumonia, and on which patients to put into respiratory isolation. The limitations with current *Mp* diagnostics are demonstrated, with poor correlation between PCR and serological positive diagnoses.

Abstract P137 Table 1 Demographics, Co-morbidities, Investigations and Management of patients with a laboratory positive diagnosis of *Mp*

Patient Demographics (n=340)	
Median Age (range)	42 years (2–93)
Gender	52% Male
Setting of Diagnosis	49% Inpatients
Patient Co-morbidities (inpatients only, n=167)	
Known Current Smoker	7%
Documented Chronic Lung Disease	9%
Immunodeficiency	13%
Investigations (inpatients only, n=167)	
White Blood Cell Count (WBC)	9 x 10^9/L
Neutrophils	6.3 x 10^9/L
C-reactive protein (CRP)	94
Creatinine	83
Alanine Transaminase (ALT)	71
Abnormal Chest X-Ray (CXR)	81%
Management (inpatients only, n=167)	
Oxygen Support	28%
Antimicrobial treatment given	90%
Mp Appropriate Antimicrobial treatment Given	85%
Intensive Care Unit (ICU) admission	2%
Mortality	0.6%
Respiratory Isolation	32%

Key: N = number of patients

Conclusions The characteristics of a patient with *Mp* differs from the norm for a patient presenting with a CAP. We propose that targeted atypical cover should be considered in preference to B-lactam mono-therapy for all patients with these characteristics, together with testing for *Mp*.

REFERENCE

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P138 IMPROVING ANTI-FUNGAL STEWARDSHIP AND THE MANAGEMENT OF CHRONIC PULMONARY ASPERGILLOSIS THROUGH A COMPLEX LUNG INFECTION MDT

A Browne, M Wilkie, A Waqar, A Shaw, K Hill, N Rae, JD Chalmers, TC Fardon, DW Connell. *Ninewells Hospital and Medical School, NHS Tayside, Dundee, UK*

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Background Complex fungal lung infections such as Chronic Pulmonary Aspergillosis (CPA) require expertise for diagnosis and management. This challenge is now made more urgent by the recent rise in resistance to triazole drugs by *Aspergillus sp*. To address this, we now manage these cases through a novel Complex Lung Infection MDT. In doing so, we aimed to improve the decision-making around CPA diagnosis and management, whilst improving anti-fungal/triazole stewardship.

Methods The core MDT comprised three respiratory physicians with an interest in complex lung infections, an infectious disease physician, and two pharmacists with a special interest in this area, alongside a microbiologist, and an immunologist. There were six meetings in the initial twelve-month period from April 2018 to April 2019. We have analysed our management of Complex Fungal Lung Infections through the MDT in this time, with a specific focus on diagnosis and anti-fungal stewardship.

Results Of the 32 new cases discussed at the MDT over the six meetings, 13 were classified as complex fungal lung infections, with detailed analysis of their disease stage recorded as: 1 Sub-Acute Invasive Aspergillosis (SAIA), 7 Chronic Pulmonary Aspergillosis, 2 CPA/SAIA overlap, 2 CPA/ABPA overlap, and 1 ABPA/complex bacterial infection overlap. The cohort was highly co-morbid: 69.2% of new cases had a co-morbidity which influenced management, or required pharmacist-guided management of drug interactions.

10 of the 13 patients were initially treated with triazole drugs (7 Itraconazole, 3 Voriconazole); subsequent re-discussion meant that 6 of the 10 had changes to therapy (1 stopping, with 5 changing triazole drug to voriconazole or posaconazole). Therapeutic drug monitoring (TDM) occurred in 9 of the 10 patients, with subsequent dose or formulation changes.

Conclusions Discussion of patients with suspected complex fungal lung disease at our MDT has allowed a refinement in diagnosis of *Aspergillus*-associated lung diseases, as well as improved stewardship of triazole drugs, including decisions not to treat, and better anticipation of drug interactions and use of TDM. This approach may help mitigate the expected and worrying rise in anti-fungal resistance amongst *Aspergillus sp*.

P139 ARE WIND INSTRUMENT MUSICIANS AT A GREATER RISK OF DEVELOPING A CHEST INFECTION WHEN COMPARED TO THE GENERAL UK POPULATION?

[1]H Drover, [1]E Douglas, [1]TC Harvey-Dunstan, [2]S Gates, [1]K Hyndes. *[1]University of Nottingham, Division of Physiotherapy and Rehabilitation Sciences, School of Health Sciences, Nottingham, UK; [2]Nottingham University Hospitals, Nottingham, UK*

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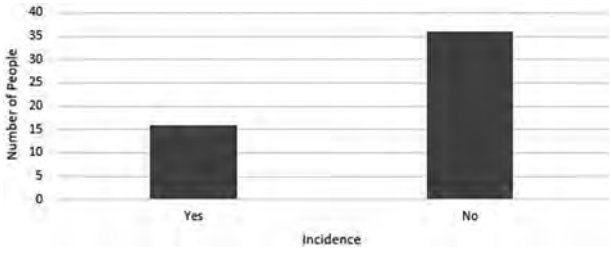
Introduction and objectives Bacteria and viruses cause chest infections (CI). Evidence suggests a presence of bacteria in wind instruments,[1] however little is known if this impacts upon the risk of developing a CI. Furthermore, there is no research investigating wind musicians' instrument hygiene or knowledge of standardised instrument cleaning guidelines. The aim of this study was to investigate the incidence of CI's along with knowledge of its symptoms. Secondary aims were to explore the practice of instrument hygiene.

Methods Members from a university orchestra were recruited to an undergraduate study. A bespoke questionnaire was created, and a pilot conducted to ensure applicability. 54 surveys were completed. Completed responses were analysed for descriptive and basic thematic analysis. Incidence of a CI (per 1000) was compared to that of a general UK population.[2]

Results 52 subjects had complete data. Mean±SD or percentage (%) Age 20±1years, Gender 54% female, Primary Instrument 44% flute & 31% saxophone, diagnosis of Asthma 23%. Of these, there was an incidence of 62 CI per 1,000 people per year (see Figure 1). 48% (n=25) cleaned their instruments every time after playing and 58% (n=30) have never been taught methods of instrument cleaning. 39% (n=20) identified that they may be at an increased risk of developing a CI and 2% (n=1) were able to correctly identify all symptoms stated within the questionnaire. Causation of CI's were identified as bacterial or viral (35%, n=18; and 23%, n=12), respectively.



Abstract P139 Figure 1 Incidence of chest infections in the previous five years

Conclusion There was an increased incidence of CI when compared to the general UK population. The majority of subjects reported inadequate instrument hygiene along with a poor knowledge of CI symptoms. Standardised cleaning guidelines would therefore be beneficial. Further investigation on a larger scale would build on these initial findings.

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P140 HOW IMPORTANT IS MYCOBACTERIUM CHIMAERA ISOLATION IN PATIENTS WHO HAVE NOT HAD CARDIAC SURGERY?

[1]M Kamalanathan, [1]F Perrin, [1]D Somasunderam, [2]R Breen. *[1]Kings College Hospital, London, UK; [2]Guys and St. Thomas, London, UK*

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Introduction There have been increasing reports of invasive infection caused by *Mycobacterium Chimaera* in recent years. Most commonly infection has been associated with the use of heater-cooler units in open cardiac surgery.[1] Although for many clinicians *M. chimaera* is a new entity, it is in fact a member of the *Mycobacterium avium-intracellulare complex* (MAC). Limited data exist surrounding its clinical manifestations in other patient groups.

Objective To investigate the clinical characteristics of patients identified with *M.Chimaera* in two teaching hospitals in South-East London.

Methods All reported positive mycobacterial cultures between January 2015 to July 2019 were retrospectively searched and those where *M.Chimaera* was isolated were identified. Electronic patient records were reviewed for site of infection, co-morbidities, co-existing immunosuppression and clinical outcomes. 12 patients with Cystic Fibrosis and 2 paediatric cases were excluded.

Results Isolates were identified from 22 patients; 12 (55%) were male and age ranged from 21 – 83 years. The details of the cases are shown in Table 1. 2 cases (9%) had previously undergone cardiac surgery: 1 had disseminated infection that was thought related to the surgery that required treatment, while the other had an isolated sputum culture post-operatively that was not followed up. In 7 (36%) cases the positive culture was not referenced in the medical records. In one case *M.Chimaera* was referred to as 'a contaminant' and in another as 'likely not pathogenic.'

Conclusions *M.Chimaera* was only identified in our cohort from March 2018, which likely reflects the introduction of distinct speciation of *M.Chimaera* by the Mycobacterial Reference Laboratory. Although two of our cases had undergone cardiac surgery, the majority of our patients had underlying COPD, bronchiectasis or immunosuppression, which are similar characteristics to those found in MAC infection. We believe further studies to determine the clinical significance and outcomes of *M.Chimaera* infection are required. Our data also suggest that clinicians may not be aware of the clinical relevance of newly reported non-tuberculous mycobacteria, something which will become increasingly relevant in the era of routine whole genome sequencing.

Abstract P140 Table 1

	N=22
Site of positive culture	
Sputum	18 (82%)
Lung nodule biopsy	3 (14%)
Liver biopsy	1 (4%)
Previous Cardiac surgery	2 (9%)
Underlying Respiratory Diagnosis	16 (73%)
COPD	5
Bronchiectasis	6
Interstitial Lung Disease	3
Asthma	2
Identified Immunosuppression	5 (23%)
Post-transplant	2
Primary Immunodeficiency	2
Untreated HIV	1
Previous MAC culture	4 (18%)
Management/Outcome	
Antibiotic therapy	3 (14%)
Active surveillance	6 (27%)
Repeat culture negative, discharged	1 (5%)
Death	3 (14%)
M. Chimaera result not acknowledged in records	7 (32%)
M. Chimaera regarded as clinically not significant	2 (9%)

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P141 PERSISTENT BACTERIAL BRONCHITIS IN ADULTS – A PRECURSOR TO BRONCHIECTASIS?

[1]S Finch, [2]L Carreto, [1]H Abo-Leyah, [3]A Browne, [3]TC Fardon, [3]JD Chalmers. *[1]University of Dundee, Dundee, UK; [2]Hospital Professor Doutor Fernando Fonseca, Amadora, Portugal; [3]NHS Tayside, Dundee, UK*

10.1136/thorax-2019-BTSabstracts2019.284

Introduction Bronchiectasis is both a radiological diagnosis and a clinical syndrome. In children, a pre-bronchiectasis condition called persistent bacterial bronchitis (PBB) has been described, but this is not recognised in adults. Here we describe a series of adult patients with clinical features of bronchiectasis without radiological bronchial dilation.

Methods CT scans from patients with clinically suspected bronchiectasis referred to a Bronchiectasis clinic between 2011 and 2017 were reviewed by two blinded observers, maximal Bronchio-arterial ratio was recorded. Fleischner society guidelines were used to diagnose radiological bronchiectasis. Adult PBB was defined by chronic or recurrent productive cough,

laboratory evidence of bacterial infection in sputum cultures, responsiveness of cough to antibiotic treatment and exclusion of alternative causes of cough (asthma, COPD, smoking) without radiological evidence of Bronchiectasis.

Results 90 patients met the criteria for adult PBB, 56.7% female, mean age 67. 63 (70%) had positive sputum cultures at presentation. Of those with recurrent positive sputum samples, 68.9% had persistent *Haemophilus influenzae* infection. *Pseudomonas aeruginosa* was isolated in 7 patients. Applying the bronchiectasis severity index (BSI), the mean score was 7, indicating a significant burden of disease despite no radiological abnormality.

55 patients were treated with long term antibiotics, typically long term azithromycin. 42 had a documented reduction in exacerbation frequency and/or symptoms. 35 patients had follow-up CT scans of which 10 (28.6%) patients developed overt radiological bronchiectasis.

Conclusion Adult PBB is a distinct disease entity representing a precursor to overt bronchiectasis in a significant number of patients. The condition is clinically similar to Bronchiectasis and responds to long term antibiotics. Further work to clearly define the condition and its natural progression is required.

P142 DOES THE APPEARANCE OF THE CHEST RADIOGRAPH MATTER IN PLEURAL INFECTION?

[1]EO Bedawi, [2]NI Kanellakis, [3]A Kim, [3]AL Pattabi, [4]A Dudina, [1]RM Mercer, [4]V George, [1]NM Rahman, [1]RJ Hallifax. *[1]Oxford Respiratory Trials Unit, University of Oxford, Oxford, UK; [2]Laboratory of Pleural and Lung Cancer Translational Research, Nuffield Department of Medicine, University of Oxford, Oxford, UK; [3]Mathematical and Computational Science School, Stanford University, California, USA; [4]Oxford University Hospitals NHS Trust, Oxford, UK*

10.1136/thorax-2019-BTSabstracts2019.285

Introduction The chest radiograph is used in clinical practice to guide decision-making in the treatment of pleural infection. This outcome was used as the primary endpoint in the randomised second Multicentre Intrapleural Sepsis Trial (MIST-2), defined as the change in area of pleural opacity, measured as the percentage of the ipsilateral hemithorax occupied by effusion, from day 1 to day 7 [1]. The value of this radiographic outcome measure as a surrogate for predicting clinically important outcomes, e.g. time in hospital (LOS), surgery at 3 months and 3-month mortality, has not been directly addressed.

Methods Retrospective analyses were conducted using the prospectively collected data from the MIST-2 database (n=210). Regression analyses were modelled with number of days in hospital (linear), and surgery or death at 3 months, both individually and as a combined outcome (yes/no; logistic), as dependent variables. The independent variables were absolute change in chest radiograph opacity (MIST-2 primary endpoint) and relative change, which is more clinically applicable in daily practice (a secondary endpoint in MIST-2). Each of the analyses was corrected for day 1 radiograph appearance to account for baseline variability. SPSS v25 was used for all analyses.

Results Absolute and relative change in chest radiograph opacity were associated with hospital LOS and either surgery or death at 3 months (combined outcome) with strong statistical significance ($p \leq 0.01$). Analysing the components of the combined outcome individually, absolute and relative change were associated with surgery at 3 months ($p \leq 0.01$ and $p=0.021$ respectively). Absolute and relative change in chest radiograph to death at 3 months alone was borderline significant ($p=0.089$) and non-significant ($p=0.16$) respectively.

Conclusion These findings demonstrate that change in chest radiograph during the course of treatment of pleural infection is a robust and clinically important surrogate endpoint which appears to predict meaningful outcomes. Although surgery may be decided upon solely on the basis of the radiograph (which would explain this result), change in x-ray appearance predicts other important outcomes (length of stay). This data supports its clinical utility, and suggests its robust use as a research outcome measure.

P143 ASSOCIATION BETWEEN PLATELET COUNT AND PLEURAL INFECTION

[1]AL Dudina, [2]EO Bedawi, [2]RM Mercer, [1]V George, [2]R Hallifax, [2]NM Rahman. *[1]Oxford Pleural Unit, Oxford University Hospitals, Oxford, UK; [2]Oxford Respiratory Trials Unit, University of Oxford, Oxford, UK*

10.1136/thorax-2019-BTSabstracts2019.286

Introduction Secondary thrombocytosis is one of the commonest reactive processes in clinical settings of acute bacterial and viral infection. Platelet response could be similar to any other markers of inflammation such as C-reactive protein (CRP) and white cell count (WCC).

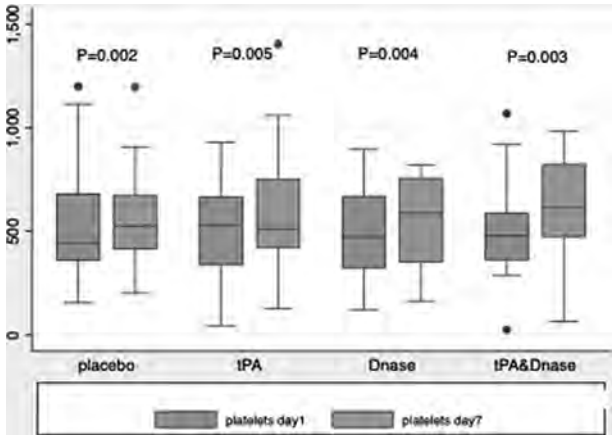
Objectives The aim of this study was to analyse whether change in platelet counts could be associated with time of recovery in patients with pleural infection on day 7 as compared with day 1. What is the association of platelet count with other inflammatory markers?

Subjects and methods This was a retrospective study using data from MIST2 trial recorded in 11 centres in the UK within 3 years (2005–2008).[1] For our analysis there were available 25 patients in placebo group, 23 - in t-PA group, 21 patients in DNase group and 25 patients in t-PA and DNase group.

We calculated the change in inflammatory markers in all groups of treatment.

Paired t-test was applied to calculate the mean difference in platelets, CRP and WCC during recovery time. Spearman's rank test used for comparison of means in four groups of treatment.

Results The analysis revealed an increase in mean platelets count from 489.25±215 to 575.78±231 9/L ($p=0.000$) by day 7 in whole data population with the highest increase in



Abstract P143 Figure 1

tPA&Dnase group and slight fall in tPA arm (Figure 1). Platelets correlate negatively with WCC and CRP which decreased by 3.05 (p=0.000) and 76.29 (p=0.000) respectively. But there is a weak correlation with the decreased WCC and CRP in the group treated with tPA and DNase.

Conclusion The reaction of platelets seems to be stronger than reaction of other inflammatory markers during treatment with tPA&DNase arm. This might be due to interaction between these two medications or platelets fall more slowly during recovery. A better understanding of the platelets role in pleural infection might help to produce new prognostic and therapeutic approaches.

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Asthma epidemiology: understanding the problem

P144 REGIONAL VARIATION IN OCS USE FOR UK PATIENTS WITH ASTHMA: HEAT MAP ANALYSIS

[1]A Menzies-Gow, [2]T Haslam, [3]T Morris, [4]LH Gylvin, [5]ER Bleecker, [6]C Nan. *[1]Royal Brompton Hospital, London, UK; [2]IQVIA, London, UK; [3]AstraZeneca, Luton, UK; [4]AstraZeneca, Cambridge, UK; [5]University of Arizona College of Medicine, Tuscon, USA; [6]AstraZeneca, Gothenburg, Sweden*

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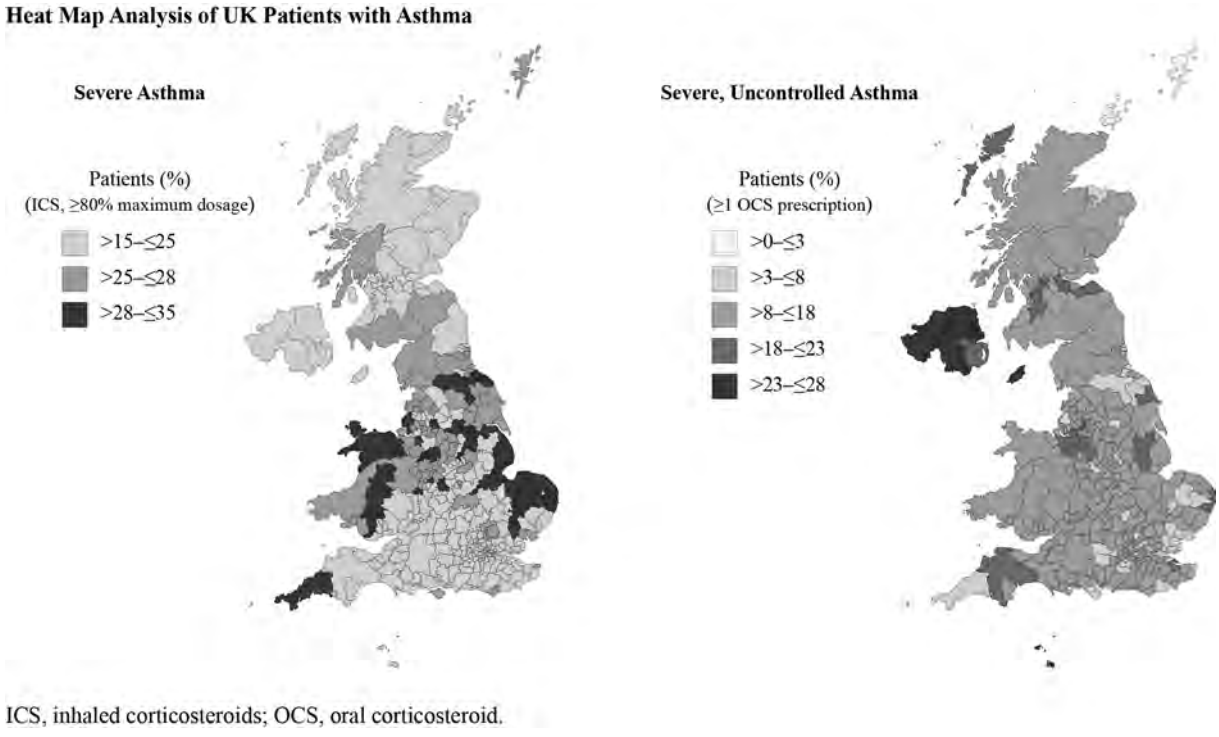
Introduction and objectives A better understanding of differences in asthma prevalence between regions will inform disease management and treatment. To examine regional variations in prevalence of severe asthma and severe, uncontrolled asthma, we analyzed pharmacy records from the United Kingdom.

Methods Data for 4,356,990 patients who received treatment for fixed airflow obstruction during 2018 were extracted from IQVIA's longitudinal database of UK pharmacy records, which included data for 61% of all UK patients from 46% of pharmacies. Indications for prescriptions were not available. Therefore, patients aged <35 years were classified as having asthma by default. Those aged ≥35 years were classified based on predominant monthly therapy consistent with asthma treatment. Patients were excluded if age was unknown, or they may have had intermittent asthma (≤3 prescriptions during 2018). Patients who received a daily average ≥80% of high-dosage inhaled corticosteroid (ICS) therapy during the year were considered to have had severe asthma. Severe asthma was considered uncontrolled if patients also received ≥1 oral corticosteroid prescription.

Results We identified >3 million patients with asthma. Severe asthma prevalence was approximately 25% overall and was greatest in the southwest and east of England and in parts of Wales (figure). Prevalence of severe asthma was comparatively less for greater London and other metropolitan areas. Prevalence of severe, uncontrolled asthma was greatest for Northern Ireland. Pharmacy migration, nonadherence to medication, and inability to link patients across pharmacies may have resulted in the underestimation of prescriptions, particularly in urban areas where populations are more likely to be transient. However, a sensitivity analysis that included only patients with 100% ICS coverage (adherent and nontransient) did not reveal any large differences in relative prevalences from the primary analysis.

Conclusions Regional patterns of severe asthma and severe, uncontrolled asthma were notably different. For some regions, relatively high prevalence might be explained by small patient numbers. Patients may have received high ICS dosages rather than biologic therapies, based on local access restrictions. Despite data limitations, this first heat map analysis of unmet needs for UK patients with severe asthma provides important tools for the discussion on improving severe asthma care.



Abstract P144 Figure 1

P145 IDENTIFYING PEOPLE MOST AT RISK OF A SEVERE ASTHMA ATTACK USING ROUTINE ELECTRONIC HEALTHCARE RECORD DATA

[1]A Clark, [1]S Stirling, [2]D Price, [1]S Musgrave, [3]A Sheikh, [3]H Pinnock, [4]M Al Sallakh, [5]M Noble, [1]AM Wilson. *[1]Norwich Medical School, Norwich, UK; [2]Observational and Pragmatic Research Institute, Southbank, Singapore; [3]University of Edinburgh, Edinburgh, UK; [4]SAIL Databank, Swansea, UK; [5]Acle Medical Centre, Acle, UK*

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Background Although many of the individual risk factors for asthma attacks are known, there is no published algorithm, using routinely available electronic health record data, to predict those individuals who are at a high risk of severe asthma attacks in primary care. We aimed to develop such an algorithm, so that individuals could be identified for a trial evaluating at-risk registers in primary care (the ARRISA-UK trial).
Methods Multivariable logistic regression was applied to a large dataset of 61,861 people with a history of asthma from England and Scotland from Clinical Practice Research Datalink (CPRD) and external validation using the Secure Anonymised Information Linkage (SAIL) databank of 174,240 patients from Wales. We defined a severe asthma attack as one resulting in one or more hospitalisation or A&E attendance (development dataset) and asthma-related hospitalisation, A&E attendance or death (validation dataset) within a 12-month period.
Results 969 (1.65%) patients (derivation data) and 2,439 (1.40%) (validation dataset) experienced one or more severe asthma attacks. Risk factors for asthma attacks were: previous hospitalisation, older age group, lower body mass index, smoking, blood eosinophilia, presence of diabetes diagnosis/therapy, ischaemic heart disease, anxiety/depression, history of anaphylaxis but not rhinitis, primary care consultations for lower respiratory tract infection, oral steroid courses and paracetamol, either no asthma treatment or high GINA step. This algorithm had good predictive ability with a Receiver Operating Characteristic (ROC) of 0.71 (95% CI 0.70 – 0.72) in the validation dataset. Those at highest risk of an attack (top 7%, 20–30 people/practice of 8,000 patients) had a positive predictive value of 5.7% (95% CI 5.3 – 6.1) and a negative predictive value of 98.9% (98.9 – 99.0), with 28.5% (26.7 – 30.3) sensitivity and specificity of 93.3% (93.2 – 93.4)
Conclusions This externally validated algorithm, the ARRISA-UK At-Risk Algorithm, derived from data within routine primary care electronic health records has good predictive ability for identifying patients at high risk of severe asthma attacks and excluding individuals not at high risk. We are able to use this algorithm to determine whether prioritising care for these individuals reduces hospital admissions.

P146 CHARACTERISTICS OF PATIENTS IN THE UK SEVERE ASTHMA REGISTRY

[1]A Menzies-Gow, [2]J Busby, [3]DJ Jackson, [4]AH Mansur, [5]S Siddiqui, [6]R Chaudhuri, [7]PE Pfeffer, [8]M Patel, [2]LG Heaney. *[1]Royal Brompton Hospital, London, UK; [2]Queens University Belfast, Belfast, UK; [3]Guys and St. Thomas Hospitals, London, UK; [4]Birmingham Heartlands Hospital, Birmingham, UK; [5]University Hospitals of Leicester, Leicester, UK; [6]Gartnavel General Hospital, Glasgow, UK; [7]Barts Health NHS Trust, London, UK; [8]Derriford Hospital, Plymouth, UK*

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Background The UK Severe Asthma Registry (UKSAR) collects standardised data on patients referred to specialist difficult asthma services in England, Scotland and Northern Ireland since 2015. It aims to characterise the patient population, standardise high-quality care, and facilitate research into the assessment and clinical management of severe asthma.
Methods Individual patient data from the UKSAR were analysed. Data were presented as mean (standard deviation [SD]) or median (inter-quartile range [IQR]) as appropriate.
Results Data from 2,397 patients were analysed from 20 centres. The mean age was 47.3 (15.5), and most were female (65.5%). The vast majority of patients were Caucasian (78.5%), while almost half were obese (BMI>30, 49%). Patients were generally never- (71%) or ex- (26.1%) smokers, atopic (65.5%), with frequent rescue steroid use in previous year (4+, 60.0%). The mean age of onset was 23 years (19). Mean FEV_1 was 69.1% (23.1) with 22% having significantly impaired lung function (FEV_1 <50%). 59.7% of patients had a FEV_1/FVC ratio <70% suggesting some fixed airflow obstruction. Median blood eosinophils, FeNO and IgE were 0.30 cells/uL (0.13, 0.59), 36.0 ppb (18.0, 72.0) and 161 (49, 485) respectively. Mean ACQ-7 scores were 3.1 (1.3), with the majority of patients uncontrolled (ACQ-7>1.5, 86.7%). 89.2% of patients were taking high dose (>1000mcg BDP equivalent) ICS. 85.2% were receiving a LABA, mostly with formoterol-containing preparations. Over half (52.2%) were taking a LAMA with the majority of these tiotropium (94.0%). 51.4% of patients used LTRAs while 7.2% used macrolide antibiotics. Nearly half (48.3%) of patients were treated with maintenance OCS. A significant minority of patients (19.7%) were thought to be poorly adherent with maintenance medications. Following multidisciplinary review, 90.6% met ATS/ERS criteria for severe asthma and 52.6% of patients progressed to biologic therapy, most commonly with Mepolizumab (68.6%), Omalizumab (24.2%) and Beralizumab (6.9%).
Conclusions Patients referred to UK specialist difficult asthma services have substantial unmet need due to significant asthma symptoms, impaired lung function and high exacerbation rates. Evidence of elevated Type-2 biology is frequently present. Add-on treatments are common at registration, particularly OCS, LAMAs and LTRAs. Over half progressed to biologic therapy.

P147 HOW ACCURATE ARE PRIMARY CARE ELECTRONIC DATABASES AT COUNTING ASTHMA EXACERBATIONS?

JF Yang, WTN Lee, NC Thomson, SJ Smith, M Shepherd, R Chaudhuri. *Gartnavel General Hospital, Glasgow, UK*

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Background There is a growing use of electronic databases for asthma studies, many of which use exacerbations to assess asthma control, severity and determine eligibility for biologic treatment.[1] Databases identify severe exacerbations based on prednisolone prescriptions, however its accuracy in counting exacerbations is not validated. We determined whether healthcare databases accurately identify asthma exacerbation numbers and the true proportion of UK primary care patients eligible for treatment with mepolizumab.
Methods Demographic and treatment information were collected from adults with asthma from ten UK general practices

over a 12 months period. Frequent exacerbators (FE) were defined as ≥2 exacerbations in the past year. Oral corticosteroid (OCS) prescriptions were manually checked against clinical records for FE identified by database search. Prescriptions for non-asthma indications, dose <30mg daily, or within 7 days of a previous course were removed from the total exacerbation count. Blood eosinophil counts (BEC) in the previous year were obtained for FE from NHS Safe Haven.

Results Of 2639 patients with active asthma, 254 (10%) FE were identified using electronic database searches. Whereas 185 (7%) FE were confirmed after manually reviewing OCS prescriptions. Database search overestimated FE by 37% and has a positive predictive value of 73%. Of 1000 prescriptions examined from eight practices, 302 (30%) prescriptions were discounted as an asthma exacerbation. The most common reason for overcounting of exacerbations was consecutive prescriptions given within 7 days. Less common reasons included OCS prescribed for other conditions, low dose maintenance OCS or emergency supply prescriptions. 30 patients had ≥4 exacerbations in the past year and/or were on maintenance OCS dose ≥5mg daily. 22 (73%) had BEC recorded in the past year. Twelve patients were eligible for mepolizumab according to NICE criteria.

Conclusion Primary care electronic database searches overestimated FE by 37%. Accuracy can be improved by adding the date, indication and daily dose of OCS in the search algorithm. Using confirmed exacerbation numbers and applying blood eosinophil criteria where available, 0.5% of patients with active asthma attending primary care in an urban area could be considered for mepolizumab.

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P148 ASTHMA-RELATED MORTALITY IN SPORT – STILL RELEVANT? AN ANALYSIS OF UNITED STATES COMPETITIVE ATHLETES

[1]OJ Price, [2]KL Kucera, [2]HM Price, [3]JA Drezner, [4]A Menzies-Gow, [4]JH Hull. *[1]Leeds Beckett University, Carnegie School of Sport, Leeds, UK; [2]National Center for Catastrophic Sports Injury Research, Department of Exercise and Sport Science, University of North Carolina, North Carolina, USA; [3]Department of Family Medicine, Sports Medicine Section, University of Washington, Washington, USA; [4]Department of Respiratory Medicine, Royal Brompton Hospital, London, UK*

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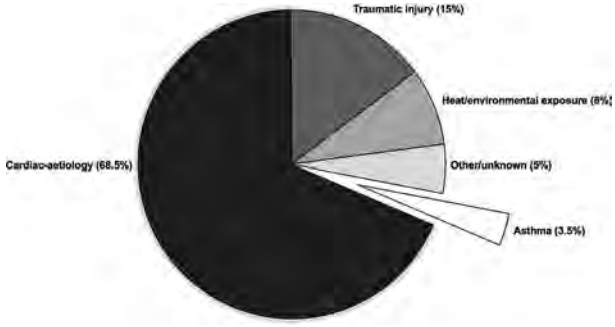
Background Asthma is prevalent in athletes and when left untreated is recognised to impact health and performance. Prior research highlights the presence of asthma-related mortality associated with sport, however, this data is now almost twenty years old[1] and both treatment and mortality patterns have evolved over this time. Indeed the Royal College of Physicians National Review of Asthma Deaths, revealed no sport-related mortality. Thus the aim of this work was to provide an up-to-date perspective regarding asthma-related sudden death from a large athletic database.

Method Retrospective analysis of the United States National Center for Catastrophic Sports Injury Research (NCCSIR) database. Information concerning sudden death was obtained via autopsy and/or news or media reports between 2012–2019. Athlete age, sex, sporting discipline/event, standard, date of death and cause of death were examined. Data are presented as absolute and percentage of total deaths.



Abstract P148 Figure 1 States NCCSIR cause of sudden death in athletes

Results Two-hundred and ninety-five cases of sudden death were identified over the study period. Of these, two-hundred and two (68.5%) were attributed to a cardiac aetiology; forty-four (15%) to traumatic injury; twenty-four (8%) to heat/environmental exposure; fifteen (5%) other/unknown, and ten (3.5%) to asthma or exercise-induced bronchoconstriction (EIB) (figure 1). Asthma-related deaths occurred most frequently in elite young athletes (i.e. sponsored or scholarship recipients aged: 13–21 years) regularly participating in high-intensity intermittent-based sports: American football (60%); soccer (10%); wrestling (10%); volleyball (10%) and running (10%). The majority of asthma deaths (70%) occurred during training or competition (i.e. severe exercise-induced exacerbation) - with the remaining cases (30%) occurring at rest (i.e. several hours post-exercise or recovery rest day).

Conclusion Our findings indicate that asthma is the fourth leading identified cause of sudden death in young athletes (approximately one in thirty cases). Although the relative risk of mortality is low, the importance of securing an early diagnosis and initiating appropriate therapy in athletes reporting exertional breathing difficulty should not be overlooked. Further longitudinal population-based research in this setting remains a priority.

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P149 THE IMPACTS LOW EMISSION ZONES HAVE ON IMPROVING HEALTH AND DECREASING HEALTH INEQUALITIES

TR Campbell, NJ Roberts. *Glasgow Caledonian University, Glasgow, UK*

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Background While there has been an increase in low emission zones (LEZ) across Europe, there is poor knowledge base examining the relationship between LEZ's and their effect on public health. This study was to assess the current research base on the relationship between different models of low emission zones (LEZ's) in Europe and their relationship with improving health and reducing health inequalities in areas of high air pollution.

Methods A literature search was undertaken using MedLine, ProQuest and Web of Science. A range of key words and synonyms were used including 'low emission zones' and 'health inequalities'.

Results Four quantitative studies were identified and included; 2 sequential cross-sectional and 2 observational descriptive study designs.

The studies found that implementing LEZ's in city centres was beneficial to the population's overall health. This impacted different socio-economic groups depending on the country/article. Modelling was undertaken to investigate the impact of pollution levels. The dispersion models analysed in this study revealed that all studies had a reduction in particulate matter 10 (PM_{10}) and nitrogen dioxide (NO_2). While the two studies that also examined particulate matter 2.5 ($PM_{2.5}$) and nitrogen oxides (NO_x) found slight decreases. In two of the studies examining mortality it was found that LEZ's slightly improved the populations years of life gained (YLG) in adults. The other two studies examining different health parameters associated with respiratory/allergic symptoms in children, found that reduction in air pollutants had a slight improvement in some of the symptoms.

Conclusion LEZ's have been shown to have a positive impact on improving health and reducing health inequalities in areas of high air pollution. Further research is necessary to further assess the relationship LEZ's have on improving health and reducing health inequalities.

P150 INCREASED NATIONAL MORTALITY RATES FOR ASTHMA ARE ASSOCIATED WITH INCREASED FINANCIAL INEQUALITY AS CALCULATED BY THE GINI INDEX

[1]GJ Connett, [2]S Rudrappa. *[1]University Hospital Southampton, Southampton, UK; [2]Evelina Children, London, UK*

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Introduction Recent international comparisons of health and wellbeing in adolescence and early adulthood report that mortality figures for asthma in the UK, Australia, New Zealand and the USA are three times higher than most European countries. All four countries have relatively high levels of social inequality. In this study we have compared Organisation for Economic Co-operation and Development (OECD) and UN Development Programme (UNDP) indices of social inequality data with global health data for asthma mortality reported by the Institute for Health Metrics and Evaluation (University of Washington).

Methods Data for all 27 OECD countries for whom there were available data for 2016 were downloaded from publicly available sites (Global Burden of Disease Study, OECD and UNDP). Asthma mortality rates per 100,000 population were selected for 5–14 years and 15–49 years age cohorts. Associations between asthma mortality and income inequality indices were explored by visual inspection and simple and multivariate linear regression models using SPSS software.

Results The GINI coefficient is the most widely accepted index for measuring inequality. This index was significantly associated with asthma mortality for both age cohorts (5–14 years; r=0.423, p=0.028 β coefficient=0.055 [95% CI 0.006 to 0.103]. 15–49 years; r=0.432 p =0.024 β coefficient= 0.120, [95% CI 0.017 to 0.224]). Inequality indices were in a relatively narrow range of 0.24–0.45 on a scale of 0–1 with higher scores indicative of greater inequality. An 0.1 increase in GINI score was associated with a 0.055 increase in asthma mortality rate for 5–14-year olds (median=0.026/100,000) and 0.120 increase for 15–49-year olds (median=0.159/100,000). Analyses using another inequality index, the S80/20 quintile ratio and the UN coefficient of human inequality index, taking into account additional health and educational determinants, were not associated with asthma mortality for either age group.

Conclusions Asthma is a complex syndrome with multiple factors determining severe and life-threatening phenotypes. These data provide some support for the hypothesis that at a national level high levels of financial inequality are associated with fatal asthma.

P151 ASSOCIATION BETWEEN ASTHMA AND SHIFT WORK: EVIDENCE FROM UK BIOBANK

[1]J Turner, [2]R Maidstone, [3]MK Rutter, [3]D Ray, [4]HJ Durrington. *[1]University of Manchester Medical School, Manchester, UK; [2]Division of Informatics, Imaging and Data Sciences, School of Biological Sciences, Faculty of Biology, Medicine and Health, University of Manchester, Manchester, UK; [3]Division of Diabetes, Endocrinology and Gastroenterology, School of Medical Sciences, Faculty of Biology, Medicine and Health, University of Manchester, Manchester, UK; [4]Division of Infection, Immunity, Respiratory Medicine, School of Biological Sciences, Faculty of Biology, Medicine, Health, Manchester Academic Health Science Centre, The University of Manchester, Manchester, UK*

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Introduction Shift work can negatively impact circadian rhythms causing circadian disruption. Circadian disruption due to shift work is associated with: obesity; diabetes; ischaemic heart disease; hypertension and cancer. These conditions are unified by the involvement of inflammatory pathways in their pathophysiology. Asthma is an inflammatory disease and displays marked circadian http://abstracts.kriyadocs.com/welcome-variation, yet the impact of shift work on asthma is unexplored. The relationship between asthma and shift work was investigated using data from the UK Biobank.

Methods We analysed the association between current shift work exposure and: doctor diagnosed asthma (N=286,825); wheeze/whistling (N=280,998) and FEV_1 percentage predicted ≤80% (N=89,157). Additional analyses included examining lifetime shift work exposure with doctor diagnosed asthma (N=120,306) and recent use of medication for asthma (N=15,379). Chi-squared tests were used to determine statistical significance, with $P<0.05$ being significant.

Results Current shift work was significantly related to the proportion of participants who reported: doctor diagnosed asthma (7.00% in shift workers, 6.91% non-shift workers, $P<0.05$); wheeze/whistling in the chest in the last year (23.33% in shift workers, 18.39% in non-shift workers, $P<0.001$) and FEV_1 percentage predicted ≤80% (15.73% in shift workers, 12.73% in non-shift workers, $P<0.001$). When looking at the impact of lifetime shift work, Chi-squared testing showed a significant impact on the proportion of participants who reported: doctor diagnosed asthma (13.37% in shift workers, 12.55% in non-shift workers, $P<0.001$) and recent use of medication for asthma (63.58% in shift workers, 61.20% in non-shift workers, $P<0.05$).

Conclusions This is the first study to assess relationships between shift work and asthma. Both shift work and night shift work were significantly related to features of asthma: doctor diagnosis; hallmark features used in diagnosis (i.e. wheeze and FEV1) and recent use of medication for asthma. We will extend this work using modelling that accounts for potential confounders. These novel data could have important

Abstract P151 Table 1 Current shift work schedule and features of asthma

	Current Shift Work Schedule					
	Day Workers (% of row)	Shift work, but never or rarely night shifts (% of row)	Irregular or rotating shifts with some night shifts (% of row)	Irregular or rotating shifts with usual night shifts (% of row)	Permanent night shifts (% of row)	P-value (Chi-squared test)
Asthma diagnosed by doctor (N = 286,825)						
Adult Asthma (18+)	15,574 (82.4)	1728 (9.2)	896 (4.7)	237 (1.3)	457 (2.4)	0.014
No	209,687 (82.6)	21,680 (8.5)	12,671 (5.0)	3530 (1.4)	6339 (2.5)	
Wheeze or Whistling in the Chest in the Last Year (N = 280,998)						
Yes	42,791 (79.1)	5374 (9.9)	3297 (6.1)	879 (1.6)	1732 (3.2)	< 0.001
No	189,845 (83.7)	18,478 (8.1)	10,503 (4.6)	2926 (1.3)	5173 (2.3)	
FEV1 Percentage Predicted ≤ 80% (N = 89,157)						
Yes	9381 (79.4)	1183 (10.0)	662 (5.6)	187 (1.6)	397 (3.4)	< 0.001
No	64,338 (83.2)	6286 (8.1)	3728 (4.8)	1055 (1.4)	1940 (2.5)	

clinical and public health implications, and may suggest common mechanisms linking shift work with disease.

P152 CHARACTERISTICS OF PATIENTS IN THE UK SEVERE ASTHMA REGISTRY: VARIATION BY ETHNICITY

[1]J Busby, [2]DJ Jackson, [3]AH Mansur, [4]A Menzies-Gow, [1]LG Heaney, [5]R Chaudhuri, [6]PE Pfeffer. *[1]Queens University Belfast, Belfast, UK; [2]Guys and St. Thomas Hospitals, London, UK; [3]Birmingham Heartlands Hospital, Birmingham, UK; [4]Royal Brompton Hospital, London, UK; [5]Gartnavel General Hospital, Glasgow, UK; [6]Barts Health NHS Trust, London, UK*

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Background Severe asthma demographics differ globally which may reflect biologic differences in asthma pathology and/or differences between healthcare systems. Inequality in healthcare access may also exist between regions. We examined whether the characteristics of patients varies by ethnicity in the UK Severe Asthma Registry (UKSAR) – a registry of patients attending regional specialist centres for severe asthma care across the UK.

Methods Baseline demographics of patients meeting ERS/ATS criteria in UKSAR were analysed by Ethnicity (Caucasian or Non-Caucasian). Linear and logistic regressions were used with adjustment for treating centre and, where relevant, maintenance oral corticosteroid use. Differences are displayed as adjusted percentage change or percentage change in odds between Non-Caucasian and Caucasians.

Results Non-Caucasian (n=349) and Caucasian patients (n=1,080) had similar mean age (48.3 vs 49.4, p=0.173) and similar female predominance (64.8% vs 63.6%, p=0.600). Non-Caucasian patients had significantly worse FEV1 (-6% adjusted difference, p=0.012) and worse ACQ7 asthma control scores (14%, p<0.001), higher blood eosinophil counts (14%, p=0.045) and serum total IgE (62%, p<0.001) compared to Caucasian patients. Non-Caucasian patients were less likely to have a history of smoking (-44%, p<0.001) or be in receipt of maintenance oral steroids (-42%, p<0.001). There was a trend towards higher prevalence of atopic disease among Non-Caucasian patients (27% increase, p=0.071). These differences were consistent across centres. For example, mean blood eosinophils and FeNO were higher in Non-Caucasians within all centres, while% predicted FEV1 measurements were materially lower in Non-Caucasians across centres.

Discussion Significant differences were evident between the demographics of UK severe asthma patients by ethnicity. Whether these differences reflect an effect of ethnicity on pulmonary immune responses or an effect on referral pathways is unclear and requires further investigation within population-based datasets.

P153 CHARACTERIZATION OF UNCONTROLLED SEVERE ASTHMA PATIENTS WITH TYPE 2 INFLAMMATION (T2) IN LATIN AMERICA

[1]I Kosoy, [2]O Ledanois, [2]E Lew. *[1]Ipsos, Parsippany, New Jersey, USA; [2]Sanofi, Paris, France*

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Introduction Among asthma patients who remain uncontrolled despite use of high-dose inhaled corticosteroids (ICS) plus a second controller medication or oral corticosteroid (OCS) dependent asthma patients, the latest Global Initiative on Asthma (GINA) guidance characterizes type 2 inflammation (T2) with biomarkers, such as blood eosinophils (EOS) or fractional exhaled nitric oxide (FeNO), and atopy. Some comorbidities, such as chronic rhinosinusitis with nasal polyps (CRSwNP) or atopic dermatitis (AD) should also be considered in determining add-on biologic T2-targeted treatment[1] This study estimated the proportion of uncontrolled, high-dose ICS asthma patients in Latin America based on T2 comorbidities, exacerbation history and biomarkers.

Methods A cross-sectional survey of physicians was conducted between June 6, 2018 and July 18, 2018. Pulmonologists, allergists and general practitioners from Colombia, Brazil, and

Abstract P153 Table 1

	Pooled n (%)	Brazil n (%)	Mexico n (%)	Colombia n (%)
Uncontrolled severe asthma patients age 12+ on high-dose ICS plus ≥ 1 controller				
N	320 (100)	113 (100)	109 (100)	98 (100)
Type 2 asthma-related comorbidities				
Atopic Dermatitis	65 (20)	20 (18)	23 (21)	22 (22)
Nasal Polyposis	49 (15)	14 (12)	22 (20)	13 (13)
Allergic Rhinitis	219 (68)	82 (73)	73 (67)	64 (65)
Exacerbations*				
2+ exacerbations in past year	106 (33)	34 (30)	38 (35)	34 (35)
3+ exacerbations in past year	48 (15)	15 (13)	18 (17)	15 (15)
4+ exacerbations in past year	28 (9)	10 (9)	9 (8)	9 (9)
OCS use				
Chronic	40 (13)	8 (7)	19 (7)	13 (13)
Biomarkers (among patients with lab values)				
EOS ≥ 150 cells/μL†	83/136 (61)	22/39 (56)	35/49 (71)	26/48 (54)
EOS ≥ 300 cells/μL†	59/136 (43)	15/39 (38)	32/49 (65)	12/48 (25)
EOS ≥ 400 cells/μL†	41/136 (30)	8/39 (21)	25/49 (51)	8/48 (17)
FeNO ≥ 25 ppb‡	12/12 (100)	10/10 (100)	1/1 (100)	1/1 (100)
IgE 30 -1500 IU/mL	152/173 (88)	44/50 (88)	63/66 (95)	45/57 (79)
150 cells/μL ≤ EOS ≤ 300 cells/μL	33/136 (24)	10/39 (26)	8/49 (16)	15/48 (31)

* Direct question to physicians
†Regardless of other biomarker levels
‡Limited FeNO lab data available

Mexico reported data from medical records of a convenience sample of their six most recent patients age 12+ years. This analysis described the uncontrolled severe asthma population in terms of OCS use, number of exacerbations in past year, EOS level, FeNO and T2 asthma-related comorbidities.

Results 320 uncontrolled severe asthma patients age 12+ on a high-dose ICS regimen plus at least one controller were included (Brazil=113, Mexico=109, Colombia=98) (table 1).

Conclusions A high proportion of severe asthma patients had evidence of T2 asthma as reflected by the proportion of patients having allergic rhinitis, nasal polyposis and atopic dermatitis, and based on EOS and FeNO results. Additionally, a third of patients had experienced two or more exacerbations in the past year.

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P154 CHARACTERIZATION OF UNCONTROLLED SEVERE ASTHMA PATIENTS WITH TYPE 2 INFLAMMATION (T2) IN THE EURASIAN MIDDLE EAST (EME) REGION

[1]I Kosoy, [2]O Ledanois, [2]E Lew. [1]*Ipsos, Parsippany, New Jersey, USA*; [2]*Sanofi, Paris, France*

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Introduction Among asthma patients who remain uncontrolled despite use of high-dose inhaled corticosteroids (ICS) plus a second controller medication or oral corticosteroid (OCS) dependent asthma patients, the latest Global Initiative on Asthma (GINA) guidance characterizes type 2 inflammation (T2) with biomarkers, such as blood eosinophils (EOS) or fractional exhaled nitric oxide (FeNO), and atopy. Some comorbidities, such as chronic rhinosinusitis with nasal polyps (CRSwNP) or atopic dermatitis (AD) should also be considered in determining add-on biologic T2-targeted treatments.[1] This study estimated the proportion of uncontrolled, high-dose ICS asthma patients in the Eurasian Middle East (EME) region based on T2 comorbidities and exacerbation history.

Methods A cross-sectional survey of physicians was conducted between June 6, 2018 and July 18, 2018. Pulmonologists, allergists and general practitioners from Russia, United Arab Emirates (UAE), Saudi Arabia and Turkey reported data from medical records of a convenience sample of their six most recent patients age 12+ years. This analysis described the uncontrolled severe asthma population in terms of OCS use, number of exacerbations in past year and T2 asthma-related comorbidities.

Results 358 uncontrolled asthma patients age 12+ on a high-dose ICS regimen plus at least one controller were included (Russia=121, UAE=50, Saudi Arabia=52, Turkey=135) (table 1).

Abstract P154 Table 1

	Pooled n (%)	Russia n (%)	UAE n (%)	Saudi Arabia n(%)	Turkey n (%)
Uncontrolled severe asthma patients age 12+ on high-dose ICS plus ≥ 1 controller*					
N	358 (100)	121 (100)	50 (100)	52 (100)	135 (100)
Type 2 asthma-related comorbidities					
Atopic Dermatitis	62 (17)	29 (24)	12 (24)	7 (13)	14 (10)
Nasal Polyposis	59 (16)	13 (11)	12 (24)	15 (29)	19 (14)
Allergic Rhinitis	169 (47)	52 (43)	32 (64)	34 (65)	51 (38)
Exacerbations†					
2+ exacerbations in past year	136 (38)	65 (54)	14 (28)	14 (27)	43 (32)
3+ exacerbations in past year	69 (19)	37 (31)	8 (16)	5 (10)	19 (14)
4+ exacerbations in past year	33 (9)	19 (16)	2 (4)	2 (4)	10 (7)
OCS use					
Chronic	55 (15)	14 (12)	5 (10)	9 (17)	27 (20)

*Biomarker data was not reported due to limited availability of the data
†Direct question to physicians

Conclusions A high proportion of severe asthma patients had evidence of T2 asthma as reflected by the proportion of patients having allergic rhinitis, nasal polyposis and atopic dermatitis. Additionally, more than a third of patients had experienced two or more exacerbations in the past year.

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P155 PREVALENCE OF URINARY INCONTINENCE WITHIN A DIFFICULT ASTHMA POPULATION

H Hylton, AL Long, SJ Quantrill, FR Ali, PE Pfeffer. *North Central and East London Severe Asthma Service, St Bartholomew's Hospital, London, UK*

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Background Urinary incontinence (UI) is a common, but under-reported comorbidity of many chronic respiratory conditions. Its prevalence can be associated with symptoms of coughing causing stress incontinence leading to an increased symptom burden.

To provide holistic care, it is important that patients are asked about their continence status on assessment and appropriate follow on care provided.

Aim To demonstrate the prevalence of urinary incontinence within the Difficult Asthma population and the impact this has on disease burden.

Method A retrospective service evaluation (Barts CEU ref: 10342) was conducted of patients' response to questions on continence status whilst undergoing a severe asthma assessment in the difficult asthma service. Patient's responses were compared with their ACQ6 scores as a measure of asthma control and EQ-5D-5L as a measure of health-related quality of life.

Results 103 consecutive patients (70% female, mean (SD) age 50.1 (13.8) years) undergoing specialist physiotherapy review were included. 47 (45.6% of patients, 96% female) reported urinary incontinence with significant association between gender and UI (chi-squared test, $p<0.001$). Asthma control was significantly worse for those with UI, with a mean (SD) ACQ6 score 3.34 (0.96) versus those without UI 2.64 (1.49) (t-test, $p=0.02$). Health related quality of life was significantly worse in those with UI; median EQ-5D-5L value for those with UI 0.494 vs those without 0.783 (Mann-Whitney U test, $p=0.02$). Age was not significantly different; with UI 50.5 (13.0) years vs without 49.8 (14.6) years ($p=0.79$).

Discussion UI is highly prevalent in the female severe asthma population and associated with increasing symptom burden. A raised ACQ6 score is indicative of poor asthma control which could potentially lead to increased cough frequency exacerbating stress UI. Further work is required to identify if UI worsens with poor ACQ6 scores as a result of cough symptoms, or if this is an independent factor. Appropriate questioning of patients and onward referral is important for holistic care.

Targeted assessment of asthma

P156 USE OF THE BREATHING PATTERN ASSESSMENT TOOL WITHIN THE DIFFICULT ASTHMA SERVICE

H Hylton, AL Long, SJ Quantrill, FR Ali, PE Pfeffer. *North Central and East London Severe Asthma Service, St Bartholomew's Hospital, London, UK*

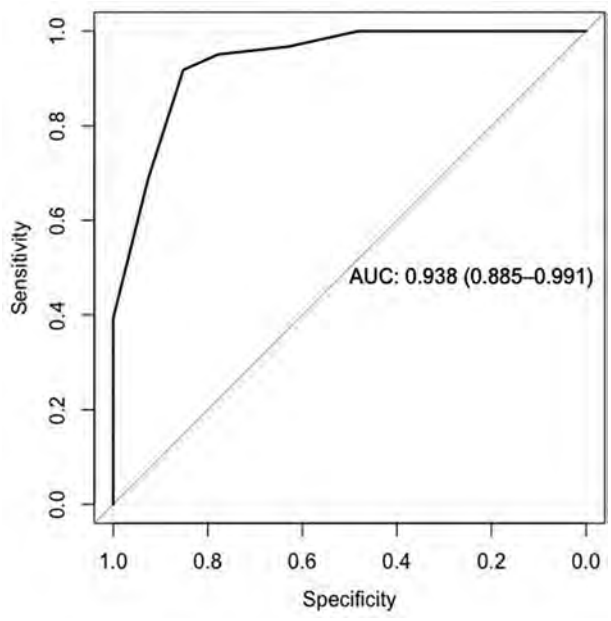
10.1136/thorax-2019-BTSabstracts2019.299

Background Dyspnoea is a widely reported symptom within Difficult Asthma populations and many patients have a concurrent diagnosis of a Breathing Pattern Disorder (BPD). The diagnosis and management of BPD is important to their holistic care. However, currently there is no extensively validated objective measure for BPD, leading to a lack of clarity in the diagnostic process. The Brompton Breathing Pattern Assessment Tool (BPAT) has been developed, with a score ≥ 4 indicative of breathing pattern irregularities with a sensitivity of 92%.[1] The tool is simple to use and takes 1 minute to complete. Replication of the model with another patient cohort at another centre with different staff is a key step in validating the BPAT for use at other clinical centres.

Aims We have sought to demonstrate reproducibility of the BPAT as a step towards further validation of the tool in difficult asthma populations.

Method We conducted a retrospective service evaluation (Barts Health CEU ref: 9592) of BPAT as a diagnostic tool for BPD in patients undergoing systematic severe asthma assessment at our centre. Presence or not of BPD was determined by specialist physiotherapy assessment with Manual Assessment of Respiratory Motion (MARM). In addition Dyspnoea 12, Dyspnoea MRC and Nijmegen questionnaires were completed.

Results 88 consecutive patients (69% female, mean age 50 years) undergoing specialist physiotherapy review were included. 27 (31%) patients had BPD on physiotherapy assessment. The utility of a BPAT score ≥ 4 as a cut off for diagnosing BPD was confirmed with ROC analysis AUC 0.938 (0.885–0.991), sensitivity 95% and specificity 78% (figure 1). AUC for BPAT was superior to AUC for D12 questionnaire (0.76), Nijmegen (0.70) or MRC Dyspnoea Scale (0.64).



Abstract P156 Figure 1

Discussion The results from this study support the use of the BPAT as a robust screening tool for assessment of BPD in difficult asthma populations and its use in severe asthma assessments. Its utility in other populations, for example emphysematous COPD and interstitial lung diseases, now needs addressing.

REFERENCE

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P157 SEVERE ASTHMA QUESTIONNAIRE (SAQ): VALIDATION AND CONTINUING USE

[1]J Lanario, [1]M Hyland, [1]R Jones, [2]M Masoli. [1]*University of Plymouth, Plymouth, UK*; [2]*University of Exeter, Exeter, UK*

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Background Current asthma-specific health related quality of life (HRQoL) questionnaires do not assess deficits specific to people living with severe asthma. To create a new questionnaire (the SAQ), qualitative studies identified items relevant to the target population and optimized the wording in a draft questionnaire using focus group feedback.

Data collected from 160 patients attending a severe asthma clinic demonstrated the SAQ's validity versus established

measures of HRQoL (Mini Asthma Quality of Life Questionnaire), asthma control (Asthma Control Test) and health status (EQ-5D-5L).

Translations are available in English, French, Italian, Dutch, Swedish, German, Portuguese and Spanish.

Current research Additional validation data from 300 patients is being collected in a UK study with three recruiting sites. The 12-centre UK BenRex study is using SAQ in a study (a Refractory Asthma Stratification Programme project) and will evaluate the change in quality of life after initiating benralizumab.

A preliminary Minimum Clinically Important Difference (MCID) of 0.46 was calculated by statistical methods, future studies will examine other methods including an anchor method.

Registries SAQ is being used in a number of national (e.g the Italian SANI network) and international registries including the International Severe asthma Registry (ISAR) and the Severe Heterogenous Asthma Research Patient-centered Project (SHARP). Future studies will include an independently conducted a patient preference study of severe asthma HRQoL measures.

Conclusion The SAQ is a newly validated measure of HRQoL specifically designed for assessing severe asthma and is being widely adopted. Further determination of MCID, cross-cultural validation and further translations are ongoing.

P158 INCREASE OF MEDICATION USAGE FOR ASTHMA, COPD AND RHINITIS DURING THREE DECADES IN FINLAND

[1]T Mattila, [2]V Jormanainen, [3]T Vasankari, [4]S Toppila-Salmi, [5]A Lammi, [6]F Herse, [4]T Haahtela, [2]M Erhola. *[1]Helsinki University Hospital, Heart and Lung Center, Helsinki, Finland; [2]National Institute for Health and Welfare, Helsinki, Finland; [3]University of Turku, Turku, Finland; [4]Skin and Allergy Hospital, Helsinki University Hospital, Helsinki, Finland; [5]Finnish Lung Health Association (FILHA), Helsinki, Finland; [6]Nordic Healthcare Group, Helsinki, Finland*

10.1136/thorax-2019-BTSabstracts2019.301

Background The Finnish National Asthma Programme (1994–2004), COPD Programme (1998–2007), and Allergy Programme (2008–2018) improved diagnostics and care, and saved costs.[1] Yet, the long-term medication trends are undetermined.

Methods We used national registry data from the Finnish Statistics on Medicines from 1990 to 2018. The data include all medications purchased in pharmacies in Finland with a population of 5.5 million. We analyzed the drugs for asthma and COPD, systemic antihistamines, nasal drugs and cough/cold preparations by employing Anatomical Therapeutic Chemical classification (ATC) (figure 1). Medication consumption was expressed as the number Defined Daily Doses (DDDs) per 1000 inhabitants per day.

Results In early 1990s, use of asthma drugs decreased, probably because overuse of inhaled beeta-2-agonists diminished as inhaled corticosteroids became first-line treatment (figure 1). In 1993, the use of asthma drugs started a steady increase because of improved awareness and diagnostics fueled by the Asthma Programme. Increase in prevalence contributed to this development. After 2008, the Allergy Programme has boosted the increase. The COPD Programme enhanced management, and many asthma drugs were also employed for COPD treatment. Use of antihistamines, nasal corticosteroids and specific immunotherapy increased along with the Allergy Programme. Antihistamines became also available over the count (OTC). Interestingly, sales of cough and cold preparations have been in steady decline.

Conclusions There have been several, even opposite trends in medicating chronic respiratory diseases in Finland during the last 28 years. The net result, nevertheless, has been a general increase in drug use. As asthma and allergic rhinitis are effectively treated by modern medication, the increase mainly reflects better awareness and improved diagnostics of these conditions. In COPD, drugs are less effective and multipharmacy and overuse may become a problem. The reduction in the use of cough medicines is a result of long-term educational efforts. Time series data from nationwide statistics play an essential role when monitoring outcomes of public health programmes.

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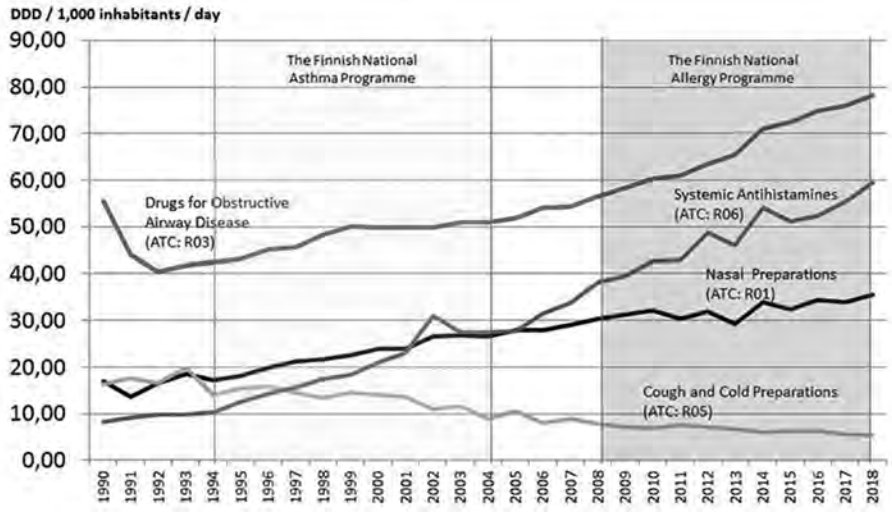

Abstract P158 Figure 1 Nationwide consumption of medications for treating asthma, chronic obstructive airway disease (COPD) and gallery in 1990–2018 in Finland

P159 CARE FOR PATIENTS ATTENDING EMERGENCY DEPARTMENTS IN ENGLAND WITH AN ACUTE ASTHMA EXACERBATION: CAN TARGETED INTERVENTIONS IMPROVE COMPLIANCE WITH SUGGESTED BRITISH THORACIC SOCIETY STANDARDS?

[1]S Faruqi, [2]A Macnair, [1]M Barik, [1]J Thompson, [2]A Diviney, [2]M Baker, [2]M Crooks. *[1]Hull University Teaching Hospitals NHS Trust, Cottingham, UK; [2]South Tyneside NHS Foundation Trust, Cottingham, UK*

10.1136/thorax-2019-BTSabstracts2019.302

Introduction We previously reported the outcome of a retrospective evaluation of asthma care for patients attending three emergency departments (ED) in England. [1] We demonstrated that components of the BTS Asthma Care Bundle were completed in less than a third of patients attending the ED with an acute exacerbation. We now report prospective data from two of the participating trusts following implementation of interventions designed to improve asthma care for patients attending the ED.

Methods *Setting:* Two NHS hospital trusts in England over a six-month period.

Abstract P159 Table 1

Descriptor	Retrospective study[1]	Prospective study		
	Trust 1 and 2 (n=207)	Trust 1 (n=68)	Trust 2 (n=52)	Combined (n=120)
Inhaler technique assessment, n (%)*				
- Yes	6 (2.8)	67 (98.5)	3 (5.8)	70 (58.3)
- No	114 (55.1)	0 (0)	1 (1.9)	1 (0.8)
- Not documented	87 (42.1)	1 (1.5)	48 (92.3)	49 (40.8)
Medication adherence assessed, n (%)				
- Yes	*Trust 1 only*	56 (82.3)	43 (82.7)	99 (82.5)
- No	0 (0)	4 (5.9)	2 (3.8)	6 (5.0)
- Not recorded	0(0)	8 (11.8)	7 (13.5)	15 (12.5)
	117 (100)			
Asthma action plan provided, n (%)				
- Yes	0 (0)	67 (98.5)	8 (17.3)	75 (63.3)
- No	117 (56.5)	0 (0)	21 (40.4)	21 (17.5)
- Unknown	90 (43.5)	1 (1.5)	22 (42.3)	23 (19.2)
Follow-up arranged, n (%) Community				
- Yes	36 (17.4)	0 (0)	31 (59.6)	31 (25.8)
- No	164 (79.2)	0 (0)	9 (17.3)	9 (7.5)
- Not recorded Specialist				
- Yes	7 (3.4)	68 (100)	12 (23.1)	80 (66.7)
- No	2 (1.0)	68 (100)	34 (65.3)	102 (85)
	205 (99.0)	0 (0)	18 (34.6)	18 (15)
Smoking status documented, n (%)	*Trust 1 Only*			
- Yes	18 (15.4)	63 (92.6)	38 (73.1)	101 (84.2)
- No	99 (84.6)	5 (7.4)	14 (26.9)	19 (15.8)
- Current smoker	6 (6)	18 (26.4)	9 (17.3)	27 (22.5)

* All assessed in the ED in the retrospective study; Trust 1 completed assessment during the nurse-led clinic in the prospective study, whereas in Trust 2 this was still actioned in the ED

Design: Prospective evaluation of asthma care for patients attending the ED with asthma exacerbation.

Intervention: Both trusts implemented electronic systems to identify asthma patients attending ED. All patients were contacted by an asthma nurse by telephone following their attendance. In Trust 1, contacted patients were invited to attend a specialist nurse-led clinic within 2 working days of ED attendance. In Trust 2, a specialist nurse-led telephone consultation was undertaken and patients were triaged for follow-up using a standard protocol.

Data collection: A standard dataset was collected for each patient event, including demographics and delivery of asthma care with reference to the BTS asthma Care Bundle.

Data analysis: Data are presented descriptively.

Results This study includes 120 patient events (26% male, 17–81 years). Significant improvements in asthma care were observed in both trusts. Attendance in nurse-led clinics in Trust 1 led to completion of care elements set-out in the BTS asthma bundle in almost all patients. Follow-up arrangements improved in both Trusts. Data are presented in Table 1.

Conclusion Electronic systems can be used to identify patients attending ED with asthma exacerbations for review by specialist asthma services. Elements of asthma care described in the BTS bundle are infrequently performed in the ED. Early specialist nurse-led clinic review can address this. Identifying patients and arranging review in specialist nurse-led clinics offer a way of providing optimal asthma care for patients discharged from ED.

P160 ASTHMA IN THE EMERGENCY DEPARTMENT (E.D.), A CONTINUED MATTER FOR CONCERN

E Sadler, MJ Doherty, FS Rands. *Department of Respiratory Medicine, Dudley Group NHS Trust, Dudley, UK*

10.1136/thorax-2019-BTSabstracts2019.303

The annual asthma survey 2018 found the provision of follow up care after an emergency visit remained dangerously low. We therefore set out to review patients attending E.D. with acute asthma, to investigate if these they were adequately managed before and after their attendance.

A Band 7 asthma nurse specialist reviewed all E.D. attendances over a 6 month period October 2018 to March 2019. Patients who were admitted or who were already known to the respiratory services were excluded. All other patients were contacted and offered a clinical review or if they could not make this a telephone consultation, on average 7 days after their E.D. attendance. Fifty seven patients were seen by the nurse, 13 had telephone consultations and 59 DNA'd. The rest of the data refers to the 57 seen.

Of these 57, one was on no treatment, one on LAMA only, 19 on salbutamol prn, 21 on step 1, 12 on step 2 and 3 on step 3. Compliance was assessed as good in 20, poor in 15, 19 were on prn salbutamol only and three turned out not to have asthma. After clinical review 7 increased to step 1, 26 increased to step 2, 14 to step 3 and 1 to step 4, 12 were eventually seen by a respiratory Consultant because of either multiple courses of corticosteroids or diagnostic doubt. Forty nine patients who did not previously have one were given a personalised asthma action plan. GPs received letters about spirometry, FENO and treatment plans.

These data show that although in spite of different forms of assessment being offered the DNA rate in this group of patients is as would be expected high. However in those who did attend, compliance was poor, personalised action plans were unheard of and treatment was stepped up in most patients. Patients were seemingly undertreated in spite of the recent E.D. attendance. Suggesting that there is a significant unmet health need in this group of patients and that continued efforts to improve management of them, although difficult is worthwhile.

P161 CHRONIC PAIN IS PREVALENT IN SEVERE ASTHMA AND IS ASSOCIATED WITH IMPAIRMENT IN PATIENT'S ACTIVITY

A Cass, AH Mansur, A Vigus. *Birmingham Regional Severe Asthma Service, Heartlands Hospital, University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK*

10.1136/thorax-2019-BTSabstracts2019.304

Background Difficult and severe asthma patients suffer from several recognised comorbidities, some of which are well described. However the prevalence of chronic pain and its impact on patient performance has not been previously reported.

Methods Patients presenting to a tertiary severe asthma clinic with confirmed diagnosis of severe asthma were asked to complete a questionnaire about their health and chronic pain and a validated pain self-efficacy questionnaire (PSEQ)(Ref) which measures how confident a patient is to do a range of activities despite his/her pain.

Results 76 randomly selected severe asthma patients participated in the study; mean age of 49.1years (range 19–71), 61 (80.3%) females, mean body mass index 32.3±8.2 kg/m^2, forced expiratory volume in 1 second (FEV^1) 2.09±0.79, and FEV^1% predicted 77.6±23.7. 56/76 (73.7%) suffered from chronic pain with a mean visual analogue score (VAS) of pain severity of 6.7±2 (range 0–10, 10=worst pain). The mean PSEQ score was 28.4±15.4 (range 0–60, lower= worse activity due to pain). The impaired activities were severe in 17/50 (34%), moderate 14/50 (28%), mild 8/50 (16%), and minimal 11/50(22%). 61% had pain in the lumbar or thoracic spine regions and 30.9% had rib or anterior thorax pain and many had multiple sources of pain (mean number of pain sites 3.1±2, range 1–8), 37/56 (66.9%) were on daily analgesia for pain control. 46% had never had a diagnosis regarding their pain, 14% had had musculoskeletal physiotherapy, one patient had been to pain management clinic. Strong association was observed between chronic pain and breathing pattern disorder ($p<0.001$), and morbid psychology ($p<0.0001$).

Conclusion Our data suggests that chronic pain is a poorly recognised but highly prevalent co-morbidity in severe asthma and is associated with impairment in activities, breathing pattern disorder and morbid psychology. We recommend regular screening and development of effective management strategies for chronic pain as part of a holistic approach to severe asthma care.

REFERENCE

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P162 THE IMPACT OF DAY-CASE MULTIDISCIPLINARY ASSESSMENT ON ASTHMA CONTROL AND QUALITY OF LIFE SCORES OF PATIENTS REFERRED TO THE MANCHESTER SEVERE ASTHMA SERVICE

LJ Holmes, L Elsey, C Sommerton, GA Tavernier, D Allen. *Manchester University NHS Foundation Trust, Manchester, Greater Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.305

Introduction 250,000 individuals are affected by severe asthma, which can cause a huge physical and psychological burden. Severe asthma requires a comprehensive and systematic assessment, to confirm diagnosis, distinguish the correct phenotype, identify co-existing conditions and tailor therapy.

Historically our initial assessment of the referred patient was dictated by a traditional medical model. We have redeveloped our processes to facilitate a daycase multi-disciplinary (MDT) systematic assessment for all patients referred to our service.

Methods A retrospective review of patient records from baseline assessment and their 12-week follow-up was performed, to assess their initial outcomes after attending the MDT assessment.

Results In the first 6 months 100 patients were referred 94% had a pre-existing diagnosis of asthma and 63% were female.

Day-case assessment identified a primary diagnosis of atopic asthma (25%), eosinophilic asthma (34%), neutrophilic asthma (6%), occupational asthma (1%), and mixed phenotype or differential diagnosis (24%/10%). By second visit we had confirmed co-diagnosis of Tracheo-bronchomalacia n=20(20.4%), inducible laryngeal obstruction n=13(13.1%) and breathing pattern disorder n=20 (20.6%).

Comparison of Asthma Control (ACQ) at baseline to 12 weeks review shows an overall improvement of 0.75 (m=0.75, SD 1.5 t (78)4.43, $p<0.001$) and a 0.76 (z=-2.7, $p=0.005$) improvement in Asthma quality of life (AQLQ).

Poor inhaler technique was demonstrated by 48 (62%), fair technique by 17(22%) and good technique by 12(15%). Only 8.1% had an asthma action plan on referral.

Through delivery of educational intervention at baseline, the ACQ at 12 weeks has shown the highest improvement in the group with the poorest technique dropping by 0.96(CI 0.45–1.4). The fair technique group dropped by 0.5 (CI 0.08–0.92) and good technique dropped by 0.4 (CI 0.11–0.93). Similarly, the non-adherent group (collection of <80% prescription refills) at baseline n=18 (25.3%) showed an improvement in their ACQ of 1.1 (C I 0.28–1.9), when compared to the adherent groups n=53(74%) ACQ of 0.67(CI 0.28–1.07).

Abstract P162 Table 1 Baseline clinical information of new patients assessed

Age	51.2 9 (CI 42.8–59.7)
FEV1	2.62 (IQR 0.94)
FVC	4.8 (IQR 1.50)
Reversibility	10 (IQR 13.50)
FeNO	17 (IQR 34.00)
ACQ	2.52 (CI 2.21–2.82)
AQLQ	3.08 (CI 2.83–3.32)
Blood eosinophils	0.26 (IQR 0.32)

Conclusion Our results indicate that poor control may in part be due to poor adherence and inaccurate diagnosis. Through adopting an MDT systematic assessment, we can consider differential diagnosis and demonstrate an improvement in ACQ and AQLQ with a significant positive patient feedback.

P163 ASSESSMENT OF NOVEL ELECTRONIC ADHERENCE MONITORING DEVICES IN CHILDREN WITH ASTHMA

[1]S Makhecha, [2]AHY Chan, [3]CJ Pearce, [4]A Jamalzadeh, [5]L Fleming. *[1]Pharmacy Department, Royal Brompton Hospital, London, UK; [2]University of Auckland, London, UK; [3]Centre for Behavioural Medicine, University College London, School of Pharmacy, London, UK; [4]Paediatric Respiratory Department, Royal Brompton Hospital, London, UK; [5]Imperial College, London, UK*

10.1136/thorax-2019-BTSabstracts2019.306

Introduction Adherence monitoring to inhaled corticosteroids (ICS) is an essential component of asthma management. Electronic monitoring devices (EMD) provide objective data on date, time and number of actuations. However, most give no information on inhalation. Novel platforms in development monitor both activation and inhalation, ensuring more accurate estimates of the actual dose inhaled.

Aim To assess the feasibility of novel electronic monitoring devices (NEMDs), in terms of accuracy, usability and acceptability and assess impact on asthma control.

Method Open label, prospective, pragmatic randomised study. Children with asthma on ICS attending tertiary care trialled one of four NEMD: Remote Directly Observed Therapy (R-DOT), Hailie® Smartinhaler, INhaler Compliance device (INCA) and the Rafi-tone App.

Following up to 16 weeks monitoring, participants participated in focus group meetings, or one-to-one interviews. Accuracy was assessed using adherence data, acceptability and usability using themes identified from focus groups and interviews. Spirometry and measures of asthma control were recorded at baseline and follow-up.

Results 35 children were recruited: 18 (52%) (11 males, median age 13.5 (7–16) years) completed; 7 (20%) were lost to follow up; 4 (11%) experienced device failure, 4 (11%) lost their device and 2 (6%) withdrew. 11/18 (61%) attended focus groups or interviews.

There were no significant differences in measures of asthma control and adherence rates between the devices, however, there was a significant difference ($P<0.001$) between mean (SD) activation alone 65.2% (±19) with activation, inhalation and orientation 21.5% (±8.3) and activation plus inhalation 52% (±13.6) with activation, inhalation and orientation ($P=0.006$) for Hailie®.

Thematic analysis identified four main themes each with subthemes: device functionality, usability, perceptions and emotions; enhancements, improvements and preferences. The subthemes included 'big brother' effect, 'emotions' such as self-conscious of appearance, suggestions on characteristics of the 'ideal device' and preferred choice. The Halie and INCA were the most accurate and preferred. An acceptability criteria was developed to aid selection of devices.

Conclusion NEMDs that attach to inhalers requiring no additional effort or steps were selected by participants as the devices of choice, however, there is no 'one size fits all' and there are advantages and disadvantages of each device tested.

P164 IS ADEQUATE MONITORING BEING DONE FOR PATIENTS ON LONG-TERM ORAL CORTICOSTEROIDS FOR SEVERE ASTHMA (ADULTS)?

R Bhugra, H Joplin, K Mortimer, H Burhan. *Royal Liverpool and Broadgreen University Hospitals NHS Trust, Liverpool, UK*

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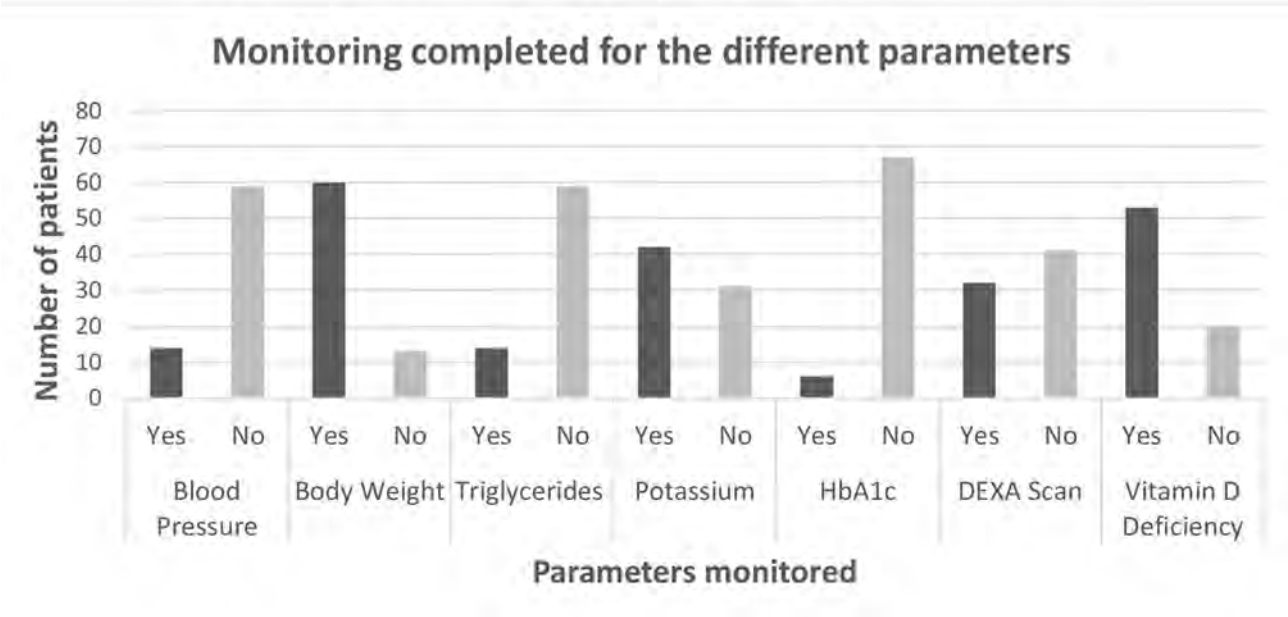
Severe asthma is defined by the British Thoracic Society as 'persistent symptoms and/or frequent asthma attacks despite treatment with high-dose therapies or continuous or frequent



Abstract P164 Figure 1 A graph representing some of the monitoring parameters as defined by NICE and the number of patients who had received adequate monitoring. Note NICE does not specify how often to monitor blood pressure, body weight or repeat a DEXA scan

use of oral steroids'. For patients on long-term oral corticosteroids (OCS), defined as ≥3 weeks as per National Institute for Clinical Excellence (NICE), blood pressure, body weight, height, HbA1c, triglycerides, potassium and optometrist assessment should be done at baseline. Risk of osteoporosis, adrenal suppression and falls should also be assessed. NICE recommends monitoring of HbA1c (every 3 months), triglycerides and potassium (every 6–12 months respectively), and all other monitoring to be done according to clinical judgement.

73 patients with severe asthma and on long-term OCS were identified, and quantitative data was collected retrospectively using appropriate resources. From the results, it is evident that the recommended monitoring is not being completed with compliance rates ranging from 8% (HbA1c) to 80% (body weight) for the different parameters (Figure 1). However, it is important to note that some of the patients were aged under 25 years (5/73 patients) and hence may not need a DEXA scan or vitamin D levels to be checked, whereas some patients had been recently transferred to the Trust for their asthma management and hence the data needed could not be collected fully.

Being on long-term OCS has a heavy side-effect profile which reduces the patient's quality of life, increases co-morbidities and medication load, and can amount to a substantial economic burden for the Trust and the local Clinical Commissioning Group. However, apart from the management of osteoporosis, there is lack of evidence-based guidelines for the management of OCS-related side-effects with most recommendations being published by experts. Having collected baseline results, we aim to develop a virtual clinic to review and monitor patients on long-term OCS. The aim is to establish whether increased monitoring is needed for these patients, and if so, how often, and whether it leads to increased interventions, improved patient care and outcomes.

P165 EFFECTS OF INTERVAL EXERCISE TRAINING ON ASTHMA SYMPTOMS AND INFLAMMATION

[1]AT Freeman, [2]D Hill, [1]K Gove, [1]D Cellura, [1]S Jack, [1]KJ Staples, [1]MPW Grocott, [1]TMA Wilkinson. *[1]University of Southampton, Southampton, UK; [2]University Hospital Southampton, Southampton, UK*

10.1136/thorax-2019-BTSabstracts2019.308

Introduction and objectives Exercise intervention may modulate the inflammation responsible for asthma, offering clinical benefit beyond functional improvement. Interval training is tolerated in asthmatics, and may also improve symptom control. This proof of concept study has recruited sub optimally controlled, untrained asthmatics to a 12-week Interval Training Programme to ascertain feasibility and safety, and effect on symptom control, airway and systemic inflammation, and physical fitness.

Methods Participants completed thrice weekly 30-minute interval exercise training sessions for 12 weeks. The training intensities were prescribed based on oxygen uptake (VO2) at anaerobic threshold (AT) and peak exercise. Lung function, blood, exhaled breath, saliva, sputum and symptom questionnaires were sampled at baseline, 3, 6 and 12 weeks.

Results Early results (n=6) suggest safety and tolerability, with improvement in symptom scores using the Asthma Control Questionnaire score (Friedman p=0.003) and Asthma Quality of Life Questionnaire score (Friedman p=0.02). This improvement in symptoms was associated with reductions in peripheral blood total white cell count (Friedman p=0.02), neutrophil count (Friedman p=0.04), eosinophil count (Friedman p=0.0017), and lymphocyte count (Friedman p=0.04). There was a significant improvement in pre-bronchodilator FVC (Friedman p=0.04) but not FEV1, with a trend for reduction in percentage bronchodilator reversibility (Wilcoxon signed rank p=0.09). The training intervention did not significantly improve physical fitness, assessed by VO2 at anaerobic threshold (Friedman p=0.37) or peak (Friedman p=0.15). BMI did not significantly change (Friedman p=0.18) and exhaled nitric oxide (FeNO) did not significantly improve (Friedman p=0.5).

Conclusions This interim analysis suggests exercise intervention in sub optimally controlled asthma is tolerated and beneficial for symptom control, with associated improvement in inflammatory parameters and lung function. The stability of BMI suggests the improvements in inflammatory markers are not a result of reduced adipose tissue related systemic inflammation. The stability of FeNO and significant reductions in total white cell and neutrophil count suggest the improvement in symptoms and inflammation are not due to improved adherence to inhaled corticosteroids. Prescribed training programmes may provide a cost-effective, disease modifying treatment adjunct in poorly controlled asthma.

P166 DISCHARGE FROM THE EMERGENCY DEPARTMENT WITH ASTHMA: AN UNMET NEED?

JTY Ting, TJT Sutherland, I Clifton, J Slough. *Leeds Teaching Hospitals NHS Trust, Leeds, UK*

10.1136/thorax-2019-BTSabstracts2019.309

Introduction Patients admitted to hospital with an asthma exacerbation are being offered follow-up in secondary care as per British Thoracic Society guideline. However, most patients who attend the Emergency Department (ED) with an exacerbation are being discharged following treatment in ED and are seldom offered routine follow up. This may represent an unmet need for intervention. The aim of the study is to look at this group of patients and determine the burden of need.

Methods We retrospectively reviewed data from patients attending ED with a diagnosis of asthma exacerbation from 1/5/2016 to 30/6/2016. Data were collected from the hospital system which integrates primary and secondary information. The GP record was reviewed for all patients where available. We looked at the number of ED attendances, asthma treatment and frequency of corticosteroid use.

Results A total of 116 patients were identified with an exacerbation of asthma. 85 patients were discharged from ED post treatment. From this group, we identified 33 patients (28%) who attended the ED but did not receive secondary care follow-up. This includes 7 patients who had a single ED attendance but had received further oral corticosteroid course by the GP, 15 patients with multiple ED attendance, and, 11 patients with single ED attendance but on step 3 or 4 of the BTS asthma guideline. We were unable to access 23 patients' GP drug record and hence their asthma therapy and frequency of oral corticosteroids were not known.

Conclusion We have identified an unmet need in patients attending ED and this is likely to be an underestimate. During 2016, there were 1291 attendances to ED with asthma exacerbation and this potentially would mean an additional 360

outpatient clinic reviews which would equate to an additional 6 review slots per week.

We are redesigning the asthma ED pathway to reflect this unmet need and will re-audit the impact.

P167 THE CONTRIBUTION OF EXTRA-PULMONARY SYMPTOMS OF QUALITY OF LIFE IN SEVERE ASTHMA ARE IMPORTANT AND MAY BE OVERLOOKED

[1]J Lanario, [1]M Hyland, [1]Y Wei, [1]R Jones, [2]M Masoli. [1]*University of Plymouth, Plymouth, UK*; [2]*University of Exeter, Exeter, UK*

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Rationale and aims People with severe asthma report both pulmonary specific symptoms and systemic symptoms. The aim was to survey the frequency of extra-pulmonary versus pulmonary symptoms as reported by people with severe asthma, and their contribution to quality of life and relationship to treatment.

Methods Consenting patients attending a severe asthma clinic completed a questionnaire measure of a large range of general symptoms using the General Symptom Questionnaire, (GSQ), pulmonary symptoms using the Asthma Control Test (ACT) and disease specific quality of life using the Severe Asthma Questionnaire (SAQ). Correlations are Pearson correlations, and simultaneous linear regression was used to calculate the independent contribution of the ACT and GSQ to the SAQ.

Results A median of 21 extra-pulmonary symptoms were reported per week. GSQ correlated -0.65 with the ACT and 0.69 with the SAQ. The beta for GSQ was -0.43 and for the ACT 0.41, both $p<0.001$, $R2=0.57$. There was a non-significant trend ($p=0.32$) for those on biologics to have less non-respiratory symptoms compared to those not on biologics (2.79 vs 3.01) as indicated by mean GSQ score.

Discussion Extra-pulmonary symptoms were common in this sample of people with severe asthma. Extra-pulmonary and pulmonary symptoms provided equal variance to the score of HRQoL, suggesting that they are equally important contributors to patient's experience of severe asthma. Despite this, extra-pulmonary symptoms are often overlooked in clinical medicine and in measures of quality of life. Participants receiving biologic treatments had lower extra-pulmonary symptoms possibly indicating that biologics reduce systemic symptoms more effectively than other treatments.

P168 TRANSFORMATION FROM MILD TO SEVERE ASTHMA; THE SEVERE ASTHMA CLINIC PERSPECTIVE

D Viswam, AH Mansur. *University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK*

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Background Significant minority of asthmatics develop severe disease with increased morbidity and risk of mortality. However, the mode of the onset of severe asthma is not well understood.

Aim To study the events leading up to severe asthma in patients referred to a tertiary severe asthma centre.

Methods Consecutive new patients referred to our centre between (….) undergone systematic assessment to confirm asthma diagnosis and establish severity level. Patients completed structured questionnaire narrating the mode and timing of the severe onset.

Results 148 patients with confirmed severe asthma diagnosis included in the analyses (70% females, mean age 45.2yrs (16–94), FEV1% predicted 70.3±22, FEV1/FVC ratio 65±15, BMI 32±7.7 kg/m^2, blood eosinophils 478 cells/µl, smokers: never 69%, ex 28% and current 4%). The mean age of onset of asthma was 19.4yrs (0–65), with majority [122 (82.4%)] had an early onset asthma (<40yrs), and minority [26 (17.6%)] had late onset asthma (≥40yrs). The mean duration of asthma prior to the onset of severe disease was 17.3yrs (0–57), and 25/146(17%) started as denovo severe. The transformation into severe disease was of gradual progression in 67/143(47%), following an acute lower respiratory tract infection in 46/143 (32%), or non-infective other acute event (multiple causes: e.g. accidental inhalation injury, psychological stressful event) in 30/143 (21%). The clinical outcomes in terms of lung function, biomarkers or asthma control did not differ significantly between these 3 modes of onset.

Conclusion The mode of severe asthma onset is variable with majority of patients endure gradual progression from mild to severe, whilst about third transform into severe following an infective event. Longitudinal studies are warranted to elucidate triggers of severity transformation and enable early intervention or prophylactic measures to prevent disease progression.

P169 IS THERE AN ASSOCIATION BETWEEN RECEIVING A RESPIRATORY SPECIALIST REVIEW AND RECEIPT OF DISCHARGE BUNDLE WHEN ADMITTED FOR ASTHMA?

[1]A Adamson, [2]S Robinson, [3]CM Roberts, [2]JK Quint, [4]J Calvert. [1]*Imperial College London, London, UK*; [2]*Royal College of Physicians, London, UK*; [3]*University College London Partners, London, UK*; [4]*North Bristol NHS Trust, Bristol, UK*

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Introduction Respiratory specialist review is recommended in people admitted to secondary care with acute asthma[1] as there is evidence that patient self-management education reduces readmissions.[2]Patient education forms the bulk of the discharge bundle recommended for asthma patients before discharge. Our analysis is the first to assess whether specialist review is associated with receipt of a discharge bundle and its individual elements in acute asthma patients in secondary care.

Methods The Royal College of Physicians National Asthma and COPD Audit Programme (NACAP) began a continuous audit on acute asthma treatment in secondary care in November 2018. 170 hospitals in Britain provided data on acute asthma admissions from November 2018 to March 2019. Data were collected on patient characteristics and care received. We used multi-level logistic regression including hospital as a random intercept to assess the effect of specialist review on receipt of a discharge bundle and individual discharge elements.

Results 10,428 asthma admissions were inputted during the audit, of which 10,242 (98.2%) were suitable for analysis. 76.8% of patients (N=7870) received a respiratory specialist review during their hospital stay, and 48.1% (N=4926) of patients received a discharge bundle. After excluding patients who self-discharged or died in hospital (N=221), patients who received a respiratory specialist review were 33 times more likely to receive a discharge bundle compared to those who did not receive a respiratory specialist review, after adjusting for hospital (adj-odds ratio=32.9,

Abstract P169 Table 1 The proportion of patients that receive elements of good practice care, broken down according to whether the patient received a respiratory specialist review. Patients who died or self-discharged are excluded from the analysis. Odds ratios are adjusted for clustering by hospital

Good Practice Care Item	Respiratory specialist review (N=7,747)	No Respiratory specialist review (N=2,274)	Adjusted odds ratio
Discharge bundle received	4,786 (61.8%)	140 (6.2%)	32.9 (26.0 to 41.5)
Inhaler technique checked	5,608 (72.4%)	334 (14.7%)	17.9 (15.1 to 21.3)
Maintenance medication reviewed	6,258 (80.8%)	818 (36.0%)	10.9 (9.4 to 12.7)
Adherence discussed	5,099 (65.8%)	272 (12.0%)	15.1 (12.7 to 17.9)
Personalised Asthma Action Plan issued/reviewed	4,022 (51.9%)	105 (4.6%)	21.6 (17.1 to 27.2)
Triggers discussed	4,740 (61.2%)	227 (10.0%)	12.3 (10.4 to 14.6)
Community follow up requested within 2 working days	3,143 (40.6%)	293 (12.9%)	4.21 (3.60 to 4.92)
Specialist review requested within 4 weeks	4,647 (60.0%)	377 (16.6%)	7.72 (6.68 to 8.92)
No good practice care elements given.	580 (7.5%)	1,031 (45.3%)	0.08 (0.07 to 0.09)

95% CI=26.0 to 41.5). Receipt of a specialist review was significantly associated with receipt of each of the elements of good practice care recommended by NICE/BTS before discharge (see table 1).

Conclusion Receiving a respiratory specialist review significantly increases the likelihood of acute asthma patients receiving a discharge bundle and elements of good practice care.

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Community and integrated care: joining the dots

P170 REDUCING NON-ELECTIVE RESPIRATORY ADMISSIONS: INITIAL EXPERIENCE OF THE DERBY INTEGRATED IMPACT+ RESPIRATORY SERVICE

D Subramanian, A Baguneid, R Evans, R Aldridge, G Lowrey. *University Hospitals Derby and Burton, Derby, UK*

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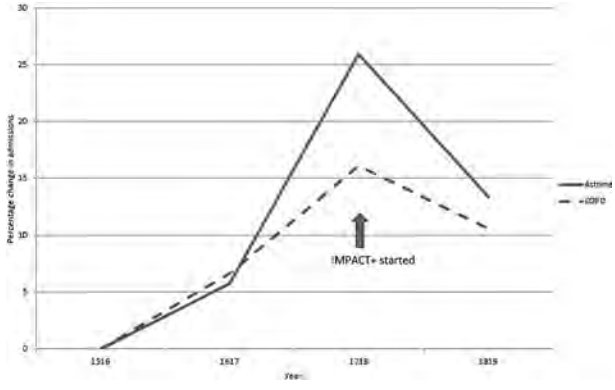
Introduction The Improving Adult respiratory Care Together (ImpACT+) project is a collaboratively designed, commissioned integrated respiratory service in South Derbyshire which was fully implemented in July 2018. This comprehensive service was evidenced based, follows NICE recommendations and included components based on service-user feedback. The service spans prevention through to end of life, includes all respiratory diseases and utilises learning from the asthma ImpACT project.[1]

Respiratory RightCare Commissioning for Value highlighted opportunities to reduce variation in non-elective admissions and this formed our primary objective.

Methods We assessed the usage of the ImpACT+ service, outcomes of the virtual MDTs and the effect on non-elective admissions to the Royal Derby Hospital. The service fully launched in July 2018 in South Derbyshire, with a catchment population of approximately 660,000. It is delivered by a multi-disciplinary team (including consultants, specialist nurses, physiotherapists, occupational therapists, physical trainers and administrators). The 6 main areas are i) prevention ii) case finding iii) early specialist review at the point of diagnosis iv) on-going care including virtual place based consultant led clinics and pulmonary rehabilitation; v) crisis: telephone helpline and supported discharge vi) advanced care.

Results Since the service launched, we received 4932 referrals. The telephone helpline received 493 calls, directly avoiding 14 admissions. 207 patients were discussed in the virtual respiratory clinics, avoiding 83 referrals to secondary care (40%). Other outcomes from the virtual clinics included medication changes (23%), pulmonary rehabilitation referral (25%) and confirmation of new diagnosis (20%).

Since introduction, non-elective admissions for all respiratory conditions have declined by 6% (7563 in 2017/18 to 7110 in 2018/19). COPD non-elective admissions fell 4% (1132 to 1086), asthma non-elective admissions dropped 16% (456 to 381). Emergency department attendances for asthma dropped 9% (639 to 584) during this period. Figure 1 shows the trend of asthma and COPD admissions since 2015.



Abstract P170 Figure 1 Non-elective asthma and COPD admissions since 2015

Conclusion Within one year of launching an integrated respiratory service, we have demonstrated that the service is well utilised and is associated with a reduction in non-elective respiratory admissions and emergency department asthma attendances.

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P171 'IT'S A GREAT IDEA, BUT I DIDN'T REALLY SEE HOW IT WAS INTEGRATED': A QUALITATIVE INTERVIEW STUDY TO UNDERSTAND THE COLLABORATION BETWEEN SECONDARY CARE, COMMUNITY CARE AND COMMISSIONERS TO DELIVER AN INTEGRATED RESPIRATORY SERVICE

TJ Stone, J Banks, JW Dodd. *The National Institute for Health Research Collaboration for Leadership in Applied Health Research and Care West, University Hospitals Bristol NHS Foundation Trust, Bristol, UK*

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Introduction and objectives Integrated care systems are central to the NHS 10 year plan. Commissioning to achieve integration of primary and secondary care services for respiratory conditions is taking place amongst an increasing number of clinical commissioning groups (CCGs). However, the relationship between service design and delivery at the point of staff experience is not well understood. The King's Fund suggested that embedding integrated care might be 'a bumpy ride'. This study sought to explore the dynamics of the implementation process.

Methods Nineteen in depth qualitative interviews were conducted with commissioners, hospital clinicians/managers and community provider clinicians/managers. Interviews were audio-recorded, transcribed, imported into NVivo11 and analysed using inductive thematic analysis.

Results Interviewees provided a variety of perspectives on a newly launched Integrated Respiratory Service, highlighting and explaining the barriers and successes from their differing positions in the process. The interviews identified that: 1. There was support for the principle of integrated care as a 'good idea' but widespread recognition that integration had not been fully realised; 2. Successful integration depended on trust and communication but cultural, structural and resource factors proved to be significant barriers; 3. Specific areas of tension arose around clinical governance, patient 'sharing', communication 'styles', and perceptions of the rationale of integration.

Conclusions This study offers insight from direct experience and a range of perspectives on the development and implementation of a newly designed integrated respiratory service. The greatest opportunity to expediate better communication, trust and subsequent integration should be at the commissioning stage. Commissioners having a clear understanding of current provision of services and encouraging input from stakeholders at all levels at the development stage may prevent later difficulties. The study offers directly transferable knowledge pertinent to the embedding of integrated healthcare services generally in line with current NHS priorities of reducing pressure in the secondary care settings.

P172 GENERAL PRACTICE FEEDBACK ON MULTIDISCIPLINARY RESPIRATORY VIRTUAL CLINICS

[1]T Perkins, [2]PD Hughes. *[1]NHS Devon Clinical Commissioning Group, Plymouth, UK; [2]University Hospitals Plymouth, Plymouth, UK*

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Introduction and objectives To gather initial feedback from General Practices offered a respiratory virtual clinic, and understand if General Practice finds this a useful exercise. General Practices in Plymouth were offered a 3 hour multidisciplinary respiratory virtual clinic. The initial structure of the

Abstract P172 Figure 1 Feedback from General Practice Doctors and Nurses following multidisciplinary respiratory virtual clinics

clinic was planned by the specialist respiratory team, this feedback was sought to understand if these clinics are useful and how they might be improved. The following areas were reviewed in the clinics:

1. Home oxygen prescribing
2. Pulmonary rehabilitation utilisation
3. Inhaled corticosteroid prescribing for patients with COPD
4. Management of frequent COPD exacerbations
5. Excessive salbutamol prescribing in Asthma
6. General advice as requested by the General Practice

Methods Satisfaction questionnaires were completed by the General Practice clinicians (GPs and Nurses) upon completion of the clinic. The questionnaire consisted of; six questions scored on a Likert scale, one multiple choice question regarding preferred frequency of repeat clinics, and an area for general comments. The Likert scale options were; definitely not, probably not, not sure, probably, definitely.

Results Initial feedback from 8 primary care clinicians indicates high level of satisfaction (figure 1). Most clinicians (n=6) wanted a repeat clinic in 6 months, a minority requested a repeat clinic quarterly (n=2). Free text comments were broadly positive and some areas for improvement were identified. Broadly positive quotes: 'great to talk about tricky cases', 'this clinic has avoided nine hospital referrals', 'improves networking with specialist team', 'good to review asthma and beta-blocker use', 'useful meeting'. Comments suggesting areas for improvement: 'helpful to have an agenda and prescribing data sent in advance', 'possibly a longer session to look at more patients'. Figure 1 only shows answers of probably and definitely, because no clinicians indicated any lower degree of satisfaction.

Conclusion This small sample supports a continued use of respiratory virtual clinic in general practices. It is reassuring every questionnaire indicated a repeat clinic would be welcomed and overall there is a perception this helps with general respiratory care. Ensuring GP practices receive information about their prescribing in advance is important and clinic processes have been changed accordingly.

P173 THE GRENFELL FIRE: EXPERIENCE OF A COMMUNITY CLINIC

B Stone, HLB Owles, E Wong, P Mallia, S Ghafur, V Mak, M Wickremasinghe, SL Elkin. *Imperial College Healthcare Trust, London, UK*

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Introduction The Grenfell Tower fire in 2017 claimed 72 lives and hospitalised a further 74. Following this disaster a rapid access respiratory outpatient service was offered to all primary care patients affected by the fire. We aim to identify the symptoms leading to referrals and any new diagnoses made.

Methods The patient records were reviewed for all those referred to the rapid access respiratory clinic between 14/07/2017 and 1/7/2019. Data was collected on demographics, smoking status, co-morbidities, reason for referral, respiratory diagnosis and ongoing management.

Results 77 patients were referred. 21/77 (27%) lived in Grenfell Tower on the night of the fire, the others were from the surrounding area. 8/77 (10%) had been admitted on the night of the fire. Patients were 18–83 years (median 50 years) with a slight female (61%) predominance. 46/77 (60%) had a smoking history. The main symptoms resulting in referral were cough (64%), dyspnoea (39%) and wheeze (19%). Of the patients referred, 13/77 (17%) did not attend their appointment and 5/77 (6%) currently are awaiting a first appointment.

Of the 59 patients reviewed, all patients were offered spirometry and 44/59 (75%) had thoracic imaging (CT or chest radiograph). Respiratory physicians had access to further tests from clinic including: lung volumes, gas transfer, bronchodilator reversibility, exhaled nitric oxide, histamine challenges and echocardiograms.

12/59 (20%) patients had pre-existing respiratory conditions confirmed. A further 12/59 were diagnosed with a new chronic respiratory disease: 6 asthma, 3 COPD, 2 ILD, 1 bronchiectasis. Of these 6/12 (50%) had respiratory symptoms pre-dating but exacerbated by the fire.

7/59 (12%) had temporary symptoms due to smoke/dust inhalation which either self-resolved or improved with inhaled corticosteroids. There was overlap between respiratory symptoms and anxiety after the fire. 7/59 (12%) patients were referred to dyspnoea clinic for breathing pattern disorders, meanwhile 35/59 (59%) patients received simultaneous support from the mental health team.

Conclusion The Grenfell Fire resulted in a local increase in respiratory symptoms and an increase in new respiratory diagnosis. A rapid access respiratory service helped optimise pre-existing respiratory conditions and identify patients with previously undiagnosed respiratory disease exacerbated by the fire.

P174 INITIAL PROCESS EVALUATION FINDINGS FROM THE AT-RISK REGISTERS INTEGRATED INTO PRIMARY CARE TO STOP ASTHMA CRISES IN THE UK (ARRISA-UK) TRIAL: PRACTICE CHARACTERISTICS, ENGAGEMENT AND EARLY EXPERIENCES OF THE INTERVENTION

[1]JR Smith, [2]MJ Noble, [1]R Winder, [1]L Poltawski, [3]PA Ashford, [3]S Musgrave, [3]S Stirling, [1]S Morgan-Trimmer, [4]AL Caress, [3]AM Wilson. *[1]University of Exeter Medical School, Exeter, UK; [2]Acle Medical Centre, Acle, Norfolk, UK; [3]Norwich Medical School, University of East Anglia, Norwich, UK; [4]University of Huddersfield, Huddersfield, UK*

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Introduction The ARRISA-UK trial is investigating whether, compared to usual care, a GP practice-level complex intervention decreases the proportion of 'at-risk' asthma patients who experience asthma-related A&E attendances, hospitalisations or death over 12 months. This presentation reports initial findings from a nested process evaluation.

Methods ARRISA-UK is a nationwide cluster-randomised controlled trial of an intervention involving identification and flagging of at-risk asthma patients' electronic records and web-based training of practice staff to support implementation of actions in response to the flags (e.g. improved access and opportunistic care). A mixed-methods process evaluation is exploring intervention implementation, mechanisms of action and the influence of contextual factors (e.g. practice characteristics). Quantitative and qualitative data from questionnaires, training software, practice-specific action plans and staff focus groups/interviews were analysed to describe practice characteristics, and their engagement with, and initial implementation and experiences of, the ARRISA-UK approach.

Results The 275 recruited practices, from across 14 English Clinical Research Network Regions, 7 Welsh and 5 Scottish Health Boards, had a median list size of 8801 (range 1667–

Abstract P174 Table 1 Characteristics of ARRISA-UK intervention practices (N=139)

	N (%)
Practice software EMIS	65 (47)
SystmOne	55 (40)
VISION	19 (14)
Urban practices	103 (74)
Dispensing practices	35 (25)
English practices (n=116) in two most deprived quintiles	20 (34)
Practices with asthma/respiratory lead GP	36 (26)
Practices with asthma diploma trained nurse	96 (69)

37800) and identified 10,000+ at-risk asthma patients in total, representing an average of 33 (range 1–197) and 6% (range 0.2–13%) of registered asthma patients per practice. There was considerable variation in the characteristics of the 139 intervention practices (Table 1). Despite some early documented difficulties with technology and staff turnover, at least 409 staff (GPs, nurses, receptionists/administrators, dispensers/pharmacists) from 131 (94%) practices completed at least minimum individual on-line training, reflecting a median of 3 (maximum of 9) staff per practice. 128 (92%) practices also completed group training to prepare Action Plans, attended a webinar and activated flagging. Action plans varied in content and detail but illustrated ways for staff to enhance access to, and uptake of, asthma-related services by at-risk patients. Questionnaires suggested the training was generally well-received. Analyses of staff focus groups/interviews are underway.

Conclusions The ARRISA-UK intervention represents a pragmatic, practice-wide approach to targeting at-risk asthma patients which has been successfully implemented across a variety of GP practices and generally engaged and been well-received by all practice staff groups. Initial findings have informed ongoing quantitative and qualitative data collection.

P175 DOMICILIARY VISITS BY SPECIALIST RESPIRATORY CLINICIANS FOR PATIENTS WITH COPD: PATIENT EXPERIENCE, OUTCOMES AND PREDICTING THOSE THAT MAY BENEFIT MOST

E Linacre, K Ryan, L McDonnell, A Dewar. *Guy's and St Thomas' NHS Foundation Trust, London, UK*

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Introduction and objectives The Integrated Respiratory Team aims to provide holistic individualised care for patients with COPD. Patients who are housebound, frail, or assessed as needing intensive 1:1 support for self-management, receive domiciliary visits, with the aims of improving patient self-management, and preventing admission to hospital.

Methods Patients (n=20) were assessed with PHQ9, GAD7 and EQ5D5L questionnaires during the visit, followed by a structured telephone interview within one week. Patients were excluded if they were unable to complete telephone interview.

Results Participants: 9 female: 11 male, mean age 74 years (range 62 to 91), mean MRC score 4.7. 5 patients were GOLD II, 12 patients GOLD III and 3 patients GOLD IV.

Patient-reported experience: 100% of patients reported the visit took place at a suitable time; 90% reported they felt they definitely had enough time to discuss what was required; and 93% felt that the right amount of information was provided.

Patient-reported outcome: 95% of patients rated the domiciliary visit as '*Very useful*'. When asked if they '*felt confident they could self-manage their condition*' after domiciliary visit, 50% of patients responded '*Yes definitely*', 45% responded '*Yes to some extent*', and 5% responded '*No*'. Qualitative answers also provided strongly positive responses.

Predicting benefit: matched Wilcoxon signed rank test was used to investigate correlation between PHQ9, GAD 7 and EQ5D5L scores and patient reported confidence in their ability to self-manage their condition after domiciliary visit.

GAD7 and PHQ9 scores did not correlate with the patients' self-reported confidence in self-managing their condition. Higher EQ5D5L score did show significant correlation with self-reported confidence in their ability to self-manage after domiciliary visit $p<0.001$.

Conclusion Patients with poorer health-related quality of life were most likely to feel confident in their ability to self-manage after a domiciliary visit. Interventions that improve self-management have been concluded to reduce respiratory-related and all-cause admissions, reduce dyspnoea and improve quality of life [1]. Models of care that allow specialist domiciliary visits may be important in improving outcomes for patients with poorer health-related quality of life.

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P176 THE CHANGING FACE OF HOME OXYGEN THERAPY; SEAMLESS COMMUNICATION BETWEEN HOSPITAL, PRIMARY, AND COMMUNITY CARE IS ESSENTIAL

MCP Apps, L Ateli, C Morgan, G Oliver, T Gisby, L Champion. *North East London Foundation NHS Trust Community Respiratory Team, Billericay, UK*

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Introduction Long term oxygen therapy for home use was introduced after trials which showed it worked in COPD and oxygen concentrator development. Some services are hospital based, but some patients too ill to attend; others community based often without full data on hospital blood gases and treatments in the primary care record. We have examined the primary care notes on all patients on our oxygen register to see why they are on it, and identify issues to improve care.

Methods We carried out audits on source/diagnosis for referral and examined primary care notes for all those on the oxygen register We have looked for issues that needed addressing for each patient.

Results We took over the service in April 2015; 109 patients receiving oxygen were alive 1.2.19. 59 with COPD, 7 on NIV, 42LTOT, 10 ambulatory oxygen alone. 19 with OHS/OSA, 6 ILD, 5 on LTOT, 1 ambulatory. Audits in 2018 (345) and 1.1.19–26.6.19 (202) show 56% of referrals with COPD, 12% ILD.

Of 538 patients on the oxygen register, 322 COPD, of which 20 NIV, 38 ambulatory, 237 LTOT, 52OHS/OSA, 9 PAH, 18LVF, 26 palliative.

65 had PCO2>7, 19 on NIV/CPAP, 4 who refused it, 7 referred for NIV, 41/46COPD LTOT. Where ↑PCO2 (16), 2 sent to A&E, 2 referred NIV, 5 already on NIV, 1 refused

NIV. Of 24 patients with ↓PCO2, 10/24 needed therapy change.

18 had delayed annual review, 9 patient issues, 9 service issues. Communication issues included incomplete blood gases from HOOF, hospital referral or sleep services, hospital unable to access primary care records, and the need to identify for early post discharge gases those with respiratory failure in hospital.

Discussion Home oxygen provision is not just for COPD, and NIV/CPAP patients are an increasing group. PCO2>7 should mean early review and consideration of NIV support. Although many patients with oxygen therapy have a short lifespan, some survive for years. Some patients can only be seen at home.

Conclusion Good communication is the key to delivery of oxygen services where increasing NIV/CPAP and a need for NIV support for chronic CO2 retainers is increasing.

Sleep miscellany

P177 PATIENT REPORTED OUTCOME MEASURES (PROMS) FOLLOWING MAXILLOMANDIBULAR ADVANCEMENT (MMA) SURGERY IN PATIENTS WITH OBSTRUCTIVE SLEEP APNOEA SYNDROME

MJ Martin, A Khanna, D Srinivasan, MP Sovani. *Nottingham University Hospitals NHS Trust, Nottingham, UK*

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Background MMA is an effective treatment option for OSAS refractory to conventional treatment. However, MMA is a highly invasive procedure with a number of recognised side effects and few data exist on the effect of MMA on metrics likely to be of prime importance to patients such as quality of life.[1]

Here we describe a case series of patients selected for MMA through our joint respiratory/maxillofacial surgery clinic detailing the effect of MMA on objective physiological measurements and important PROMS.

Methods Patients with confirmed moderate/severe symptomatic OSAS intolerant to CPAP/MAD were assessed in the joint clinic for evaluation and consideration of MMA. Pre and post-operative X-ray airway measurements, AHI, ESS and quality of life on a 10 point Likert scale were recorded. A custom questionnaire was administered post-operatively to assess a number of psychosocial and functional domains (sleep quality, energy levels, appearance, ability to perform daily activities, mood) and patient satisfaction using 5 point Likert scales.

Results Over an 18 month period, 39 patients were referred to the clinic for assessment for MMA. 10 patients underwent the surgery of whom 8 (5 men) with mean age of 50 and mean BMI of 27.6 completed all PROMS.

Surgery resulted in significant improvements in ESS (mean pre-op 14.1, post-op 4.5, $p<0.001$), quality of life (mean pre-op 2.8, post-op 7.9, $p<0.01$), AHI (mean 22.2 events/hour pre-op to 9.9 events/hour post-op; $p=0.03$) and airway diameters. All patients reported improvements in all psychosocial/functional domains except for appearance, in which 5/8 (63%) reported improvements and 3/8 (37%) reported no change or worsened appearance. All subjects were satisfied with the results of the surgery and felt it provided better symptom control than CPAP. Side effects were reported in all subjects, most commonly facial/lip numbness (n=7/8, 88%) and affected bite (n=4/8, 50%).

Conclusions MMA resulted in significant improvements in ESS, quality of life and a range of PROMS and there was a high level of satisfaction with the procedure. Commonly reported side effects included facial/lip numbness and affected bite.

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P178 NATIONAL SURVEY OF OPINIONS REGARDING PRE-OPERATIVE SCREENING FOR OBSTRUCTIVE SLEEP APNOEA

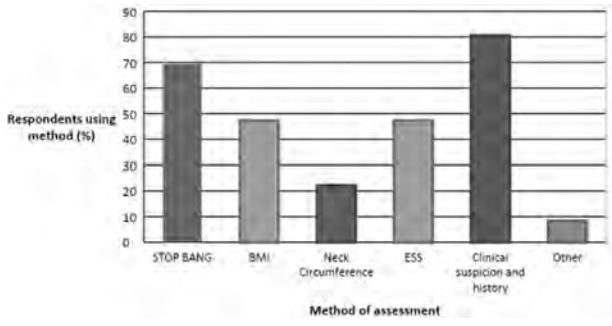
R Davidson, J Hughes, SD West. *Newcastle Regional Sleep Centre, Freeman Hospital, Newcastle upon Tyne, UK*

10.1136/thorax-2019-BTSabstracts2019.321

Introduction There are no standardised UK guidelines for OSA screening in the pre-operative setting. This exposes undiagnosed sufferers to a potentially heightened risk of complications, while simultaneously missing a crucial window for diagnosis. We first surveyed UK sleep centres in 2014.[1] The consensus at that time advocated screening of high-risk patients thus we elected to repeat the survey to reassess current opinions, and to determine whether a standard practice now exists.

Methods Online surveys were sent to 97 UK sleep services, asking whether respondents had a hospital policy for OSA screening in elective pre-operative patients. Amongst other questions were the volume and sources of pre-operative patient referrals, how these patients are then screened, and how they defined high-risk for OSA.

Results Replies were received from 36 of 97 centres (37%). Responding centres varied in size with their cohort of patients on CPAP ranging from 100 to 16000. 17 of the centres had a policy regarding pre-operative oximetry or sleep studies. The majority of centres (75%) receive referrals regarding patients undergoing pre-operative screening, ranging in number from <5 to >30/month. The majority of these referrals come from the anaesthetic team. The spectrum of practice is evident from the various means by which centres define high-risk of OSA (**Abstract P178 figure 1**) and the diagnostic tests then



Abstract P178 Figure 1 What methods do you use to define high risk of OSA?

used for screening, which included oximetry, limited respiratory polygraphy and polysomnography.

Our survey identified a strong opinion that patients identified as high-risk for OSA should be screened before planned surgical procedures, with 80% of respondents advocating screening. There remained a prevailing desire for national guidelines on pre-operative screening

Conclusion Our survey showed the majority of responders are still of the opinion that there should be national guidelines covering OSA screening in the pre-operative setting. There is still widespread variation in practice between centres that emphasises the ongoing need for robust evidence to guide future practice, and ensure cost-effective healthcare.

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P179 IS TRYING CPAP FOR A SECOND TIME (AFTER GIVING UP PREVIOUSLY) WORTH IT?

CPL Simmons, H Groves, P Close, S Uddin, J Littlemore, M Tomlinson, G Olds, S West. *The Freeman Hospital, Newcastle, UK*

10.1136/thorax-2019-BTSabstracts2019.322

Background Continuous positive airway pressure (CPAP) is a successful treatment for moderate and severe obstructive sleep apnoea (OSA). Patients may return their CPAP machine on account of improvement in symptoms or adverse side effects. Cessation of CPAP can cause recurrence of the initial symptoms of OSA and necessitates a review for consideration of second trial of CPAP.

Aim The aim of this study was to review whether people who have previously tried and returned their CPAP machine are adherent to CPAP following a second trial.

Methods Between September 2016 and April 2019 a prospective study of consecutive patients attending the sleep clinic for consideration of a second trial of CPAP for OSA was performed. Data was collected at the CPAP initiation and review, including adherence and indications for ongoing CPAP treatment.

Results The data for 55 patients (50 male) were analysed.

Prior to initial trial of CPAP: mean age 49.1 years (SD 12.5), mean weight 107.9 kg (SD 22.2), mean ESS 11.4 (SD 5.2), mean AHI 28.5/hr (SD 21.5). Patients adhered to their first trial of CPAP for a mean of 57.8 weeks (range 0.3–364 weeks). Seventeen patients (30.9%) noticed symptom improvement after their first trial of CPAP. Reasons for stopping CPAP included problems with mask discomfort, sleep disturbance due to noise from the CPAP machine and claustrophobia.

Prior to second re-trial of CPAP: mean weight 107.0 kg (SD 22.7), mean ESS 11.6 (SD 6.3), mean AHI 28.1/hr (SD 14.8). Reasons for patients being reviewed for consideration of a second re-trial of CPAP including mask discomfort were addressed and resolved with equipment modifications.

After a second trial, 37 (67%) patients chose to continue with CPAP long term after review (mean 8.3 weeks after initiation). Mean compliance was 5.1 hours after modification of factors affecting adherence.

Conclusion There was ongoing adherence to CPAP in 67% of people following a second trial of CPAP for OSA in patients who had previously returned CPAP. A second trial of CPAP can prove successful and result in long term adherence and is therefore worth it.

P180 APNOEA-HYPOPNOEA-INDEX COMPARING THE AASM 2007 AND 2012 CRITERIA IN COPD/OBSTRUCTIVE SLEEP APNOEA OVERLAP SYNDROME

[1]BT He, [2]M Sherif, [2]S Higgins, [2]E Schwarz, [3]YM Luo, [4]A Said, [1]J Steier. *[1]Faculty of Life Science and Medicine, King's College London, London, UK*; *[2]Sleep Disorders Centre/Lane Fox Unit, Guy's Hospital, London, UK*; *[3]State Key Laboratory of Respiratory Disease, Guangzhou Medical University, Guangzhou, China*; *[4]Department of Respiratory Disease, Faculty of Medicine, Minia University, Minia, Egypt*

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Background In 2007 and 2012, the American Academy of Sleep Medicine (AASM) updated their scoring criteria for nocturnal respiratory events. We hypothesised that this could have led to changes in the apnoea-hypopnoea index (AHI) and thus diagnosis of COPD associated obstructive sleep apnoea (OSA) overlap syndrome.

Patients and methods In a retrospective study, polysomnographical recordings (PSG) of 11 patients with COPD/OSA overlap syndrome were independently analysed using the AASM criteria from 2007 and 2012. The primary outcome was the difference in AHI between the AASM 2012 and the AASM 2007 recommended and alternative scoring rules, secondary outcomes were the percentage of hypopnoeas and the diagnosis of overlap syndrome. Data are presented as mean (standard deviation) if normally distributed, and as median (interquartile range) for non-normally distributed data.

Results The PSG of 11 obese, elderly and predominantly male patients with mild-moderate COPD were analysed (table). The AHI using AASM 2007 (recommended) criteria was 12.9 (5.8, 16.9) h^{-1} *vs* 18.7 (11.3, 24.7) h^{-1} using the 2012 criteria

Abstract P180 Table 1 Summary of demography, spirometry and polysomnography result

Parameter	Mean ± SD
n	11
Age (years)	64.5 ± 10.4
Sex M/F	8/3
Body mass index (kg/m^2)	32.8 ± 8.5
FEV_1 (%pred)	60.4 ± 30.3
FEV_1/FVC (%)	62.9 ± 15.5
ESS (points)	9.4 ± 5.2
Total sleep time (h)	5.3 ± 1.0
Sleep efficiency (%)	69.3 ± 14.1
Stage N1 (%)	18.5 ± 9.0
Stage N2 (%)	36.3 ± 9.0
Stage N3 (%)	28.1 ± 9.7
Stage R (%)	16.6 ± 4.4
AI (events/h)	27.3 ± 13.0
Wake SpO_2 (%)	93 ± 1.1
Mean SpO_2 (%)	91.2 ± 1.3
Nadir SpO_2 (%)	82.5 ± 3.6
Time with SpO_2 <90% (min)	56.3 ± 48.1
% of TST with SpO_2 <90% (%)	17.5 ± 14.3

ESS, Epworth Sleepiness Scale; FEV_1, Forced expiratory volume in 1 second; FVC, Forced vital capacity; AI, Arousal index

(p<0.001); with the altered AASM 2007 criteria, the AHI was 10.7 (4, 19.1) h^{-1} (p<0.001). With the 2012 classification, the number of scored hypopnoeas increased by +25.7% (p<0.001) compared to the AASM 2007 (recommended) criteria, 41% of these events were associated with arousal. Although non-significant for the AASM recommended classification, 18% of our cohort would not have been diagnosed with COPD/OSA overlap syndrome using the old criteria (p=0.238), this was true for 36% of the cohort when the AASM 2007 altered classification was used (p=0.045).

Conclusion The AHI significantly increases when the AASM 2012 instead of 2007 criteria are used in patients with COPD/OSA overlap syndrome, in parts due to a higher number of arousal-associated hypopnoeas. These observations will impact on the definition of the COPD/OSA overlap syndrome.

P181 OBSTRUCTIVE SLEEP APNOEA (OSA) SEVERITY IN PATIENTS WITH CHRONIC OPIOID USE: A RISK FACTOR MATCHED STUDY

K Lee, M Mason, I Smith. *Royal Papworth Hospital, Cambridge, UK*

10.1136/thorax-2019-BTSabstracts2019.324

Introduction and objectives Concern has been raised that prescribing opioids could exacerbate underlying OSA. We previously hypothesised that this would lead to younger and/or thinner patients presenting with OSA comparing opioid taking (Op+ve) to non-opioid taking (Op-ve) patients matched for oxygen desaturation index (ODI/hr) at diagnosis. We found instead that Op+ve patients were older with the same mean BMI.[1] To explore this unpredicted finding we sought new matched controls based on known risk factors, mirroring existing methodology.[2]

Methods We sought Op-ve matches for our original sample of 120 Op+ve patients initiated on CPAP in 2017–18. Matching was based on: age ± 5Yrs, BMI ± 1.5 kg/m^2, smoking status (Y/N) and sex. We compared OSA severity, using t tests, at diagnosis and response to CPAP initiation.

Results Matching was successful for 79 Op+ve patients (28 women, 70 non-smokers). Op+ve patients had a lower ODI at diagnosis than Op-ve controls (24.4 vs 30.4, p=0.048). Respectively there was no difference between mean Sp O2 (92.7vs92.6)%, min Sp O2 (75.3vs72.8)% or Epworth Sleep Score (13.4vs13.9) at diagnosis or follow-up (8.6 vs 7.1) or mean nightly hours of CPAP use (both 5.6). Compared to a larger unmatched sample of general CPAP starters Op+ve patients mean ODI was not significantly different (ODI 27vs26.1, n=192 & 120, p=0.32).

Conclusion In this sample the chronic use of opioids was associated with a lower ODI at OSA diagnosis after matching for other known risk factors. Possible explanations include an attrition of patients with severe OSA on opioids but the overlap of ODI for the unmatched group argues against this. It might be that opioids ameliorate OSA lowering ODI but this raises the question of why these patients presented for treatment. Finally opioids may produce sleepiness that precipitates presentation and request for treatment in people with less severe OSA. Further work will be required to differentiate between these possibilities.

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P182 AWARENESS OF SLEEP HYGIENE AMONGST HEALTHCARE PRACTITIONERS (HCP)

N Devani, A Shah, S Mandal. *Royal Free London NHS Trust, London, UK*

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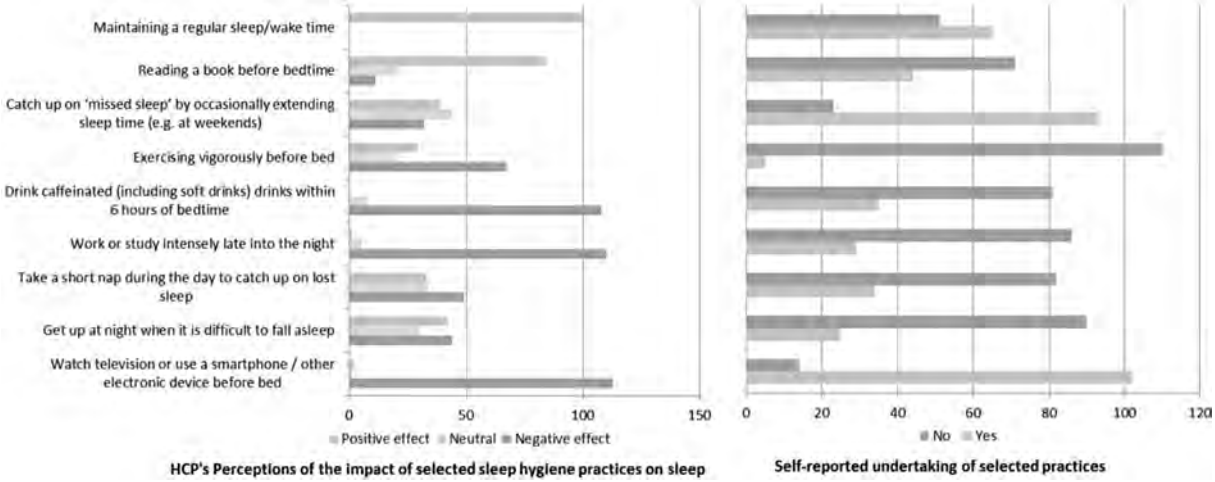
Background Sleep problems are estimated to affect up to 1/3 of the population,[1] contribute to reduced physical and mental health and sleep-related productivity losses in the UK are estimated at £30bn/p.a.[1] Limited studies within this area suggest that for many patients, sleep problems are often minimised or misattributed by HCPs.[2] A lack of awareness and adherence to sleep hygiene practices is a recognised contributor to sleep problems. We wished to understand the awareness of these practices amongst hospital HCPs delivering patient care since admissions provide an ideal opportunity to discuss good sleep hygiene with patients.



Abstract P182 Figure 1

Method HCPs at a London teaching hospital were invited to complete a survey assessing their understanding of 18 sleep hygiene practices and rate their own adherence to these practices and overall sleep quality.
Results 116 HCPs participated: 92% doctors, 8% registered nurses. Only 57% had inquired about patient sleep quality during routine clinical interactions and most (90%) only ask when relevant to the presenting complaint. HCP self-reported awareness of sleep disorders using a Likert scale (1 to 10; 1=limited understanding; 10=extensive knowledge) revealed a score of 4.9±2.03. Assessment of their own sleep quality demonstrated a score of 6.01±2.3 (Likert scale of 1–10; 1=poor quality with frequent waking and difficulty initiating sleep; 10=excellent quality regular, refreshing sleep). Perceptions of selected sleep hygiene practices and an evaluation of their own practices have been summarised in figure 1.
Conclusion Despite the prevalence of sleep problems, most HCPs do not routinely inquire into a patient's sleep quality. Furthermore, there is a variable level of awareness of sleep hygiene practices and many HCPs themselves undertake practices which may impact negatively on sleep. In order to advise patients appropriately, HCPs will require a better understanding of such practices thus highlighting the need for further training in this important area.

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P183 POSITIVE EXPERIENCE WITH SERVICE TRANSFORMATION TO ASYNCHRONOUS CONSULTATIONS, VIRTUAL CLINIC AND REMOTE-MANAGED CPAP FOR PATIENTS WITH SUSPECTED OSAS

[1]D MacFarlane, [1]R Tourish, [2]P Hodkinson, [1]C Carlin. [1]*Queen Elizabeth University Hospital, Glasgow, UK*; [2]*University Hospital Crosshouse, Kilmarnock, UK*

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Background Rising referral rates for evaluation of sleep-disordered breathing requires innovation and adaptation of service models, with benchmarking against existing approach. Existing service model (general respiratory clinic review, home sleep study, onward referral to sleep clinic) in place at our neighbouring health board was unsustainable. Since September 2017 we have evolved the service for diagnostic patients: vet to test, patient questionnaires completed at attendance for apnealink screening sleep study, monthly virtual clinic review to determine generic results-advice letters and next action. Patients discharged with advice (normal or mild abnormality on sleep test with minimal symptoms or other explanation for symptoms) have a 3-month opt-in to clinic attendance. Patients requiring treatment are setup with autoCPAP at a single visit, with remote-consultation based follow up and a single sleep clinic medical review.
Methods Retrospective review of routine clinical data all patients managed through regional spoke virtual sleep clinic over first 12 months. CPAP outcomes were reviewed in a subset of 59 patients referred Jan-Apr 2018.
Results 652 patients were evaluated through the diagnostic service. 115 referrals were resolved at vetting. 528 patients had completed evaluation and table 1 shows outcomes. 8 patients opted in for sleep clinic review after receiving a negative/mild results letter.

Abstract P183 Table 1 Ayrshire virtual sleep clinic patient outcomes

	Total	Normal/mild results & advice letter	Sleep clinic review	PSG (non-diagnostic apnealink)	CPAP	NIV
Number of patients	528	235	108	31	143	11

CPAP outcomes based on apnealink test, results advice letter and remote-managed treatment were similar to our preceding service model (9 patient's DNAd, significant reduction in Epworth score was seen with CPAP use, 64% 7night/4-hour compliance rate, majority required only single remote consultation), and to our CPAP service experience with treatment decision based on home polygraphy or polysomnography. Initial referral to outcome time was reduced (typically by 6 months for patients requiring PSG, CPAP or NIV vs previous service model). Ayrshire virtual clinic requires single monthly sleep consultant session, and supporting admin staff time.
Conclusions A sleep service model based on asynchronous consultation, screening sleep study and remote-managed CPAP achieves significant efficiencies, improves referral-treatment times and matches existing service outcomes.

P184 A COST-SAVING PATHWAY FOR DIAGNOSING PATIENTS WITH SUSPECTED OBSTRUCTIVE SLEEP APNOEA (OSA) IN THE COMMUNITY

[1]N Devani, [2]T Aslan, [2]S Morgan, [1]S Mandal. [1]*Royal Free London NHS Foundation Trust, London, UK*; [2]*Hampstead Group Practice, London, UK*

10.1136/thorax-2019-BTSabstracts2019.327

Background OSA is a major healthcare challenge with current UK data estimating that up to 85% of individuals with OSA are undiagnosed. Promoting awareness and improving access to diagnostics is fundamental in addressing these missing cases. Diagnosis usually occurs in secondary care with data from our trust in 2017 revealing long wait times to undertake a sleep study and an average 2 clinic attendances before a diagnosis made. This places a considerable time and emotional burden on the patient and a financial and logistical burden on the hospital.
Method To address these long wait-times, streamline the patient pathway and improve access to diagnostics, we piloted a monthly community outreach OSA clinic run from within a local General Practice (GP). The clinic received referrals directly from other neighbourhood GPs and issued patients with a portable diagnostic device to allow them to undertake a home sleep study. The clinic was supported by a 'virtual MDT' run by the hospital team where the results were reviewed and outcomes communicated directly to both patients and GPs. Pathway costs, waiting times and patient related experience measures were calculated and compared to the conventional hospital-based diagnostic pathway.
Results The pilot ran from Jan 2018 to Feb 2019. 78 patients were referred and investigated along the outreach pathway

Abstract P184 Table 1

Expense		Cost per patient	
		Hospital Pathway	**Outreach Pathway**
Referral Triage Time		**3.44**	**3.44**
Sleep Study	Description	2017/18 national tariff	2017/18 national tariff
	Cost	**408**	**408**
Clinic appointment	Description	2017/18 national tariff Multiprofessional Appt	
	Raw Cost	New: £286 F/U: £113	2 hour Band 6: admin 4 hour band 6 : clinic Total = £99.84
	Average no appt	1 New; 1 F/U	1
	Total cost/patient	**399**	**12.48**
MDT	Cost	**16.58**	**11.05**
MDT administrative costs	Description	15 mins/patient Band 6	15 mins/patient Band 6
	Cost	**4.75**	**4.75**
	Total	**831.77**	**439.72**

(Note healthcare professional costs based on mid-nodal scale Agenda for Change Contract and Consultant contract)

with an average estimated cost per patient of £439.72 compared to £831.77 for the hospital-based diagnostic pathway. Table 1 provides a detailed cost breakdown and assumes the community clinic will be run by a band 6 health-care professional.

When compared to the hospital pathway, data demonstrated a significant improvement in patient waiting referral to diagnosis made (37 days vs 239 days) and commence treatment (128 days vs 267 days) (all $p<0.0001$). Measures of patient satisfaction were significantly higher within the outreach clinic group compared to the hospital-based diagnostic group.

Conclusion A hospital led community-based pathway can achieve cost-savings whilst resulting in more timely diagnosis of OSA within a local setting thereby widening access to diagnostics. It is favoured by patients and aligns with the NHS long-term plan.

P185 REDUCING WAITING TIMES FOR SLEEP APNOEA DIAGNOTICS–ARE GROUP CLINICS THE ANSWER?

N Zuhra, R Singh, B Prathibha. *East Kent Hospitals University NHS Foundation Trust, Ashford, UK*

10.1136/thorax-2019-BTSabstracts2019.328

Introduction Obstructive Sleep Apnoea is a common condition and increasing awareness has led to record number of referrals to sleep clinics. East Kent is a large Trust covering a population of more than 800,000 and as such has a large respiratory morbidity and mortality. There are around 3000 referrals for suspected sleep apnoea per year. We have piloted a new type of clinic for patients needing Sleep diagnostics to evaluate its effectiveness in reducing waiting times.

Methods All patients had been seen and assessed in the Sleep clinic by a Consultant Respiratory Physician, Nurse Consultant or Registrar in respiratory medicine. They were then invited to attend a session to pick up the equipment for domiciliary sleep study. They either had an appointment for an individual set up, or for a group session (with 5 people in the group). Both sessions were allocated the same amount of time, twenty minutes. Both groups were educated about the sleep study. In the individual session, the technologist demonstrated the method of using the equipment on the patient and answer any questions. In the group session, this was demonstrated on one of the patients, whilst the rest observed and again any questions were answered. Feedback was collected from the patients and technologists.

Result A total of 2160 studies were undertaken between 1st August 2018 and 1st June 2019. Out of these 1080 were individual appointments and 1080 were in groups. The individual sessions took a total of 23,600 minutes while the group sessions took 4320 minutes. So, it did reduce waiting times for diagnostics, but this was tempered by a small increase in repeat studies in the second group. The key ingredients for a successful group session are the size of the group, large enough room for them and patients who are agreeable to be in a group.

Conclusion With increasing demand for sleep and other resources, all NHS organisations are looking towards systems which improve efficiency without compromising patient care. Sleep diagnostics and education does lend itself to this, if carefully planned and executed

P186 THE EFFECT OF HEALTHY AGEING ON HUMAN PHRENIC NERVE FUNCTION

[1]R Shah, [1]V Wong, [1]D Robinson, [2]HV Fletcher, [3]L Estrada, [1]J Moxham, [1]GF Rafferty, [1]SDR Harridge, [1]NR Lazarus, [1]CJ Jolley. *[1]Centre for Human and Applied Physiological Sciences, King's College London, London, UK; [2]Department of Respiratory Medicine, King's College Hospital NHS Foundation Trust, London, UK; [3]Institute for Bioengineering of Catalonia (IBEC), The Barcelona Institute of Science and Technology (BIST), Barcelona, Spain*

10.1136/thorax-2019-BTSabstracts2019.329

Introduction & objectives Human diaphragm contractility typically declines with advancing age. Associated changes in human phrenic nerve function are less well-investigated. The recent development of multipair oesophageal electrode catheters allows accurate measurement of the latency and amplitude of the crural diaphragm compound muscle action potential (CMAPdi). The principal aim of this study was to investigate the effect of healthy ageing on CMAPdi amplitude and latency using this method.

Methods 20 highly active older adults (HAOA, aged 49 to 80 years), and 16 younger adults (YA, age 20 to 35 years), all male, were instrumented with a multipair oesophageal electrode catheter and a dual oesophageal/gastric pressure transducer. Transdiaphragmatic pressure (TwPdi), crural CMAPdi latency and amplitude were measured following left, right and bilateral anterolateral magnetic phrenic nerve stimulation at 100% of maximum stimulator output and compared between the HAOA and YA groups. Maximal inspiratory mouth pressure (PImax), sniff nasal inspiratory pressure (Sniff Pnasal) sniff oesophageal pressure (Sniff Poes) and sniff transdiaphragmatic pressure (Sniff Pdi) were also measured.

Results Bilateral TwPdi was significantly lower in HAOA (median (IQR) bilateral TwPdi HAOA 24.8 (22.3 to 35.1) cmH_2O) than in YA (bilateral TwPdi YA 31.1 (28.7 to 39.2) cmH_2O, $p=0.0152$). Right TwPdi was significantly lower in HAOA (HAOA 9.8 (9.2 to 11.1) cmH_2O, YA 15.2 (13.5 to

Abstract P186 Table 1 Demographic, anthropometric, lung function and respiratory muscle function data recorded in the YA and HAOA groups. Data are presented as median (interquartile range). * indicates p<0.05

	YA	HAOA	p-value
n	16	20	
% Male (%)	100%	100%	
Age (years)	25 (22 to 31)	60 (52 to 67)	<0.0001*
Height (cm)	178.7 (177.3 to 182.6)	178.9 (171.6 to 181.7)	0.3987
BMI (kg/m^2)	24.2 (22.8 to 26.5)	25.0 (23.7 to 26.3)	0.7350
FEV_1 (L)	4.66 (3.98 to 5.14)	3.58 (2.97 to 4.45)	0.0069*
%predicted FEV_1 (%)	104.0 (91.6 to 111.3)	103.5 (94.6 to 117.2)	0.2519
VC (L)	5.81(4.70 to 6.35)	4.96 (4.06 to 5.67)	0.0422*
%predicted VC (%)	104.1 (92.8 to 110.9)	110.6 (96.7 to 117.1)	0.1338
FEV_1%VC (%)	81.6 (76.2 to 85.7)	72.6 (68.3 to 78.9)	0.0013*
TLC (L)	7.28 (6.33 to 8.17)	7.04 (6.61 to 8.22)	0.9080
%predicted TLC (%)	98.4 (93.6 to 107.9)	105.7 (93.2 to 113.9)	0.3493
RV (L)	1.75 (1.33 to 2.16)	2.35 (2.01 to 2.64)	0.0021*
%predicted RV (%)	103.8 (73.1 to 122.2)	94.6 (88.2 to 107.8)	0.4475
RV%TLC (%)	23.7 (21.9 to 28.5)	33.8 (26.3 to 38.4)	0.0007*
Bilateral TwPdi (cmH_2O)	31.1 (28.7 to 39.2)	24.8 (22.3 to 35.1)	0.0152*
PImax (cmH_2O)	95.4 (79.9 to 118.6)	89.9 (70.1 to 107.3)	0.2358
Sniff Pnasal (cmH_2O)	89.1 (79.5 to 107.4)	81.6 (65.9 to 95.4)	0.1491
Sniff Poes (cmH_2O)	111.8 (94.3 to 126.6)	93.8 (82.6 to 103.1)	0.0167*
Sniff Pdi (cmH_2O)	139.4 (122.3 to 151.5)	137.0 (110.1 to 151.6)	0.6455
Left TwPdi (cmH_2O)	15.6(12.5 to 17.6)	11.6 (8.9 to 13.4)	0.0814
Right TwPdi (cmH2O)	15.2 (13.5 to 18.3)	9.8 (9.2 to 11.1)	0.0005*
Left CMAPdi amplitude (mV)	1.62 (1.08 to 1.96)	1.5 (1.2 to 1.9)	0.7148
Right CMAPdi amplitude (mV)	1.14 (0.95 to 1.27)	1.5 (1.0 to 1.7)	0.3521
Left CMAPdi latency (ms)	7.5 (7.2 to 8.1)	8.9 (8.5 to 9.3)	<0.0001*
Right CMAPdi latency (ms)	6.6 (6.3 to 7.1)	7.4 (7.0 to 7.7)	<0.0001*

YA = younger adults; HAOA = highly active older adults; FEV_1 = forced expiratory volume in 1s; VC = vital capacity; RV = residual volume; TLC = total lung capacity; Sniff Pnasal = sniff nasal inspiratory pressure; Sniff Poes = sniff nasal oesophageal pressure; Sniff Pdi = sniff transdiaphragmatic pressure; TwPdi = twitch transdiaphragmatic pressure following anterolateral phrenic nerve stimulation at 100% of maximum stimulator output; CMAPdi amplitude = amplitude of the diaphragm compound muscle action potential following anterolateral phrenic nerve stimulation at 100% of maximum stimulator output.

18.3) cmH_2O, p=0.0005) but differences in left TwPdi did not reach statistical significance (HAOA 11.6 (8.9 to 13.4) cmH_2O, YA 15.6 (12.5 to 17.6) cmH_2O, p=0.0814). CMAPdi latencies were significantly greater following both left and right phrenic nerve stimulation in HAOA compared to YA (left CMAPdi latency HAOA= 8.9 (8.5 to 9.3) ms, YA=7.5 (7.2 to 8.1) ms,p<0.0001); right CMAPdi latency HAOA=7.4 (7.0 to 7.7) ms, YA=6.6 (6.3 to 7.1) ms, p<0.0001). No significant differences in CMAPdi amplitude were observed between the YA and HAOA groups (see table 1).

Conclusions Healthy ageing is associated with increased phrenic nerve latency, interestingly without decrement in motor unit size. Reference ranges of human phrenic nerve function should be updated with age-specific normal values.

Acute and domiciliary NIV in COPD: advances in practice

P187 ACUTE NIV: FACTORS ASSOCIATED WITH CLINICAL OUTCOMES AT A CENTRAL LONDON TEACHING HOSPITAL

[1]E Mackay, [2]P Cho, [1]A Papamanoli, [1]A Burney, [1]R Lyall, [1]A Patel, [1]V Metaxa, [3]KK Lee. *[1]King's College Hospital NHS Foundation Trust, London, UK; [2]Centre for Human and Applied Physiological Sciences, Faculty of Life Sciences and Medicine, King's College London, London, UK; [3]Division of Asthma, Allergy and Lung Biology, Faculty of Life Sciences and Medicine, King's College London, London, UK*

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Introduction Non-invasive ventilation can be an effective treatment for acute hypercapnic respiratory failure, but national audits have consistently demonstrated poorer clinical outcomes than expected. Several potential factors have been identified as being associated with poor outcome. This study was conducted to assess the impact of factors on the clinical outcomes of patients commenced on acute NIV at a central London teaching hospital.

Methods A case record review was carried out for all patients treated with acute NIV for hypercapnic respiratory failure in a 12-month period. Patients already being treated with home ventilation were excluded. Clinical outcomes assessed were: NIV success (as defined by BTS criteria) and in-hospital mortality. Lateness of NIV initiation (<24 hrs vs >24 hrs), location of instigation (ED vs non-ED), background of COPD (presence vs absence), presence of consolidation (presence vs absence) and initial pH (<7.26 vs >7.26) were recorded and their relationships with the clinical outcomes assessed.

Results 141 Acute NIV episodes were identified, of which 75 had complete records available for analysis (mean±SD age 69 ±10 years, 56% female). Mean±SD initial pH was 7.22 ±0.08, pCO2 10.8±2.4 kPa and HCO3- 31.2±6.0 mEq.L-1. Overall NIV success rate was 72% and in-hospital mortality 22.7% (vs 34.6% nationally). 69% were admitted to ICU. 12% were intubated (vs 5% nationally). pH<7.26 was associated with increased mortality (OR (95% CI) 5.09 (1.09–23.82); p=0.039). None of the other factors assessed were associated with statistically significantly increased mortality or NIV success (p=0.073–0.999). There was no significant difference in mortality between those who admitted to ITU vs not admitted (P=0.766).

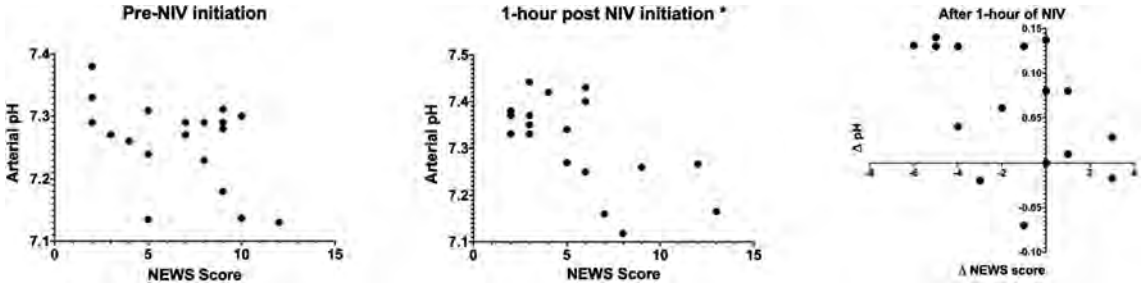
Conclusions In this single centre study, NIV success and in-hospital mortality of patients treated with acute NIV compared favourably with national data. pH<7.26 was associated with significantly higher mortality. Further study is required to assess the interactions between these factors and their impact on patient outcomes.

P188 THE NEWS SCORE AS A SURROGATE MARKER FOR PH DURING NIV

S Aziz, A Robbins, C Tweed, J Gittens. *Whipps Cross Hospital, London, UK*

10.1136/thorax-2019-BTSabstracts2019.331

Introduction and objectives The BTS recommends arterial blood gas (ABG) sampling prior to initiation of non-invasive ventilation (NIV) for Type 2 Respiratory Failure (T2RF) and after 1-hour to guide treatment.[1] We hypothesised that the



Abstract P188 Figure 1

National Early Warning Score (NEWS 2) score could be a surrogate marker for arterial pH, and therefore be used to help guide management in patients started acutely on NIV.

Methods A retrospective analysis was conducted on patients started on acute NIV due to hypercapnic respiratory failure between 05/12/2018 and 12/072019. Patient notes and electronic records were used to collect ABG results and timings, and NEWS 2 scores. The correlation between the recorded pH and NEWS scores at each time point was tested using Spearman's rank correlation coefficient.

Results Only 35/101 of patients (35%) started on acute NIV had both a pre-initiation and 1-hour ABG. There were 19/35 patients (54%) with adequate data available in their notes for inclusion. No significant correlation was found between pre-NIV initiation NEWS 2 score and arterial pH (r_s=-0.35, p=0.13). A significant negative correlation was found between NEWS 2 score and arterial pH at 1-hour after initiation of NIV (r_s=-0.55, p=0.01*). No significant correlation was found between a change in NEWS 2 score and change in arterial pH between pre-NIV initiation and 1-hour of NIV (r_s=-0.43, p=0.06).

Conclusions We did not detect a statistically significant correlation between a change in NEWS 2 score and arterial pH in the first hour NIV therapy for acidotic T2RF. These findings do not support the use of the NEWS 2 score in isolation to monitor patients on NIV. However, we also found that a large proportion of patients were not adequately monitored using ABG sampling. To ensure optimum management of patients receiving NIV, ABG sampling must be prioritised and systems put in place to facilitate these tests.

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P189 DELAYS IN DOCTOR-LED ARTERIAL BLOOD GASES MAY IMPACT TIMELY IMPLEMENTATION AND OPTIMISATION OF ACUTE NON-INVASIVE VENTILATION (NIV)

[1]I Tang, [1]A Talwar, [2]R Manalac, [2]K Dawson, [2]J Lightowler, [2]N Petousi, [2]AH Nickol. *[1]Health Education Thames Valley, Oxford, UK*; *[2]Oxford University Hospitals NHS Foundation Trust, Oxford, UK*

10.1136/thorax-2019-BTSabstracts2019.332

Introduction Timely NIV reduces mortality from 20 to 10% in acute hypercapnic COPD [Plant 2000], however successive BTS audits show a much higher mortality rate. The 2017 NCEPOD Review demonstrated a number of shortfalls in current practice across the UK, including delays in initiating NIV in ¼ patients, and oxygen toxicity in 1/5 patients. Delays in recognition of hypercapnia may contribute to this. The BTS Standard of care is to deliver acute NIV within 120 minutes of arrival in hospital, and within 60 minutes of a blood gas for all patient fulfilling criteria for acute NIV, and for a blood gas to be carried out within 120 minutes of NIV initiation.

Methods We audited timing of arterial blood gases in all patients identified from the Electronic Patient Record as having an episode of acute hypercapnic ventilatory failure requiring NIV admitted to our trust between 1st Oct–30th Nov 2018.

Results 30 patient-encounters were identified, comprising 28 patients (age 72.2±7.8 years; 17 female). 21 patients had COPD; other diagnoses were obesity/OSA, heart failure, CF, bronchiectasis and pneumonia. The ceiling of care was documented for all patients, being NIV in 27 patients and consideration of intubation in one.

Abstract P189 Table 1

Target	Proportion meeting target	Time (minutes; Median (IQR))
Hospital admission to NIV (120 min)	15/30	129 (49–275)
Blood gas to NIV initiation (60 min)	17/30	82 (35–128)
NIV initiation to first gas (120 min)	17/30	76 (48–225)

Discussion Delays in blood gases are common in our organisation, potentially impacting adversely on timely clinical decision making. Arterial blood gases are carried out by junior doctors, with the majority of patients being admitted out of hours when the work-force is lowest. We propose implementing nurse-led capillary blood gas sampling in our EAU. Capillary blood gas sampling is already successfully in use first-line on our Respiratory ward, and in our Sleep and Ventilation outpatient service. It is generally preferred by patients, and accurate in skilled hands. Furthermore nursing-numbers have greater stability in- and out- of hours. Training has been initiated, and practice will be re-audited in due course.

P190 THE SIGNIFICANCE OF CLINICAL FRAILTY SCORING IN THE OUTCOMES OF PATIENTS RECEIVING NON-INVASIVE VENTILATION

DP McMahon, B Donnelly, N Chamberlin. *Sunderland Royal Hospital, Sunderland, UK*

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Introduction and objectives Decisions regarding commencement of non-invasive ventilation (NIV) in patients for whom this would prove beneficial necessarily involves consideration of the likelihood of success, with patient comorbidity being an

important contributor to such decisions. This study aimed to test whether patient frailty scoring can act as a useful predictor of mortality for patients commenced on NIV.

Methods All cases of inpatients discharged from the respiratory ward of a district general hospital between 01/12/2018–31/03/2019 were examined. The indications for treatment, Rockwood Clinical Frailty Scale (CFS) and mortality rates were recorded for each patient who received NIV.[1] Comparison was made between the CFS scores of patients who died in-hospital and those who survived to discharge.

Results 599 patients were discharged in the period covered, with 68 patients requiring NIV on 70 separate admissions. The indication for 64 of these cases was acute exacerbation of chronic obstructive pulmonary disease (AECOPD), with 2 indications for obstructive sleep apnoea and 2 for kyphoscoliosis. 20 of the 70 patients (29%) died in-hospital, a further 3 died post-discharge. 22.9% of NIV patients had a CFS recorded during admission, the remaining patients had this done retrospectively using information from the medical notes.

Mann-Whitney U-testing demonstrated a statistically significant difference between the mean CFS of the *In-hospital mortality* (mean CFS=6.3) and *Alive-to-discharge* (mean CFS=5.42) groups; $p=0.023<0.05$. In-hospital mortality for NIV patients with CFS 7–9 was 60% whilst that with CFS 1–6 was 20%.

Conclusions Although the cut-off score for mortality outcomes differed from recently published NCEPOD data (mortality 23.7% in CFS 1–5, and 42.3% in CFS 6–9), our study reaffirmed that higher CFS scores were associated with increased patient mortality for patients treated with NIV (especially CFS>6).[2] We thus recommend routine CFS assessment prior to clinical decisions regarding commencement of NIV for management of acute hypercapnic respiratory failure.

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P191 CAN REAL-TIME DATA COLLECTION IMPROVE MORTALITY AND DELIVERY OF ACUTE NON-INVASIVE VENTILATION (NIV)?

DP Smith, LA Boast, L Kempster, S Allen, J Wyatt, ME Roberts, AW Molyneux. *Sherwood Forest Hospitals, Sutton in Ashfield, UK*

10.1136/thorax-2019-BTSabstracts2019.334

Introduction The NCEPOD Acute NIV report, Inspiring Change (2017), showed that major improvements were required. Despite high mortality (35%), fewer than half of hospitals routinely audited their own practice. NCEPOD and BTS Quality Standards recommend performance targets and governance arrangements. Nationally NACAP collects only limited data on NIV and is not consistent with BTS quality standards; there have been only 4 BTS NIV audits in a decade.

In contrast MINAP/NICOR and SSNAP mandate continuous data collection in STEMI and acute stroke, driving improved delivery of care and benchmarking. Previously we demonstrated methods for improving NIV delivery and capacity with an acute NIV prescription and NIV service quality dashboard.

Abstract P191 Table 1

	2016/17	2017/18	2018/19
Number of acute NIV patients	139	185	189
Length of Stay (Median)	7	8	7
Readmission within 30 days	36	64	54
Readmission within 30 days (%)	25.9	34.6	28.6
Number died	34	36	19
Mortality rate (%)	24.5	19.5	10.1
Chi-squared test (p value) for change in mortality compared to 16/17	-	0.2802	0.0005

We propose a Patient Quality Dashboard to continuously monitor and feedback individual patient care.

Methods To measure delivery of care we developed a 9-point scoring system designed to be administered at the first consultant NIV review, based upon 8 objective and 1 subjective criteria. This was linked with clinical coding to audit performance, length of stay (LoS), and mortality. This data is presented at our Quarterly NIV morbidity and mortality (M&M) meetings to identify further areas requiring improvement. Utilising dashboard data, we email personalised scores as feedback to the clinicians commencing NIV with references to further learning.

Results Since inception in 2018/19 189 patients have been admitted, median LoS 7 days; mortality rates have fallen significantly from 24.5% (2016/17) to 10.1%, ($p=0.0005$) (See table 1).

Dashboard scores of 104 patients show good performance with a median score of 6.9/9 (SD 1.58), significantly improving from Q1-Q4 (ANOVA, $p=0.12328$), although only 61.5% received NIV within BTS quality standard guidance.

We have sent 42 feedback emails to clinicians and conducted four M&M meetings.

Conclusions We have demonstrated that a Patient Quality Dashboard, integrated with ward round documentation and an NIV prescription allows sustainable, continuous routine data collection automating auditing against BTS quality standards. Continuous audit facilitates clinician feedback and monitoring performance via M&M meetings, and may be associated with a significant fall in mortality. We propose this as a potential National model to improve care for patients receiving Acute NIV, as per MINAP/SSNAP.

P192 BEHIND THE MASK: IMPROVED MORTALITY OUTCOMES IN ACUTE NON-INVASIVE VENTILATION FOLLOWING SERVICE REDESIGN AT A DISTRICT GENERAL HOSPITAL

K Millington, R Anstey, F Easton, R Mason. *Royal United Hospital, Bath, UK*

10.1136/thorax-2019-BTSabstracts2019.335

Introduction and objectives Non-invasive ventilation (NIV) reduces mortality in patients presenting with COPD and hypercapnic respiratory failure. Recurrent poor UK wide mortality outcomes for patients treated with acute NIV prompted the *Inspiring Change*(NCEPOD 2017) report, which made

recommendations to ensure safer practice through service development and education.

Methods A case review of 20 patients commenced on acute NIV over a 2 month period (Oct-Dec 2017) was undertaken to benchmark our current practice. A patient experience survey was also conducted. This analysis identified key areas for improvement in all stages of the NIV pathway: documentation, patient selection, monitoring, treatment escalation and patient experience.

Existing trust NIV guidelines were revised in line with BTS recommendations. Bedside patient monitoring and prescription charts were formulated and a patient information leaflet was developed to promote patient understanding and concordance.

Following implementation of service changes a repeat review was performed (30 cases, Nov-Jan 2019).

Results Key factors in NIV patient care highlighted in NCEPOD (2017) were monitoring and all showed improvement after our service review (Table 1).

At baseline, 33% patients felt they were not involved in treatment decisions and 100% would have liked more information. After implementation of an NIV patient information leaflet 100% reported that the verbal and written information provided prior to treatment was clear and easy to understand. 100% felt involved in treatment decisions and thus would accept NIV again.

This project has lead to development of an electronic NIV prescription chart that will form part of the electronic patient record, acting as a checklist prior to commencement of NIV and will facilitate development of a patient registry for audit and service review.

Abstract P192 Table 1 Pre and post NIV service review and development

	Pre service review (patient%)	Post service review (patient%)
NIV prescribed	0	60
ABG within 1 hr	35	37
ABG 4–6 hrs/ <4 hrs	50	77
Treatment escalation plan	60	81
Inpatient mortality	30	6.6

Conclusion This multi-faceted approach to our NIV service has improved patient selection, patient adherence, clinician competence and treatment outcomes. It will facilitate the development of an accurate patient registry and thus ongoing service quality improvement.

P193 IMPACT OF A MULTIDISCIPLINARY APPROACH TO DELIVERING ACUTE NIV IN A LARGE TEACHING HOSPITAL

E Parkes, J Shakespeare, A Bishopp, A Ali. *Coventry Ventilation Centre, Coventry, UK*

10.1136/thorax-2019-BTSabstracts2019.336

Introduction Acute non-invasive ventilation (aNIV) is a well evidenced treatment for acute hypercapnic respiratory failure (AHRF) in COPD and other conditions including obesity hypoventilation syndrome, restrictive chest wall conditions and neuromuscular diseases. Within our service we recognised similar challenges and outcomes highlighted by NCEPOD's 'Inspiring Change' document. In response to this and utilising BTS Quality Standards, we undertook a quality improvement project (QIP), introducing a multidisciplinary aNIV team including the skills of Clinical Scientists, Physiologists, Physiotherapists and Nurses. We present results from our first dataset.

Methods This is a retrospective study of patients who commenced aNIV according to local policy at a large university teaching hospital over a 6-month period. Outcome variables were based on BTS Quality Standards and reviewed using NCEPOD audit toolkit. In addition, physiology data, inpatient mortality, 30-day mortality and readmission rates were recorded.

Results Our patient cohort (47) was predominantly COPD patients (79%) with a mean pH of 7.25 (NCEPOD cohort; COPD 69%, pH 7.25). Mean referral to mask time was 22 minutes, with 80% seen and treated by aNIV team within 1 hour (30% prior to aNIV team). In total 30% of patients had a pre-NIV pH <7.25 and 16% <7.15. ABG sampling at 1 hr of NIV was completed in 97%. A total of 85% had an improved pH and 87% pC02 at 1 hr of NIV (range .01-.26; .16–6.29kpa, respectively) with complete reversal of respiratory acidosis in 17% of patients. In-patient mortality was lower than NCEPOD cohort and our previous audit (16%; 35%; 28%, respectively), 30-day mortality was 0% with a 14% 30-day re-admission rate. Assessment against BTS Quality Standards are shown in Table 1.

Abstract P193 Table 1

BTS Quality Standards Domain	Patients Achieved (%)	Performance Status
Treating the right patients: Is NIV indicated?	96	Amber
Making a ceiling of treatment decision or escalation plan before starting NIV.	87	Amber
Documenting NIV settings and the adjustment in settings in response to new information	100	Green
Starting NIV within 60 minutes of the decision to treat with NIV	80	Amber
Continuous monitoring of the patient over the first 24 hours or until the initial respiratory acidosis has resolved	75	Amber
Staff training and competency	100	Green

Discussion Our data shows that an aNIV MDT utilising NCEPOD toolkit is able to deliver BTS quality standards to a large percentage of patients and contribute towards a reduction in inpatient mortality. A well-defined aNIV pathway, dedicated on-call rota, specific proforma and robust staff competency framework contribute towards achieving these outcomes. Future research is required in order to fully understand the mechanisms by which further improvements in patient outcomes can be achieved.

P194 INVESTIGATING THE PSYCHOLOGICAL IMPACT OF WARD BASED ACUTE NON-INVASIVE VENTILATION

N Meghani, I Ifrah, A Phyo Naing, T Bongers. *Blackpool Victoria Hospital, Blackpool, UK*

10.1136/thorax-2019-BTSabstracts2019.337

Introduction and objectives Over the past two decades, acute non-invasive ventilation (NIV) for hypercapnic respiratory failure has been delivered in the ward setting. The psychological impact of mechanical ventilation on patients in the ICU

setting has been evaluated, leading to post-ventilation follow up clinics and event diaries being used successfully. Conversely, there have been no investigations into the psychological status of ward based NIV patients. The aim of this study is to understand the psychological impact to our patients of delivering acute NIV on medical wards and to quantify the prevalence of major depressive disorders in this population.

Methods We created a structured feedback questionnaire for acute NIV patients to complete at the time of discharge from the respiratory wards. We included a validated screening tool (PHQ-2 score) to identify patients with a major depressive disorder. The survey period was between 1st January to 1st March 2019.

Results Twenty patients completed the questionnaire. 50% (10/20) screened positively for a major depressive disorder (PHQ-2 score $\geq$3).

35% (7/20) felt that their experience on acute NIV was negative overall. The primary reasons for this were a lack of individual attention whilst on NIV and feeling uninvolved in decision making regarding time spent on the ventilator. Despite this, 80% (16/20) felt that the reasoning behind needing NIV was explained to them adequately and 75% (15/20) felt that they would have NIV again if re-admitted with the same problem.

Conclusions An admission for acute NIV most likely has an impact on a patient's mood and this project has identified a significant population of ventilated patients who screen positively for a mood disorder following NIV. Screening positively for a mood disorder using PHQ-2 scoring has already been identified as a risk factor for poor prognosis in congestive cardiac failure and coronary artery disease. Further work needs to be done looking at this cohort in more detail to ascertain whether a mood disorder could represent a modifiable risk factor for outcomes in patients with respiratory failure.

P195 DOMICILIARY NONINVASIVE VENTILATION REDUCES RE-ADMISSIONS IN PERSISTENT HYPERCAPNIC RESPIRATORY FAILURE DUE TO COPD, BUT ARE WE MISSING A TRICK?

[1]PI Ehilawa, [1]B Chisanga, [2]P Smith, [3]R Holt, [1]JA Colt, [1]MP Sovani. *[1]Advanced Respiratory Care Unit (ARCU), Nottingham University Hospitals, Nottingham, UK; [2]Lung Function and Sleep Services, Nottingham University Hospitals, Queen's Medical Centre, Nottingham, UK; [3]Respiratory and Sleep Services, Nottingham University Hospitals, Nottingham, UK*

10.1136/thorax-2019-BTSabstracts2019.338

Introduction and objectives It is well established that domiciliary noninvasive ventilation (NIV) improves mortality in neuromuscular disease (NMD) patients but evidence for chronic obstructive pulmonary disease (COPD) remains inconclusive. Research has shown reduction in hospital admission in COPD patients with persistent type 2 respiratory failure (T2RF), but variability in clinical practice exists and evidence of outcomes in real-world patients is needed.

Methods We conducted a three-year retrospective study of patients on domiciliary NIV between January 2016 and December 2018.

Results During this period, 220 patients were established on domiciliary NIV; 56% inpatient and 44% outpatient. The underlying diagnoses included; NMD (32%); Obesity Hypoventilation Syndrome [(OHS) (24%)]; COPD (17%); COPD/OHS Overlap (15%); Kyphoscoliosis (6%) and 'Others' (6%).

Unlike NMD, COPD (21%), COPD overlap (17%) and OHS (36%) accounted for 74% (n=123) of domiciliary NIV initiated on inpatient admissions. COPD and OHS cohorts had higher median carbon dioxide (PaCO2) levels; COPD [PaCO2 7.72kPa (IQR 6.95–8.96)] and OHS [PaCO2 7.88kPa (IQR 6.71–8.28)]. Only 13% (n=3) of COPD and 7% (n=1) of COPD overlap patients returned their machines due to poor tolerance. The COPD cohort had the highest number of admissions one year prior to NIV initiation, median 2.5 (IQR, 1.25–3) which reduced to 0.5 (IQR 0–2) in the year post NIV.

Median Body Mass Index (BMI) was 29 kg/m^2 (IQR 21–31.25) for COPD, 38 kg/m^2 (IQR, 42–48) for COPD overlap and 45 kg/m^2 (IQR 41–52) for OHS cohorts. There were 56 deaths during this period; with highest mortalities in NMD (46%), COPD (23%) and OHS (13%). COPD overlap cohort unexpectedly had the longest median time [17.21 months (IQR 6.3–25)] between NIV initiation and death while OHS cohort had the shortest [4.82 (IQR 3.51–20.75]; suggesting that obesity may have some protective effect but not at extremes.

Conclusions NIV was well accepted and effective in reducing admissions in COPD patients with persistent T2RF. This study raises questions about whether COPD patients should be more closely monitored and proactively initiated on domiciliary NIV as outpatients to reduce readmissions. Importantly, 13% of deaths were from OHS patients, highlighting the need for early intervention in patients with morbid obesity.

P196 OUTCOME OF COPD PATIENTS STARTED ON INPATIENT DOMICILIARY NIV FOLLOWING AN ACUTE ADMISSION WITH HYPERCAPNIC RESPIRATORY FAILURE

C Shere, C Dalton, J Oldham, A Dushianthan. *University Hospital Southampton NHS Foundation Trust, Southampton, UK*

10.1136/thorax-2019-BTSabstracts2019.339

Background Recurrent hypercapnic exacerbations of COPD place a significant burden on hospitals. GOLD guidelines recognise domiciliary NIV as beneficial for selected COPD patients hospitalised with acute hypercapnic respiratory failure (AHRF), especially with persistent $PaCO_2$>7kpa. A recent study demonstrated that domiciliary NIV conferred a reduction in composite outcomes of 12-month readmission and mortality in COPD patients following hospital admission.[1]

Methods Data collected retrospectively for 162 admissions to the Respiratory High Dependency Unit (RHDU) with AHRF COPD exacerbations in 2017, representing 132 patients. We collected clinical information from all available hospital electronic resources.

Results Mean age was 70.6 years, with a mean FEV_1 of 37.4%. 24% of patients admitted were discharged with domiciliary NIV, of which 11.4% was newly initiated. Newly initiated patients (N=15) were slightly younger with more LTOT use. They had higher $PaCO_2$ on admission and responded well to acute inpatient NIV. 73% (N=11/15) had $PaCO_2$>7kPa at the time of NIV initiation. This group had a 12-month mortality of 40% and readmission rate of 0.7 episodes/12 months. Additional 36 patients were discharged from RHDU with persistent $PaC0_2$>7Kpa, without domiciliary NIV initiation. This group had a 12-month mortality of 30%, with readmission rates comparable with the domiciliary NIV-

initiated group. However, there were deficiencies in follow-up plans with lack of repeat routine arterial blood gas (ABG) analysis for these patients compared to the NIV-initiated group.

Conclusions Following an AHRF admission, COPD patients with established respiratory failure have significant mortality even at 12-months, despite inpatient domiciliary NIV initiation. However, this group may represent patients with severe illness, who may be unable to wean off NIV completely. We identified a group of patients who could have been started on domiciliary NIV as recommended by GOLD guidelines. We found low rates of follow-up ABG analysis for those who had $PaCO_2$>7kPa during admission. We are currently developing a screening tool to ensure appropriate follow-up with repeat ABG measurements to assess potential suitability for domiciliary NIV.

REFERENCE

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P197 NON INVASIVE VENTILATION (NIV) MULTI-DISCIPLINARY MEETINGS (MDM) –IMPROVING SUPPORT AND ACCESS TO SPECIALIST CARE

[1]B Prathibha, [1]E Jagger, [1]A Scott, [1]S Haliwell, [2]S McCrossan, [3]B Kennedy. *[1]East Kent Hospitals University NHS Foundation Trust, Ashford, UK; [2]Kent Community Trust, Kent, UK; [3]Pilgrims Hospice, Kent, UK*

10.1136/thorax-2019-BTSabstracts2019.340

Introduction East Kent is a large Trust covering a population of 800,000 people with high respiratory morbidity and mortality. We have a large home ventilation service with 682 patients over a wide area and some very remote villages. As part of organization of our services, we have developed the NIV MDM, the focus of which is on our home ventilated patients.

Methods The NIV MDM was set up in its current format, a year ago. Membership includes Community and hospital Respiratory nurses, Respiratory and Palliative Care consultants

Our Ref: NIV MDM/KB
Clinic code: NIV MDM
Date of letter:
Date of MDM:

"GP DETAILS"

"PATIENT DETAILS"

Diagnosis

Attending:

Your patient was discussed today at our NIV Multidisciplinary Meeting

NIV Settings	Latest CBG results Date	Compliance with NIV	Community Respiratory Team/Nurse responsible	Palliative Input/DNAR status	Lead Consultant
Machine: Mode: IPAP: EPAP: BPM: TI: RT: Oxygen: Mask:	PH: PC02: P02: BE: HC03: S02:				

Date of discussion:	Outcome: Actions

Yours Sincerely,

Abstract P197 Figure 1

and administrator. The meetings take place monthly and last for 1 hour. In view of the size of the Trust, the meetings are Video conferenced across the 3 acute sites (Margate, Ashford and Canterbury) enabling professionals in the different parts of the Trust to take part with least disruption. The newly designed proforma (figure1) and the list are sent to all the members, in advance. Compliance data and blood gases are pre-populated on the proforma. The group also has an educational arm which takes the form of an evening meeting every three months.

Result On an average, 11 patients are discussed at each session; numbers may vary based on clinical need. Following discussions, the proforma is updated and uploaded on to the patient's record with copies to the GP and consultants. Feedback from all members of the MDM has been excellent, stating that it has improved patient care and empowered them. The educational evenings have provided a forum for team building across community and secondary care, as well as develop innovative ideas.

Conclusion There are many forms of MDMs in the NHS now, but this was designed to help address our particular problem and ensure that all patients on home ventilation had adequate support and equal access to specialist care, irrespective of where they lived in East Kent. It has not only achieved this but has also built a cohesive team across primary, community and secondary care, enhancing education.

P198 DOMICILIARY NIV (DOMNIV) IN A REAL WORLD SETTING: A RETROSPECTIVE STUDY IN A DISTRICT GENERAL HOSPITAL

S Craik, A Nasir, A Ali, H Moudgil, K Srinivasan, A Makan, E Crawford, J Wilson, N John, N Ahmad. *Princess Royal Hospital, Telford, UK*

10.1136/thorax-2019-BTSabstracts2019.341

Introduction DomNIV in patients with chronic Type 2 respiratory failure results in improved survival. HOT-HMV study produced encouraging results in patients with COPD treated with home oxygen and DomNIV. [Murphy et al, JAMA, 317(21), 2177–2186] DomNIV usage with or without oxygen has been prevalent in our hospital setting over for 10 years.

Objective Our primary aim was to look at the indications for prescription of DomNIV in our local hospital. Our secondary aim was to look at overall unadjusted mortality in this cohort and in particular any relationship with different types of oxygen provision.

Methods We collected data on all patients who have received DomNIV from 2008–2018 with or without oxygen prescription from our local database. Data on mortality was obtained from our Clinical Portal. We used MS Excel and Vassar stats (http://vassarstats.net/) for statistical analysis.

Results 105 patients commenced DomNIV; 60% were female with a mean (SD) age of 61 (13) years. Indications were Obesity hypoventilation (OH), Overlap syndrome, COPD, Neuromuscular disease, Bronchiectasis and others. 40% of patients did not receive oxygen with DomNIV (wO2), 36% received long term oxygen therapy (LTOT), 15% received overnight oxygen (OO2) and the rest received PRN oxygen.

43% of patients (N=45) died during the study period, of these 40% (N=18) died within the first 12 months. 29% died with LTOT versus 17% wO2 and 0% with OO2 in the first 12 months. This was statistically significant between LTOT and OO2 groups: RR 0.71 (95% CI 0.58–0.87), and also between wO2 and OO2 groups: RR 0.83 (95% CI 0.72–0.95).

Conclusion

1. Majority of patients received DomNIV treatment for OH;
2. 36% (N=38) had received long term oxygen therapy (LTOT) along with DomNIV;
3. Patients receiving overnight oxygen with DomNIV survived longer compared to those who had it as LTOT or who didn't have any oxygen at all.

P199 IMPACT OF THE INCREASING EVIDENCE BASE OF THE BENEFITS OF HOME MECHANICAL VENTILATION IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE ON A HOME MECHANICAL VENTILATION SERVICE: ONE REGIONAL SERVICE'S EXPERIENCE

L Campbell, PB Messer, HM Tedd. *Newcastle upon Tyne NHS Foundation Trust, Newcastle upon Tyne, UK*

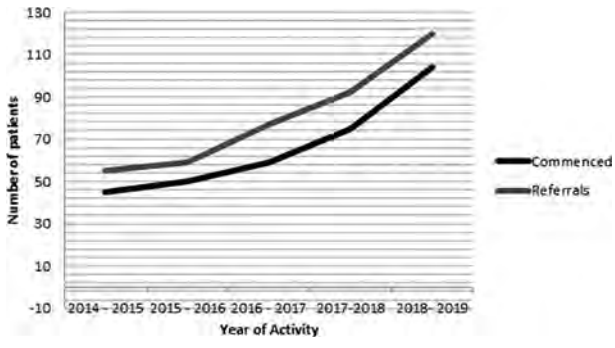
10.1136/thorax-2019-BTSabstracts2019.342

Background There is an increasing evidence base to support the use of home mechanical ventilation (HMV) in chronic obstructive pulmonary disease (COPD) Kohnlein[1]et al (2014) demonstrated an improvement in 12 month mortality in a stable COPD population with chronic hypercapnia and the Murphy et al[2] (2017) demonstrated prolongation to first admission or death, following an acute episode of hypercapnic respiratory failure. However, little is known about the impact on such evidence in this patient group on clinical services.

Aim To identify the number of patients with COPD referred for consideration of HMV and subsequently set up on HMV within our regional specialist HMV service per year over a 5 year period (2014–2019).

Results During this five year, our service saw a year on year increase in referrals for consideration for HMV in patients with COPD (figure 1). Over the 5 year period our referrals for patients with COPD increased by 118% with an 131% in set ups per year, with the biggest increase in referrals and set ups being seen following the publication of the Murphy et al paper from 2017–2018 onwards (see figure 1).

In consequence, we have recruited both a respiratory consultant and respiratory specialist nurse to our HMV team to



Abstract P199 Figure 1 Referral and commencement of COPD patients on HMV

ensure that this patient group is reflected in the clinical make up of our specialist team.

Conclusions With the increasing body of evidence supporting the use of HMV in patients with COPD, we have demonstrated a more than doubling in both the number of referrals and patients being set up on HMV with COPD within our regional service over a 5 year period.

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P200 PRE-FLIGHT ASSESSMENT IN HOME NIV USERS: DO WE GET IT RIGHT?

V Lostarakos, A Armstrong, BS Baudouin. *Newcastle upon Tyne Hospitals NHS Foundation Trust, Newcastle Upon Tyne, UK*

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Introduction There is significant uncertainty in the use of pre-flight hypoxic challenge assessments for individuals using long term ventilation. Current BTS guidelines suggest that a SaO_2 >95% precludes the need for any pre-flight assessment of the need for supplemental oxygen during flight.[1] However, a study of 19 NIV users showed significant oxygen desaturations during a hypoxic flight challenge in 15 (79%) despite a baseline SaO_2 >95%.[2]

Methods We examined the results of a pre-flight hypoxic challenge test ($FIO_2$15%) on all NIV patients who intend to travel by air and who have a baseline SaO_2 ≥92%, for the period of 2014 to 2019 (retrospective analysis).

Results Eighty-seven patients were tested (18% chronic obstructive pulmonary disease, 52% genetic muscle disease, 9% sleep disorder (obstructive sleep apnoea/obesity hypoventilation syndrome), 8% restrictive lung disease from chest wall/spinal problems,13%genetic metabolic disease). Seventy-six percent had a baseline SaO_2 >95% on air. Using current BTS criteria 13/87 (15%) 'failed' the flight test and would require supplemental oxygen during flight. Of the 22/87 with a baseline $SaO_2$92–95% 9 (41%) failed the test. Only 4/65 (6%) with a baseline SaO_2 >95% failed. This compares with 6/12 (50%) NIV users with a baseline SaO_2 >95% reported in the Mestry study[2].

Discussion We have confirmed that a non-negligible number of domiciliary NIV users, with a testing threshold above the current BTS recommendations, fail a hypoxic pre-flight challenge test. The clinical consequences of these observations and the impact of in-flight oxygen remain unknown. These findings encourage further research towards a multivariable predictive model.

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Clinical studies in TB

P201 A 15 YEAR RETROSPECTIVE STUDY OF OUTCOMES IN PAEDIATRIC TUBERCULOSIS DISEASE IN A LARGE TERTIARY CENTRE

K Dominiak, L Turnbull, R Anderson, S Hough, A Wilcock, S Bhowmik, F Child, C Bell. *The Royal Manchester Childrens Hospital, Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.344

Background Incidence rates of Tuberculosis (TB) in the United Kingdom (UK) are amongst the highest in Western Europe (9.2 cases per 100000 population).[1] Despite this there is little data on the clinical burden of TB disease in children and few reports of clinical outcomes for this population.

We present outcome data from a 15-year study performed in a large tertiary children's hospital in one of the areas with the highest UK incidence of TB.

Method A retrospective analysis of children ≤16 years identified by pre-entry screening, contact-tracing or by direct referral to TB services between 2003–2017.

Information regarding referral type, patient demographic, symptomatology, diagnostics, treatments, side-effects and clinical outcome were gathered from electronic and paper records.

Results On average we investigate 421 children for TB each year.

Over this 15 year period we diagnosed 278 children with active TB. Most had Pulmonary TB.

46% of children were referred because they were symptomatic, 51.4% because of a TB contact (17.6% symptomatic) and 2.5% from new-entrant screening.

TB was most prevalent in 12–16 year olds (35.5%).

Investigations performed varied Tuberculin skin test (TST) was positive in 89.5% of children and Gamma-Interferon in 74%. 70.2% of TST positive children had a positive Gamma-Interferon result.

Microbiology samples were sent in 55.9% cases. 41.9% had at least one positive sample.

78% completed treatment within the designated timeframe. 31 children needed treatment extending due to compliance or persistent disease. 11 children had isoniazid-resistance and 3 had multidrug-resistant TB (MDRTB) requiring alternative regimes.

28% experienced treatment side-effects, including hepatic-impairment and visual disturbance.

Following treatment completion 74% of children were discharged with no residual Chest X-ray changes. Eight children developed Bronchiectasis, six respiratory complications not classified as bronchiectasis and one with previous miliary isoniazid-resistant TB re-presented with seizures and died from TB meningitis.

Conclusion This study suggests most children with TB make a complete recovery. We found complications more likely in symptomatic culture positive children possibly representing more virulent disease. This highlights the importance of having a low investigating threshold for children presenting with symptoms suggestive of TB. Treatment side-effects occur rarely but can be life-threatening.

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P202 EVALUATION OF A LATENT TUBERCULOSIS INFECTION SCREENING AND TREATMENT PROGRAMME FOR RECENT MIGRANTS

K O'Brien, S Ikram, M Burman, A Rahman, H Kunst. *Blizard Institute, Queen Mary University of London, London, UK*

10.1136/thorax-2019-BTSabstracts2019.345

Introduction and objectives Since 2014, the London borough of Newham has been a pilot for the national latent tuberculosis infection (LTBI) screening and treatment programme for recent migrants. Effective delivery of the programme requires collaboration between multiple stakeholders across primary and secondary care; we sought to understand the lessons learned from 5 years of running the service.

Methods We performed semi-structured interviews with nine multi-level stakeholders involved in the implementation and delivery of the programme. This included individuals from the Clinical Commissioning Group, NHS England and the local pharmaceutical committee. Interviews were organised around predetermined, open style questions and were carried out during the period 15th-30thMay 2019.

Results Several barriers and facilitators to programme implementation and delivery were identified (table 1). Facilitators included effective communication between multi-level stakeholders, with those interviewed placing emphases on continuous review and training of service providers. Aggregate data collection, processing and monitoring was considered a significant facilitator. TB and LTBI education through healthcare providers and novel educational tools, was also cited as an important facilitator. The main challenges identified included communication between healthcare providers, estimations of testing and treatment uptake and perceived low levels of patient knowledge of TB or LTBI.

Abstract P202 Table 1 Facilitators and barriers identified by stakeholders

	Patient level	Healthcare level	Clinical commissioning group
Facilitators	LTBI education by healthcare providers LTBI animation educational tool	Training of healthcare providers and administration staff Accessibility to specialist TB advice by secondary care	Effective communication between stakeholders Aggregate data collection and monitoring
Barriers	Low level patient knowledge of TB or LTBI	Lack of a shared electronic platform between GP and Pharmacy	Difficulties estimating testing and treatment uptake

Conclusion To achieve the national goal of systematic screening and treatment of recent migrants for LTBI will require high quality services to be established across the country. It is vital to share learning as the programme develops. Evaluation of a large programme in East London identified that a continuous programme of education, close collaboration between stakeholders and continuous aggregate data collection were felt to be vital for successful outcomes.

P203 SOCIAL COMPLEXITY REMAINS A CHALLENGE FOR THE PROVISION OF TB CARE

[1]YO Abunga, [1]R Davies, [1]T Molefe, [1]J Faccenda, [2]SO Brij. *[1]Peterborough City Hospital, Peterborough, UK; [2]Manchester Royal Infirmary, Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.346

Introduction There has been a local increase in TB hospital admissions with some cases requiring lengthy in-patient stays. Treatment for medically complex and/or drug resistant TB is associated with significant cost implications and increased length of stay (LOS). In comparison, socially complex TB cases (homelessness; drug and alcohol dependence; imprisonment; non-compliance; denial of TB diagnosis) often require protracted period of admission.

Aim To determine factors affecting hospital length of stay (LOS), a retrospective survey was undertaken looking at adult patients admitted with a primary diagnosis of TB between 2012 and 2019.

Methodology All adult TB patients admitted between 01/01/2012 and 01/06/2019 were included. Clinical notes were used to obtain clinical history, LOS and demographicinformation.

Results 71 TB admission episodes were identified in 62 patients (male gender 61%; median age 43 years; range 18–94 years): 56 patients with a single admission; 5 with 2 admissions; 1 with 5 admissions. Overall, median adjusted LOS 15 days (range 1–134).

Non-complex admissions independent of disease severity (including 4 TB drug side-effects and 10 drug resistant TB) accounted for 54 episodes with median LOS 11 days (range 1–127).

Complex social admissions accounted for 17 episodes with median LOS 50 days (range 3–134). Factors affecting admission/discharge included homelessness 12; compliance 5; alcohol and drug-dependence 4; imprisonment 3. More than 1 social factor was present in 8 episodes.

There were 22 episodes with LOS >31 days and complex social admissions (n=12) appeared to be significantly associated with extended length of stay RR 5.34; 95% CI 2.14 to 13.33; p 0.0003.

Conclusion Length of hospital stay is significantly extended by social complexity. Homeless patients accounted for 70% of complex social admissions. Lack of recourse to public funds remains an on-going issue despite locally agreed arrangements for provision of housing for the duration of TB treatment but this is still subject to a relatively lengthy process, creating unnecessary delay. In addition, if patients with pulmonary TB (and social complexity) are persistently smear positive, a negative culture for discharge is recommended, thereby increasing LOS.

P204 BARRIERS AND FACILITATORS TO DELIVERING LATENT TUBERCULOSIS INFECTION (LTBI) SCREENING AND TREATMENT TO RECENT MIGRANTS: A SURVEY OF PROVIDERS IN A HIGH PREVALENCE TB SETTING IN THE UK

S Ikram, K O'Brien, A Rahman, J Potter, M Burman, H Kunst. *Blizard Institute, Barts and The London School of Medicine and Dentistry, London, UK*

10.1136/thorax-2019-BTSabstracts2019.347

Introduction and objectives Screening and treatment of migrants to the UK for LTBI is a key component of the TB

Abstract P204 Table 1 Views of GPs, HCAs, PNs and Pharmacists on facilitators and barriers of implementing a LTBI Screening and treatment programme in primary care in Newham

		Healthcare Professional		
		GP (n=15)	PN/HCA (n=17)	Pharmacist (n=11)
Facilitators	Good relationship of patients with primary care staff	13 (86.7%)	9* (64.3%)	11 (100.0%)
	Primary care locations easier to access	11 (73.3%)	8* (57.1%)	9 (81.8%)
	Easier to obtain LTBI medication	8 (53.3%)	4* (28.6%)	10 (90.9%)
	Provision of information regarding LTBI	6 (40.0%)	5* (35.7%)	8 (72.7%)
	Reducing language barriers through the use of interpreters	10 (66.7%)	7* (50.0%)	6 (54.5%)
	Primary care delivery of programme more cost-effective than secondary care	9 (60.0%)	3* (21.4%)	7 (63.6%)
	There are no facilitators	0 (0.0%)	1* (7.1%)	0 (0.0%)
Barriers	Time required seeing patients	8 (53.3%)	2 (11.8%)	2 (18.2%)
	Complexity of LTBI treatment	2 (13.2%)	3 (17.6%)	2 (18.2%)
	Number of adverse effects of LTBI treatment	5 (33.3%)	5 (29.4%)	3 (27.3%)
	Patient understanding of LTBI	7 (46.7%)	14 (82.4%)	4 (36.4%)
	Healthcare professional understanding of LTBI	5 (33.3%)	4 (23.5%)	0 (0.0%)
	Language barriers between patient and healthcare professional	4 (26.7%)	10 (58.8%)	2 (18.2%)
	There are no barriers	1 (6.7%)	2 (11.8%)	4 (36.4%)

* n = 14; ** n= 40

collaborative strategy in England. The London borough of Newham is a pilot site for the national programme whereby care is delivered entirely within primary care. We sought to identify facilitators and barriers to delivery of care by understanding the views of healthcare professionals delivering the programme.

Methods Between August 2017 and February 2018, questionnaires were sent to all GP practices and community pharmacies in the LTBI programme. Healthcare assistants (HCAs), Practice Nurses (PNs), GPs and community pharmacists were asked to complete questions about potential facilitators and barriers, and their role in service delivery.

Results 15 GPs, 17 HCA/PNs and 11 pharmacists completed the questionnaires. The relationship of patients with primary care staff was the most commonly considered facilitator across all professional groups. However the barriers differed – GPs listed time to see patients as the common barrier; pharmacists, HCAs and PNs listed patient understanding about LTBI as the most common barrier (see table 1).

Role specific feedback Pharmacists believed themselves as best placed to check patient adherence to LTBI medication (11/11), and pill count was believed to be the best measure of adherence (9/11). Almost all pharmacists (10/11) stated they had found good adherence to medication. Most GPs (10/15) also believed pharmacists were best placed to monitor medication adherence and GPs additionally believed comprehensive counselling used in their first consultation improved adherence. HCAs/PNs found explaining why an IGRA test was needed as the most challenging part of their role (8/15).

On a 5-point Likert scale, GPs (mean=4.33/5) and pharmacists (mean=5.00/5) both agreed that LTBI care should be provided in primary care. However, most GPs (mean 4.25/5) felt pressurised to deliver too many services in primary care, compared to pharmacists who disagreed with this statement (mean=2.00/5).

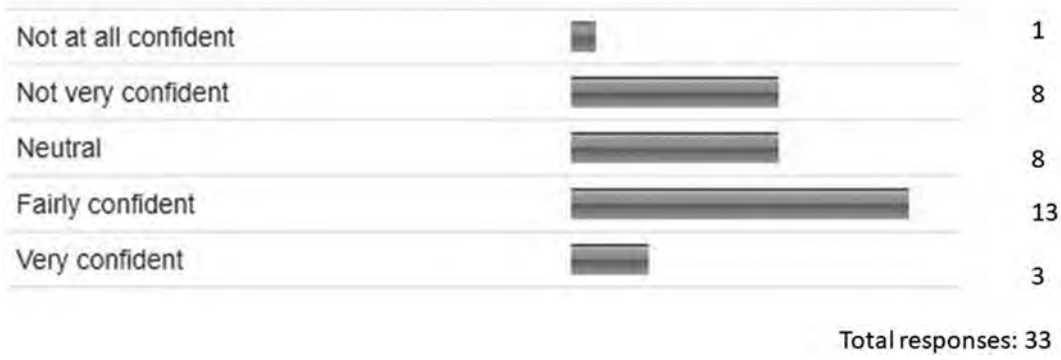
Conclusion In a primary care based model of care for LTBI screening and treatment in migrants, healthcare professionals felt ease of access and patient relationships were the key facilitators to care. GPs but not other professionals expressed pressure on services as a major barrier.

P205 WHY DO RADIOLOGISTS UNDER-REPORT PULMONARY TB ON CHEST X-RAYS IN SOUTH LONDON?

[1]M Kamalanathan, [2]G Benedetti, [2]A Azam, [2]R Breen. [1]*Kings College Hospital, London, UK*; [2]*Guys and St. Thomas, London, UK*

10.1136/thorax-2019-BTSabstracts2019.348

Introduction Delays in diagnosis of pulmonary tuberculosis (TB) are common. Although slow referral for a chest x-ray (CXR) can contribute to diagnostic delay, we previously reported that only half of patients with active pulmonary TB and an abnormal CXR had their CXR reported as possible TB.[1] In most cases the CXR showed what appeared to the TB team as easily recognisable features of infection, and so we sought to identify possible reasons for under-reporting from the perspective of the radiologists.



Abstract 205 Figure 1 How confident do you feel in identifying the features of TB from a chest radiograph

Objectives To evaluate the experience and training of radiologists at a London teaching hospital in reporting pulmonary TB on a CXR.

Methods We invited all radiologists from ST1 to Consultant level who report CXR to complete an online survey. Responses were collected from January – April 2019 and were anonymous.

Results 33 of 60 (55%) radiologists responded to the survey: 12 consultants and 21 trainees ranging from ST1 to ST5.

79% (26/33) had previously reported a CXR as TB or included it in the list of differentials.

58% (17/33) were neutral to not at all confident in reporting TB from a CXR (figure 1).

9% (3/33) had considered TB as the diagnosis but not included it in the report.

40% (13/33) had never had specific teaching about TB radiology, and 79% (26/33) thought that further teaching would help with their reporting.

79% (26/33) said that they were not aware of local TB referral pathways or what would happen to the patient if they mentioned TB.

Following this survey we invited all radiologists to a teaching session with the TB team.

Conclusions Our data suggests that despite working in hospitals with a significant burden of TB, more than half of radiologists lacked confidence in including TB in the CXR report. We have identified the need for increased education and training in TB radiology and ensuring that reporting radiologists of all grades are aware of local rapid referral pathways for TB. This is essential to increase early diagnosis of TB and reduce delays in treatment initiation.

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P206 ATTITUDES TOWARDS TREATING LATENT TUBERCULOSIS IN HEALTHCARE WORKERS

[1]C Wilson, [1,2]P Mitchelmore, [2]H Dunning, [2]T Burden. [1]*University of Exeter, Exeter, UK*; [2]*Royal Devon and Exeter NHS Foundation Trust, Exeter, UK*

10.1136/thorax-2019-BTSabstracts2019.349

Background The risk of latent *Mycobacterium tuberculosis* (LTBI) is higher among health care workers (HCW) than the general population. There is a lack of evidence about LTBI in HCW and only one study from Australia was found to examine HCW's attitudes towards taking treatment.[1] Guidelines in the UK have increased the upper age limit for testing and treating LTBI. HCW's attitudes could influence the advice given to this expanding population in whom treatment is now recommended.

Methods A 10 part online questionnaire was sent to 149 respiratory consultants, registrars and specialist nurses working across the Peninsula and Severn deaneries. Questions identified the HCW's exposure risk, BCG status and history of LTBI testing. Attitudes towards testing for and treating LTBI in these individuals were explored.

Results 51 responses were collected over the course of a week (25 consultants, 19 registrars and 7 specialist nurses). Of these, 98% had been exposed to TB in the past and all but one had received the BCG vaccination. 31 individuals reported having regular exposure to patients with TB through work. Of the 25 HCWs who had been tested for LTBI in the past, 5 had tested positive. 22% of people would not have treatment if they tested positive for LTBI and a further 23% were unsure. The majority (70%) would be happy to be tested for LTBI as part of a research study, and most (88%) would want to know the result if they were tested.

Abstract 206 Table 1 Individual responses to the question 'If you tested positive for LTBI, would you have treatment?'.

	Would you take treatment for LTBI?		
	Yes	No	Don't know
Consultants	14 (56%)	7 (28%)	4 (16%)
Registrars	11 (58%)	3 (16%)	5 (26%)
Nurses	3 (43%)	1 (14%)	3 (43%)
Total	28 (55%)	11 (22%)	12 (23%)

Conclusion As demonstrated in this pilot study, almost all HCW working in respiratory departments in the South West of England have had exposure to TB. Approximately half have undergone testing for LTBI. 20% of HCW tested had results consistent with LTBI. The majority were willing to be tested for LTBI as part of a future research study. The lack of a clear consensus among HCW regarding treatment for LTBI may affect the advice we give to patients.

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P207 PROSPECTIVE INVESTIGATION OF TUBERCULOSIS TREATMENT DELAYS

S Black, S Menzies. *Wexham Park Hospital, Slough, UK*

10.1136/thorax-2019-BTSabstracts2019.350

Introduction The World Health Organisation goal is to halve Tuberculosis incidence by 2025.[1] Delays in starting Tuberculosis (TB) treatment leads to an increased risk of cross infection and severity of disease, both in pulmonary (PTB) and extrapulmonary (EPTB) disease. Public Health England data showed that our hospitals were underperforming compared to National performance regarding the time between symptom onset and starting TB treatment.

Aim To identify where patients diagnosed with tuberculosis were facing delays in their care pathway before starting TB treatment.

Method This was a prospective study of all patients diagnosed with tuberculosis (PTB and EPTB) in 2018 at the two District General Hospitals in our county. A TB treatment delay questionnaire was completed with the patient at the time of starting anti-tuberculosis medication.

Results In 2018, 82 patients were diagnosed with TB, of which 56% were male. The median age was 37 years (range13–91) at the time of diagnosis. 82% of TB patients were born aboard. 13 out of the 28 PTB patients (46%) presented to Primary Care, and had a mean number of 2 GP visits before referral onwards. 3/13 were referred directly to the TB service, 3/13 to A&E, 4/13 to the Lung Cancer service and 3/13 to Acute Medicine. The 8 patients not meeting the target of referral within 28 days had a wide range of ages, 3/8 were UK-born (1 white British) and 5/8 had appropriate management in Primary Care on subsequent TB clinician review.

Conclusion The main delay in the diagnostic pathway was in Primary Care, although on whole the diagnosis was prompt. Once patients were seen in secondary care, the majority were diagnosed and started on TB treatment quickly. Raising awareness of TB, delivering TB teaching for GPs and streamlining the referral pathway directly to the TB team are essential to reduce diagnostic delay and subsequent morbidity and onward transmission of disease.

Abstract P207 Table 1 Stages in diagnostic pathway for TB patients in 2018 at two District General Hospitals

	PTB (n= 28)	EPTB (n= 54)
Patient Delay (Median time from symptom onset to presentation to healthcare professional)	11 days (range 0–102) Target = 14 days 9/24 (37%) missed target	14 days (range 0–352) Target = 28 days 11/51 (22%) missed target
Primary Care Delay (Median time from 1st GP review to Secondary Care referral)	31 days (range 0–240) Target = 28 days 8/13 (62%) missed target	15 days (range 0–270) Target = 28 days 10/35 (29%) missed target
Secondary Care Delay (Median time from date referred to Secondary Care to TB team referral)	13 days (range 0–102) Target = 14 days 5/14 (36%) missed target	17 days (range 0–540) Target = 28 days 12/37 (32%) missed target
TB team appointment delay (Median time from being referred to TB team to being seen)	2 days (range 0–109) Target = 14 days 4/48 (14%) missed target	11 days (range 0–71) Target = 28 days 9/53 (17%) missed target

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P208 TUBERCULOUS PLEURAL DISEASE IS ASSOCIATED WITH A HIGH RATE OF HOSPITAL ADMISSION

PI Webb, SO Brij, T Gorsuch, C Bell. *Manchester Royal Infirmary, Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.351

Purpose Tuberculous pleural disease accounts for a minority of TB disease in England and yet in 2018, of the 17 acute admissions for TB diagnosis to a major teaching hospital, 5 patients had pleural tuberculosis (PLTB)

Methodology All adults diagnosed with PLTB between January 2011 and December 2018 were retrospectively evaluated with regard to their clinical history, investigations, management and outcomes.

Results In total, 92 patients (median age 34 years; range 17–89; male 70%; UK born 14%) with PLTB were identified. TB was identified in 122 sites with the most common additional sites (AS) affected being pulmonary (25/35), mediastinal lymphadenopathy (20/35) and cervical lymphadenopathy (9/35) accounting for 65.6% additional non-pleural disease sites.

64/92 (69%) were admitted to hospital as a result of their TB disease (median adjusted length of stay (LOS) 10 days; range 2–239). 46% of admitted patients had pleural disease alone compared with 18% of those not admitted (RR 1.41; 95% CI 1.1 to 1.8; p 0.0069).

Pleural culture was positive in 36/85 (42%). In the pleural culture negative cohort, AS sampling was undertaken in 24/46 patients and yielded positive culture results in 13/24 (54%). Therefore, overall culture positivity 49/90 (54%). Only 2 patients had neither pleural nor AS sampling undertaken. Eleven patients with culture negative pleural disease were consistently culture negative following AS sampling.

Admitted patients with PLTB were significantly more likely to have a positive pleural culture compared to those managed in the out-patient setting: 58% vs 9% (RR 6.39; 95% CI 1.7 to 24.3; p 0.0066).

Conclusions Admission is likely to be a marker of TB disease burden/severity and those with pleural disease have prolonged LOS and pleural culture positivity. Pleural fluid is invariably AFB smear negative. Thus, if a second site is accessible, sampling should be undertaken to improve culture positivity with subsequent drug sensitivities.

P209 CHEST WALL TUBERCULOSIS PRESENTATIONS IN EAST LONDON

DX Pang, E Skyllberg, A Sundaralingam, A Rahman, M Burman, S Tiberi, H Kunst. *Royal London Hospital, London, UK*

10.1136/thorax-2019-BTSabstracts2019.352

Introduction Tuberculous abscesses are rare, accounting for 1% of extra-pulmonary tuberculosis (TB). The chest wall is often a site for cold abscesses. There have been only case reports described in the literature. We report a case series of chest wall TB diagnosed in a large European centre.

Methods A retrospective analysis of at a large European centre of all TB cases between 2005 -2018 notified in the London TB register.

Results We identified 22 cases of chest wall TB, this was 0.3% of all TB cases over this time period. 81.8% (18/22) were male, the median age was 33.06 years (SD 14.05 years). 81.8% (18/22) were of Asian ethnicity. 31.8% (7/22) had concurrent pulmonary TB whilst 22.7% (5/22) had concurrent osteomyelitis, of these 60% (3/5) had osteomyelitis of the spine.

81.8% (18/22) were M.TB culture positive, with just 5.5% (1/18) who had resistant disease (to Streptomycin and Isoniazid). In 71% (15/21) of cases we were able to demonstrate granulomatous inflammation on histology.

95.4% (21/22) received 6 months of treatment. All patients completed their treatment successfully and no relapses were recorded, no patient required surgery.

Conclusion The diagnosis of chest wall TB can be challenging but should be considered in an at-risk population. Microbiological diagnosis is highly attainable and will help guide treatment. Prompt diagnosis and treatment is important in preventing additional complications, often in the form of osteomyelitis.

P210 TUBERCULOMAS EPIDEMIOLOGY AND TREATMENT – EXPERIENCE IN A REFERRAL CENTRE

[1]C Cabo, [1]S Freitas, [2]P Cravo Roxo. *[1]Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal; [2]Centro de Diagnóstico Pneumológico de Coimbra, Coimbra, Portugal*

10.1136/thorax-2019-BTSabstracts2019.353

Background Tuberculomas are well defined focal masses that result from *Mycobacterium tuberculosis* infection and are most commonly found in the lungs and central nervous system. Despite it was considered a low-incidence country by WHO, Portugal still have a relatively high incidence comparing to most of European countries.

Objectives The aim of this study was to analyse tuberculomas population in a referral centre in Portugal.

Methods Restrospective study that included patients refered to a tuberculosis especialized centre and a university hospital with the diagnosis of tuberculoma between 2002 and 2018. Analysed variables were: age, gender, co-morbidities, symptoms, tuberculoma location and treatment.

Results 24 patients were studied with mean age 58.7. 17 (70.8%) were male and 7 (29.2%) were female. 58.3% (n=14) were non-smokers and 41.7% (n=10) were smokers or former smokers. 9 patients (37.5%) had prior neoplasms, 5 (20.8%) had COPD, 4 (16.7%) alcoholism, 2 (8.3%) other infectious diseases and 2 (8.3%) autoimunne disorders. 1 patient (4.2%) was HIV-positive and other(4.2%) had prior renal and cardiac transplant. 20.8% (n=5) of the patients presented with neurological symptoms, 16.7% (n=4) with constitutional and respiratory symptoms, and the same proportion with only constitutional symptoms. 3 patients (12.5%) presented with respiratory symptoms alone. 1 patient (4.2%) presented only with odynophagia and 4 patients (16.7%) had no symptoms at diagnostic. 70.8% (n=17) had lung tuberculoma (10 in the right lung, 12 in the superior lobes), 25% (n=6) had brain tuberculoma and 1 patient (4.2%) had both brain and liver tuberculoma. 45.8% of the patients (n=11) were treated with classic combination of a 4-drug regimen: isoniazid, rifampin, pyrazinamide, and ethambutol alone, 3 patients (12.5%) were treated with other drug regimens, 3 (12.5%) with tuberculoma ressection alone and 5 (20.8%) with a combination of 4-drug regimen with surgery. One patient (4.2%) died before initiating treatment, with no other deaths recorded and two patients (8.3%) abandoned the therapy.

Conclusions In this population tuberculomas were found mainly in brain and lung. Patients were mainly men and most had significant comorbidities. The disease was treated successfully in almost all cases either by surgery or anti-tuberculous drugs or combination of both.

Beyond airways disease: ILO and cough

P211 COMORBIDITY BETWEEN ASTHMA, INDUCIBLE LARYNGEAL OBSTRUCTION AND BREATHING PATTERN DISORDER

[1]C Slinger, [1]H Wilson, [1]A Vyas, [2]R Slinger. *[1]Lancashire Teaching Hospitals NHS Trust, Preston, UK; [2]Lancaster University, Lancaster, UK*

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Introduction Symptoms of breathlessness in people referred to a Tertiary Airways and Severe Asthma service may be due to a variety of treatable conditions, including asthma, inducible laryngeal obstruction (Ilo) and breathing pattern disorder (BPD).

Previous research has shown overlap between asthma and Ilo (Low et al, 2011), and between asthma and BPD (Boulding et al., 2016). In clinical practice, overlap between Ilo and BPD is also common, but this has not been consistently shown in research.

Aims and objectives To explore the incidence of Ilo, asthma and BPD and the overlap between these conditions in a sample of patients referred to a tertiary airways service, and to investigate patient characteristics associated with each condition.

Methods Patient notes were reviewed for people referred to a tertiary airways service for symptoms of breathlessness over an 18 month period. Assessment information was collated for patients (n=306) diagnosed with asthma, Ilo and/or BPD.

Results Of the 306 patients, 235 (77%) were diagnosed with Ilo via videolaryngoscopy, 177 (58%) were diagnosed with asthma, and 83 (27%) were diagnosed with BPD.

There was significant overlap between the three conditions, with 186 patients (52%) having at least two conditions. The most common overlap was between asthma and Ilo (30% of patients), followed by Ilo and BPD (11%). In contrast, only 3% of patients in this sample had both asthma and BPD. All three conditions were seen in 9% of patients.

A visual representation of overlap is presented in figure 1 below:

Of the three conditions, Ilo most commonly co-occurred with asthma, whilst BPD most commonly co-occurred with Ilo. When BPD co-occurred with asthma, this was most commonly seen together with Ilo.

Conclusions This study showed high levels of overlap between conditions that can contribute to symptoms of breathlessness. This emphasises the importance of a multi-professional assessment and optimisation of comorbid treatable traits, such as Ilo and BPD. It may also serve as a reminder for a timely referral for specialist assessment and management of treatable traits to avoid the potential of morbidity, increased healthcare utilisation and over-medication in severe and difficult to treat asthma.

P212 CHARACTERISATION OF PATIENTS WITH EXPIRATORY LARGE AIRWAY COLLAPSE

A Bikov, S Bokhari, R Niven, D Allen, C Somerton, R Sheehan, S Fowler. *Manchester University NHS Foundation Trust, Manchester, UK*

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Background Tracheobronchomalacia (TBM) and excessive dynamic airway collapse (EDAC) are two forms of expiratory large airway collapse which is a potential, often underdiagnosed cause for unexplained cough, breathlessness, inability to expectorate and frequent infections. They can vary in aetiology, morphology, extent and severity. Proper characterisation of patients may help to identify different phenotypes, potentially contributing to more personalised treatment.

Methods We reviewed the database, bronchoscopy reports and video images of n=33 patients (27 female, age 54.5±12.9 years) who had been referred for treatment to a specialist respiratory physiotherapist for the diagnosis of expiratory large airway collapse. Patients were characterised according to the classification proposed by Murgu and Colt (Respirology, 2007). TBM and EDAC were scored in terms of extent (1=mild, <50% collapse, 2=focal, 3=multifocal, 4=diffuse), severity (1= <50% collapse, 2= 50–70% collapse, 3= 70–100%, 4= 100%), morphology (crescent, sabre-sheet, circumferential) and aetiology (idiopathic or secondary to lung disease).

Results Bronchoscopy had been performed in 32 subjects, and video available for review in 26 cases. Of these 26, the extent of collapse was mild in one, focal in nine, multifocal in seven, and diffuse in nine. The severity of collapse was <50% in one, 50–70% in seven, 70–100% in 15, and complete in three. There was a significant relationship between extent and severity (p=0.01, r=0.47). Two patients had circumferential collapse, the rest were crescent type. Associated diagnoses were: asthma in 23 patients; bronchiectasis in two; Ehlers-Danlos syndrome in one; and none of relevance in the six remaining.

Conclusions Expiratory large airway collapse is a multi-factorial disorder which can manifest in various extent and severity. Further observational studies are warranted to categorise patients and to see if these categories can predict treatment response.

P213 FALLING FLAT: A COMPARISON OF INSPIRATORY FLOW VOLUME LOOPS IN PATIENTS WITH INDUCIBLE LARYNGEAL OBSTRUCTION AND ASTHMA

[1]C Slinger, [1]H Wilson, [1]A Vyas, [2]R Slinger. *[1]Lancashire Teaching Hospitals NHS Trust, Preston, UK; [2]Lancaster University, Lancaster, UK*

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Introduction The differential diagnosis of refractory breathlessness can be challenging, involving a systematic assessment of potential causes and aggravating co-morbidities. The index of suspicion for referral for specialist assessment of conditions such as Inducible Laryngeal Obstruction (Ilo) may be heightened using available clinical assessment tools, for example, the Inspiratory arm of the flow volume loop (FVL). Sterner (2009) found Ilo to be the most common diagnosis in patients with a consistently abnormal inspiratory loop. Morris & Christopher (2013) found 52% of patients with Ilo had flattened inspiratory loop. The current gold standard for objectively assessing for Ilo is Laryngoscopy.

Aims and objectives To investigate the presence of an abnormal inspiratory FVL in a sample of patients with symptoms of breathlessness, and to analyse whether this is a predictor of specific causes of breathlessness.

Methods Patient notes and FVL results were reviewed according to characteristic abnormalities of the inspiratory curve (flattened, absent and truncated) for people referred to a tertiary airways service for symptoms of breathlessness over a 22 month period. Assessment information was collated for patients (n=324) diagnosed with asthma, Ilo or both. Patient demographics and detailed assessment information were compared across these groups to look for potential patterns and predictors.

Results 59% of patients with Ilo (with or without asthma) had an abnormal inspiratory FVL, compared to 42% of patients without Ilo. For patients with Ilo as their sole diagnosis, 62% had an abnormal FVL. A chi-square analysis showed that an abnormal inspiratory FVL was significantly more common in patients with a diagnosis of Ilo (χ^2= 4.47; p≤0.05) compared to patients without.

A binary logistic regression assessed the relationship between an abnormal inspiratory FVL and Ilo diagnosis. The model was significant (χ^2 =5.1 (1, N=324) p=0.02) indicating that FVL was a significant predictor of Ilo, and odds ratios suggested that patients with Ilo were twice as likely to have an abnormal loop.

Conclusions In patients with breathlessness symptoms that are refractory to optimal medical treatment, observation of the FVL may indicate the potential for further specialist assessment for Ilo with provocation videolaryngoscopy.

P214 THE PREVALENCE OF UPPER THORACIC BREATHING PATTERN IN PATIENTS WITH BREATHING PATTERN DISORDER AND INDUCIBLE LARYNGEAL OBSTRUCTION

[1]JL Harrison, [2]R Slinger, [1]H Wilson, [1]C Slinger. *[1]Lancashire Teaching Hospitals NHS Trust, Preston, UK; [2]Lancaster University, Lancaster, UK*

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Introduction Patients referred to a Tertiary Airways and Severe Asthma Service for refractory breathlessness may be diagnosed with Breathing Pattern Disorder (BPD) or Inducible Laryngeal Obstruction (Ilo). Both are known to be comorbidities frequently seen in difficult-to-treat asthma (Tay et al, 2016).

Ilo and BPD are frequently seen together in clinical practice, however research has not consistently shown overlap between the two conditions (Denton et al, 2019).

Aims To investigate breathing patterns within a sample of patients referred to a tertiary Airways service diagnosed with Ilo, BPD or both.

Method Records of patients with a diagnosis of BPD (identified by a specialist physiotherapist) over a 12 month period (N=56) were reviewed using purposive sampling to identify people with Ilo (diagnosed by laryngoscopy) and those without.

	Full Sample		Ilo and BPD		BPD Only	
Breathing Pattern	N	%	N	%	N	%
Normal	1	2	1	4	0	0
Upper thoracic	40	71	22	85	15	60
Mixed	12	21	3	11	9	36
Abdominal	3	6	0	0	1	4
Total	56	100.0	26	100	25	100

Abstract 214 Figure 1

Breathing pattern, respiratory rate and Nijmegen questionnaire (NQ) were compared between patients diagnosed with BPD and Ilo and those with BPD alone.

Results The mean respiratory rate of the full sample was 20.09 (SD=5.949), with a mean NQ score of 26.94 (SD=10.33) indicating significant hyperventilation.

Of the 56 patients with BPD, 26 were also diagnosed with Ilo. Non-parametric comparisons of means showed no significant differences in mean respiratory rates or NQ scores between patients with and without Ilo.

Frequencies of different breathing patterns across groups are shown in Figure 1 below:

The most common breathing pattern was upper thoracic (71% of sample). This was found in 85% of patients with Ilo, compared to 60% of patients without Ilo.

Conclusions Patients with a diagnosis of both Ilo and BPD appear to have a greater likelihood of upper thoracic breathing pattern disorder than those with BPD alone.

Prevalence of upper thoracic breathing pattern in Ilo is not fully understood. Studies suggest rates for upper thoracic breathing may be up to 86% within breathing pattern disorders (Denton et al 2019) but the relationship between this pattern and Ilo has not been investigated. Further research into the role of upper thoracic breathing pattern with larger samples is indicated.

P215 PATTERNS OF RESPIRATORY CO-MORBIDITY AND TREATMENT STRATEGIES IN INDUCIBLE LARYNGEAL OBSTRUCTION AND BREATHING PATTERN DISORDERS

[1]SF Ludlow, [1]C Somerton, [1]T Pantin, [1,2]J Haines, [1,2]S Fowler. *[1]Manchester University Hospital Foundation Trust, Manchester, UK; [2]The University of Manchester, Manchester, UK*

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Background and aim Patients are referred to our complex breathlessness service due to a clinical suspicion of Inducible Laryngeal Obstruction (ILO) and/or Breathing Pattern Disorder (BPD). We wanted to understand the prevalence of these disorders and their association with other respiratory co-morbidities. If a diagnosis was made we investigated if patients were seen for Speech and Language Therapy (SLT), Physiotherapy (PT), joint therapy or if their other respiratory diagnosis was treated first.

Method Data from all patients over a six month period who attended the Manchester Airways 'one stop day assessment' were analysed. Investigations included: full clinical history from SLT, PT, clinical nurse specialist, clinical psychologist and respiratory physician, a provocation laryngoscopy and lung function tests.

Results One hundred and fifty seven patients were seen in our complex breathlessness clinic between December 2018 and June 2019. Eighty-eight (56%) of these [67 female, median (range) 54 (17–83) years] had confirmed ILO (n=32), BPD (20) or both (36). Other relevant co-morbidities are shown in table 1.

Of the patients diagnosed with ILO, most occurred on inspiration (91%) and at the glottic level (87%). All six patients with a diagnosis of tracheobronchomalacia also had a BPD. The majority of patients with a diagnosis of COPD were diagnosed with a BPD (6/7, 86%); with a high proportion also having expiratory ILO (3/7, 43%). A high percentage of patients had concurrent diagnoses of asthma, ILO and BPD (28%). Of the patients diagnosed with ILO, BPD or both; 46 were referred for SLT (52%), 20 for PT (23%) and 15 for joint SLT and PT (17%). Seven of the patients were not given therapy due to other co-morbidities needing to be medically managed first. Eight patients (9%) were referred for clinical psychology on this initial visit.

Abstract P215 Table 1

	ILO (n=xx)	BPD (n = xx)
Asthma	38	39
Bronchiectasis	8	11
Tracheobronchomalacia	3	6
COPD	4	6
Reflux disease	19	18
Nasal disease	6	5

Conclusion A high proportion of patients referred to the complex breathlessness service received a diagnosis of ILO and/or BPD, and many also had a diagnosis of asthma or other respiratory disease. Few were referred for clinical psychology at the initial assessment, but these issues are often discussed during SLT/PT sessions and referrals made at a later date.

P216 TRACHEOBRONCHOMALACIA IN SEVERE ASTHMA

M Marquette, C Paramasivan, C Owen, J Herre, RB Gore, MD Knolle. *Addenbrooke, Cambridge, UK*

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Background Tracheobronchomalacia (TBM) is a known asthma mimic. The prevalence and contribution to symptom of TBM in severe asthma patients is unclear. We collated data on the diagnosis and management of TBM in a cohort of severe asthma patients undergoing bronchoscopy under the East of England Severe Asthma Service.

Methods Patients with an unclear asthma phenotype or treatment failure may undergo bronchoscopy as part of their evaluation. We collected data from patients undergoing bronchoscopy over a 1 year period, including patient characteristics, procedural safety, diagnosis and management of TBM and potential impact of the TBM diagnosis on asthma treatment.

Results The total number of bronchoscopy procedures was 88, 27 male and 61 female patients. The mean age was 52 and the mean BMI 30.6 kg/m^2. The procedure was uncomplicated for 88% of patients. The most common complication was poor tolerance of the procedure – 10%. In two cases the bronchoscopy was abandoned due to complications (bleeding, hypoxia). Note neither case had long term ill effects of the bronchoscopy.

TBM was identified in 24% of patients undergoing bronchoscopy, while 2% had TBM and VCD. 60% of cases with TBM had severe disease. Of note, the TBM was only detected in 30% of patients by CT scan prior to bronchoscopy. Following physiotherapy review and management of TBM, in 2/3 of cases identified with severe disease, we were able to stop or wean asthma treatments.

Conclusion Bronchoscopy was safe and generally well tolerated. Bronchoscopy is a valuable tool in identifying additional co-morbid conditions in asthma. In our cohort, 24% of patients were identified as suffering from TBM. TBM is a known asthma mimic, and can lead to patients being misidentified as having severe asthma and receiving unnecessary and ineffective treatment. Patients benefited from physiotherapy following a diagnosis of TBM and were able to wean asthma treatments.

However, we do not know the prevalence of TBM in the general severe asthma population and there are no specific outcome tools to measure the success of therapy in TBM. Further research is needed to address these questions.

P217 MULTI-DIMENSIONAL ASSESSMENT AND OUTCOMES OF DYSFUNCTIONAL BREATHING (DFB) IN A SPECIALIST PHYSIOTHERAPY INTERVENTION

C Paramasivan, M Knolle, R Gore, C Owen, J Fuld. *Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK*

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Introduction Physiotherapy led breathing retraining has been reported as effective in dysfunctional breathing. Literature has been emerging about classification, multidimensional assessment and physiotherapy management of DFB. However

SUBJECTS	NIJMEGEN	RR	BREATH HOLD	HADS	NUMBEROF CHANGES
1	YES	NO	NO	NO	1
2	YES	YES	NO	NO	2
3	YES	NO	NO	YES	2
4	YES	YES	YES	NO	3
5	YES	NO	YES	YES	3
6	YES	YES	YES	YES	4
7	YES	NO	NO	NO	1
8	YES	NO	NO	NO	1
9	YES	YES	YES	YES	4
10	NO	YES	NO	NO	1
11	NO	YES	NO	NO	1
12	NO	NO	NO	NO	0
13	NO	NO	NO	YES	1
14	NO	YES	NO	NO	1
15	NO	NO	YES	YES	2
16	NO	YES	YES	NO	2
17	NO	NO	NO	YES	1
18	NO	YES	NO	NO	1
19	NO	YES	NO	NO	1
20	YES	YES	YES	YES	4
21	YES	YES	YES	YES	4
22	YES	YES	NO	YES	3
23	YES	YES	NO	NO	2
24	YES	YES	NO	YES	3
25	YES	YES	NO	YES	3

Abstract P217 Figure 1 Individual assessment response

limited data exists on the effectiveness or consensus on the use of assessment tools.

Methods Patients were referred to specialist respiratory physiotherapy clinic following diagnosis of DFB during Cardiopulmonary exercise testing (CPET) or clinically by respiratory consultants. Physiotherapy training focussed on education about CPET findings and multi dimension of DFB (biomechanical, psychological, and pathophysiological). Techniques included breathing control using nose and abdominal breathing, reducing respiratory rate (RR), improving respiratory volume and expiratory pause and relaxation. Nijmegen and hospital anxiety and depression scale (HADS) questionnaire, respiratory rate (RR) and inspiratory breath-hold (BH) were measured pre- and post-intervention.

25 patients who undertook 2–3 physiotherapy sessions with outcome assessments were included in the data analysis. 12 patients (48%) were female and 13 patients (52%) were male. 16 patients (64%) had prior diagnostic CPET. Pre and post intervention comparison was undertaken using Wilcoxon Signed Ranked Test. Subjects were classified as having responded to individual assessments if either the minimal clinical important difference(MCID) was reached (1.7 HADS) or categorisation became as normal (RR less 16, BH >30 seconds, Nijmegen <23**).**

Results For the group, RR decreased from 18.16±3.97 to 15.04±1.88 breaths per minute (P<0.01).BH improved from 11.28±7.35 to 23.84±8.79 seconds (P<0.01).Nijmegen scores changed from 27.84±9.67 to 20.64±10.72 (P<0.05).HADS-A changed 9.04±5.19to 7.32±4.75 (P>0.05).HADS-D changed 7.68±4.49 5.68±4.24 (P<0.05). Individual assessment response for each subjects are shown in figure 1.

Discussion DFB physiotherapy intervention is an effective therapy demonstrating improvements in recognised measures. Individual patients may respond in one or more of the assessment tools used to quantify DFB. However, responses may vary across individual assessment tools. No single assessment tool predicts outcomes from intervention.

Conclusion Outcome assessment tools for DFB used in isolation are unlikely to pick up response to therapy in a high proportion of patients. There is a need to develop outcome tools that encompass the varying domains of DFB.

P218 PROSPECTIVE STUDY OF PRIMARY COUGH HEADACHE IN A COUGH UNIT

D Moreno Ajona, P Cho, S Becker, J Hoffmann, PJ Goadsby, S Birring. *King's College London, London, UK*

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Objective Description of the characteristics, prevalence and comorbidities associated with cough headache in a cough unit.

Methods From July 2018 to present time, consecutive patients who attend the Cough Clinic were asked about the presence of headache with and without cough. The eligibility of the participants was determined through a telephone interview. Neurological and neuro-otological examination; the modified Valsalva manoeuvre were completed, and MRI with cranio-cervical views. Results were tabulated and statistical analysis included $\chi 2$ and Pearson correlation coefficient.

Results At interim analysis, 245 patients completed the initial screening. Of these, 167 (68%) suffered from headache, of which 78 (47%) reported headache with cough. Fifty patients have completed the telephone interview (61% women, mean age of 45±4 years) and 35 (70%) met the diagnostic criteria of cough headache according to the International Classification of Headache Disorders (ICHD-3). The remaining patients met the criteria for migraine. Among patients with cough headache, 90% had a previous history of migraine. Mean time since headache onset was 7 years (range 3–11 years). The average attack duration was 1 hour, the most frequent location was occipital and cough was the only trigger in 65%. Associated symptoms included vertigo or 'lightheadedness' for seconds in 52% of patients. The modified Valsalva manoeuvre was positive in 37% but did not distinguish between primary and secondary headaches. The respiratory diagnosis: chronic cough after exclusion of asthma, post nasal drip, and reflux disease, was significantly related to the diagnosis of cough headache ($\chi 2=5.2$ $p=0.02$). Four cases (8%) of secondary headaches were identified: Chiari malformation, fungal sinus infection and headache attributed to low CSF pressure.

Conclusion In the presence of chronic cough, primary cough headache is more frequent in women with a history of migraine. Secondary cough headache was not as prevalent as in previous series. The modified Valsalva test was not capable of distinguishing primary from secondary headaches.

P219 COMPARING THE SENSATIONS AND TRIGGERS OF COUGH IN ASTHMA AND IDIOPATHIC CHRONIC COUGH

S Saeed, J Yorke, KJ Holt, JA Smith, DK Birchall, JA Smith. *University of Manchester, Manchester, UK*

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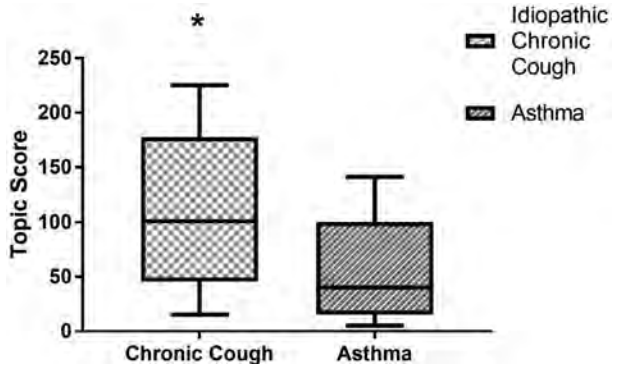
Introduction Cough is a common symptom of many different respiratory diseases. Patients may experience cough as a response to multiple environmental and endogenous triggers, and they often describe associated somatic sensations. Little is known about these sensations and triggers and there are currently no validated questionnaires to assess this.

Aims To explore the differences between the sensations and triggers of cough experienced by groups of patients with asthma or idiopathic chronic cough (iCC). This is in the context of a larger study designed to develop and validate a novel questionnaire that may have diagnostic significance.

Methods Our group are developing the ToPiC (The Sensations Provoking Cough) questionnaire which contains 49 items describing different sensations and triggers of cough. Participants are asked to rate the frequency of each item on a 6 point Likert scale, ranging from 0 (Never) up to 5 (Always). The items are summed to calculate a total TOPIC score with a minimum possible score of 0 and a maximum of 245. In this study all participants were also asked to complete The St George's Respiratory Questionnaire (SGRQ) and a Cough Severity Diary (CSD). All participants were aged over 18 years and had a persistent cough. They were excluded if they had a recent URTI (within 4 weeks) or were taking ACE inhibitors. A Mann Whitney U test was used to compare the ToPiC scores between groups and Spearman's rank correlation was used to investigate relationships with the other questionnaires.

Results Fourty five asthmatics and 49 iCC patients completed the study. The median (IQR) total TOPIC score for iCC patients (101 (77–131)) was significantly higher than for the asthmatics (40(26–49)), p<0.001. There was also a significant positive correlation between TOPIC and SGRQ scores in the



Abstract P219 Figure 1 Total ToPic scores in iCC and asthma, *p<0.001

asthmatic group (0.319, p=0.033); there was no relationship in the iCC group. ToPiC and CSD scores were unrelated.

Conclusion Differences between TOPIC scores and the lack of correlation with the SGRQ in the iCC group emphasises the need for this questionnaire and its potential value in characterising subjective experiences and cough phenotypes. Further data will be collected in other respiratory disease groups.

P220 URINARY INCONTINENCE IN CHRONIC COUGH

[1]PSP Cho, [2]PV Dicpinigaitis, [3]HV Fletcher, [4]RD Turner, [1,3]SS Birring. *[1]Centre for Human and Applied Physiological Sciences, King's College, London, UK; [2]Albert Einstein College of Medicine and Montefiore Medical Centre, Bronx, New York, USA; [3]Department of Respiratory Medicine, King's College Hospital Foundation Trust, London, UK; [4]Department of Respiratory Medicine, Charing Cross Hospital, Imperial Healthcare Trust, London, UK*

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Introduction Cough leads to increased intra-abdominal pressure, thus chronic cough may increase the risk of stress urinary incontinence. We investigated the prevalence, duration and frequency of urinary incontinence in female patients with chronic cough.

Methods Consecutive female patients with chronic cough were recruited from a tertiary specialist cough clinic. Participants self-completed a structured questionnaire to record demographics, anthropometrics, duration of cough, and presence, duration and frequency of urinary incontinence.

Results 71 participants; mean (SD) age 57.0 (14.0) years, median (IQR) BMI 26.9 (23.1–33.4) $kg{\cdot}m^{-2}$ and duration of cough 6 (3–15) years; were recruited. 40 (56%) participants reported urinary incontinence; median (IQR) duration 4.0 (3.0–6.5) years. The frequency of urinary incontinence episodes was daily, 1–6 times weekly and less than once a week in 18 (45%), 8 (20%) and 12 (30%) patients respectively. 28 of 40 (70%) participants reported that urinary incontinence only occurred after coughing, thus had stress incontinence. 18 of 40 (45%) participants reported their onset of urinary incontinence followed the onset of chronic cough. There was no significant difference in age (p=0.742), BMI (p=0.907) and duration of cough (p=0.964) between patients with and without urinary incontinence.

Discussion Urinary incontinence affects over half of female patients with chronic cough. Further studies should investigate the characteristics of urinary incontinence in a larger population (stress vs irritable bladder). There is also a pressing need to develop clinical management protocols for cough related incontinence.

P221 THE EFFECT OF A HEAT AND MOISTURE EXCHANGE MASK TO REDUCE EXERCISE INDUCED COUGH AND BRONCHOCONSTRICTION

[1]A Jackson, [2]J Hull, [3]J Hopkins, [4]H Fletcher, [4]S Birring, [3]J Dickinson. *[1]English Institute of Sport, London, UK; [2]Department of Respiratory Medicine, Royal Brompton Hospital, London, UK; [3]School of Sport and Exercise Sciences, University of Kent, Kent, UK; [4]King's College Hospital NHS Foundation Trust, London, UK*

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The present study aimed to determine if a heat and moisture exchanger (HME) face mask is effective in protecting against acute bronchoconstriction and post exercise cough in response to a cycle challenge in a cold, dry environment in asthmatic individuals.

Twenty-six participants with a clinician diagnosis of asthma (20 males, 6 females, age: 27.6±9.2 yrs, $\dot{V}O_2$peak: 42.75±8.17 $ml.kg.min^{-1}$) completed three standardised exercise challenges (EX) on a cycle ergometer at 8 ° C and 24% RH in a randomised order. Participants wore either an HME mask (MASK), a sham mask (SHAM), or no mask (CON). Following a 3-min set warm up participants completed 6-min cycling at 80% peak power output. Before and after EX, maximal flow volume loops were recorded. Immediately post EX participants were fitted with a Leicester Cough Monitor (LCM) which they wore for 24-hours. Results were analysed using repeated measures ANOVA and Friedman's tests and data presented as the mean±SD or median score.

Eleven participants failed to demonstrate evidence of EIB and were removed from the analysis. There was a difference in the% fall in FEV_1 following EX (MASK: -6.0, SHAM: -11.0, CON: -13.0%, P<0.01), with the% fall following CON greater than that of MASK (p<0.01). No differences were found between EX in cough count per hour over the 24-hour monitoring period or the number of coughs in the first hour post EX.

HME masks can attenuate bronchoconstriction but not cough in asthmatic individuals when exercising in cold, dry environments.

P222 PSYCHOLOGICAL IMPACT IN COUGH HYPERSENSITIVITY SYNDROME

[1]SF Ludlow, [1,2]J Haines, [1]H Hope, [1]P Marsden, [2]S Fowler. *[1]Manchester University Hospital Foundation Trust, Manchester, UK; [2]Manchester University, Manchester, UK*

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Background Cough hypersensitivity syndrome is associated with significant physical and psychological morbidity and impacts patient's quality of life. We aimed to evaluate the prevalence of anxiety and depression symptoms in our patients with cough hypersensitivity syndrome and to assess patients' awareness of the association.

Method All patients over a three month period who attended a Respiratory Speech and Language Therapy-led cough assessment clinic were asked to complete the Leicester Cough Questionnaire (LCQ), Generalised Anxiety Disorder Assessment (GAD-7), Patient Health Questionnaire depression module (PHQ-9) and cough severity Visual Analogue Scale (VAS, 0–10 scale). Patients were asked if they believed anxiety, depression or stress were triggers for their cough.

Abstract P222 Table 1

Characteristic	
VAS score baseline, mean (SD)	5 (3)
Anti-depressant use, n (%)	4 (13)
Stress/anxiety stated as trigger of cough, n (%)	17 (53)
LCQ total score, median (IQR)	14.3 (10.4; 17.8)
LCQ Physical score, median (IQR)	5.2 (3.7; 5.9)
LCQ Psychology score, median (IQR)	4.4 (3.3; 6.3)
LCQ Social score median, (IQR)	4.3 (2.9; 6.0)
GAD-7 score median, (IQR)	3.0 (0.3; 6.8)
PHQ-9 score median, (IQR)	4.0 (2.0, 8.0)

Results Data from 32 patients (24 female) with a median (range) age of 57 (31–73) years and average cough duration of 10 (2–40) years who attended the clinic between April and June 2019 were analysed (table). Other relevant co-morbidities included asthma (16%), inducible laryngeal obstruction (13%), reflux (38%) and nasal disease (28%). Several patients were taking (38%) or had taken (38%) anti-tussive medications for their cough.

On the GAD-7, 12 patients reported anxiety symptoms (38%); seven mild (22%), three moderate (9%) and two severe (6%). On the PHQ-9, 15 patients reported depression symptoms (47%); ten mild (31%), four moderate (13%) and one severe (3%). Several patients who recognised stress to be a trigger of their cough scored highly on the anxiety and depression questionnaires (12/17, 70%). Cough scores (VAS and LCQ) correlated strongly with each other, as did GAD7 and PHQ9 scores. PHQ9 also correlated with the LCQ-physical domain (Spearman's rho=-0.397, p=0.025) supporting the relationship between depression and increased physical symptoms related to cough.

Conclusion A high proportion of patients with cough hypersensitivity syndrome had symptoms of anxiety and depression. The direction of cough and psychological problems is difficult to determine from these results. When taking a medical history from a patient, physicians should note psychological as well as physical complications. Failure to recognise this may influence treatment outcomes. Clinical psychology input into cough multi-disciplinary teams may be beneficial.

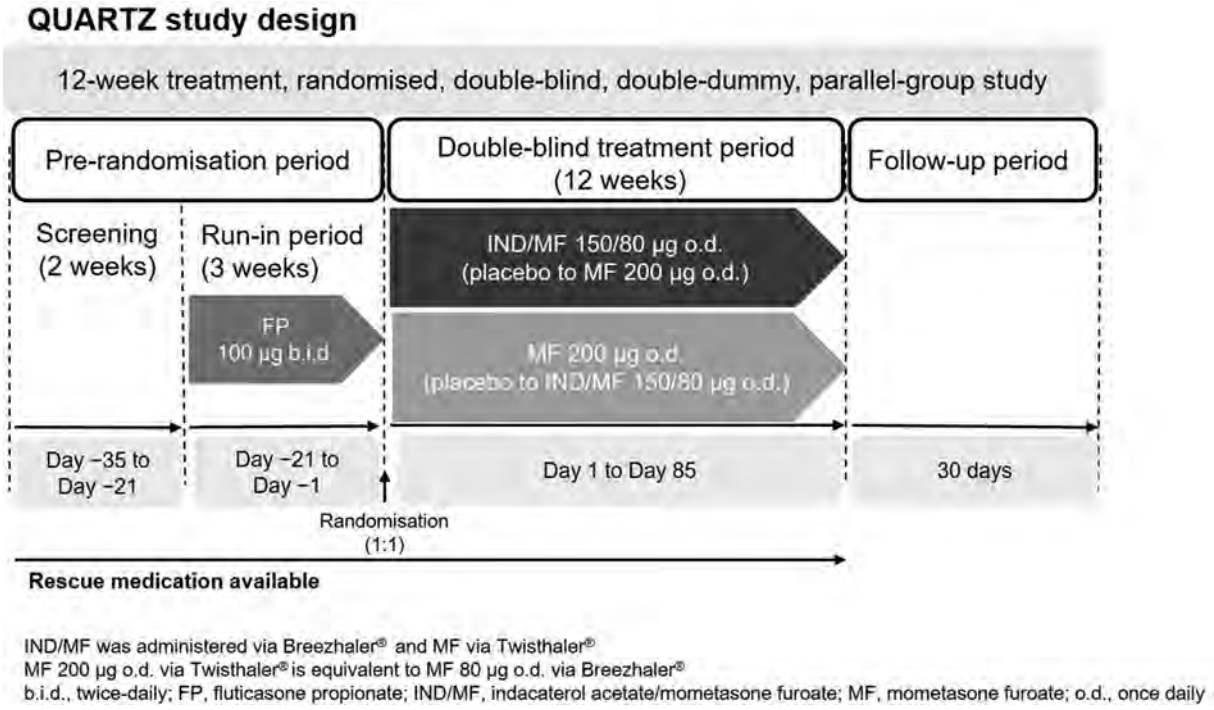
Asthma and inhalers: all the colours of the rainbow

P223 ONCE-DAILY LOW-DOSE INDACATEROL/MOMETASONE VIA BREEZHALER® REDUCES EXACERBATIONS IN PATIENTS WITH INADEQUATELY CONTROLLED ASTHMA: PHASE III QUARTZ STUDY

[1]O Kornmann, [2]J Mucsi, [3]N Kolosa, [4]L Bandelli, [4]LC Satlin, [5]B Sen, [4]P D'Andrea. *[1]IKF Pneumologie Frankfurt, Clinical Research Centre Respiratory Diseases, Frankfurt, Germany; [2]Erzsébet Gondozóház, Gödöllő, Hungary; [3]Daugavpils Regional Hospital LTD, Daugavpils, Latvia; [4]Novartis Pharmaceuticals Corporation, East Hanover, New Jersey, USA; [5]Novartis Healthcare Pvt. Ltd, Hyderabad, India*

10.1136/thorax-2019-BTSabstracts2019.366

Introduction GINA 2019 recommends LABA/ICS as preferred controller therapy in patients with inadequately controlled asthma despite low-dose ICS treatment. This Phase-III study (NCT02892344; the QUARTZ Study) is part of the PLATINUM clinical program which supports the development of both indacaterol acetate/mometasone furoate (IND/MF) and indacaterol acetate, glycopyrronium bromide and mometasone furoate (IND/GLY/MF). Specifically, in QUARTZ we evaluated efficacy and safety of low-dose IND/MF 150/80 µg once daily (o.d.) via Breezhaler® versus MF 200 µg o.d. via Twisthaler® in



Abstract P223 Figure 1

symptomatic asthma patients, both adults and adolescents. IND/MF demonstrated significant improvements in trough FEV_1 and ACQ-7 in these patients. Here, we present exacerbation data, a secondary endpoint from QUARTZ study.

Methods This Phase III, 12-week, double-blind study randomised (1:1) asthma patients (≥12yrs) receiving low-dose ICS (with or without additional controller medication) prior to study, to IND/MF or MF **(Figure)**. Patients were symptomatic (ACQ-7 ≥1.5) prior to randomisation and were not required to have a history of exacerbations prior to the study. The rate and time-to-first moderate-to-severe and all exacerbations (mild, moderate and severe) were evaluated as secondary endpoints comparing IND/MF versus MF. Safety was assessed.

Results Of 802 patients randomised, 768 completed the study. Lower rates of moderate-to-severe [Rate ratio (RR) 0.25, 95% CI: 0.12, 0.52] and all exacerbations (RR: 0.30, 95% CI: 0.18, 0.50) were observed in IND/MF versus MF. Further IND/MF treatment, delayed time-to-first exacerbation vs MF for moderate-to-severe (Hazard ratio (HR): 0.29, 95% CI: 0.14, 0.59), and all asthma exacerbations (HR: 0.30, 95% CI: 0.18, 0.50). Safety was comparable between the two groups.

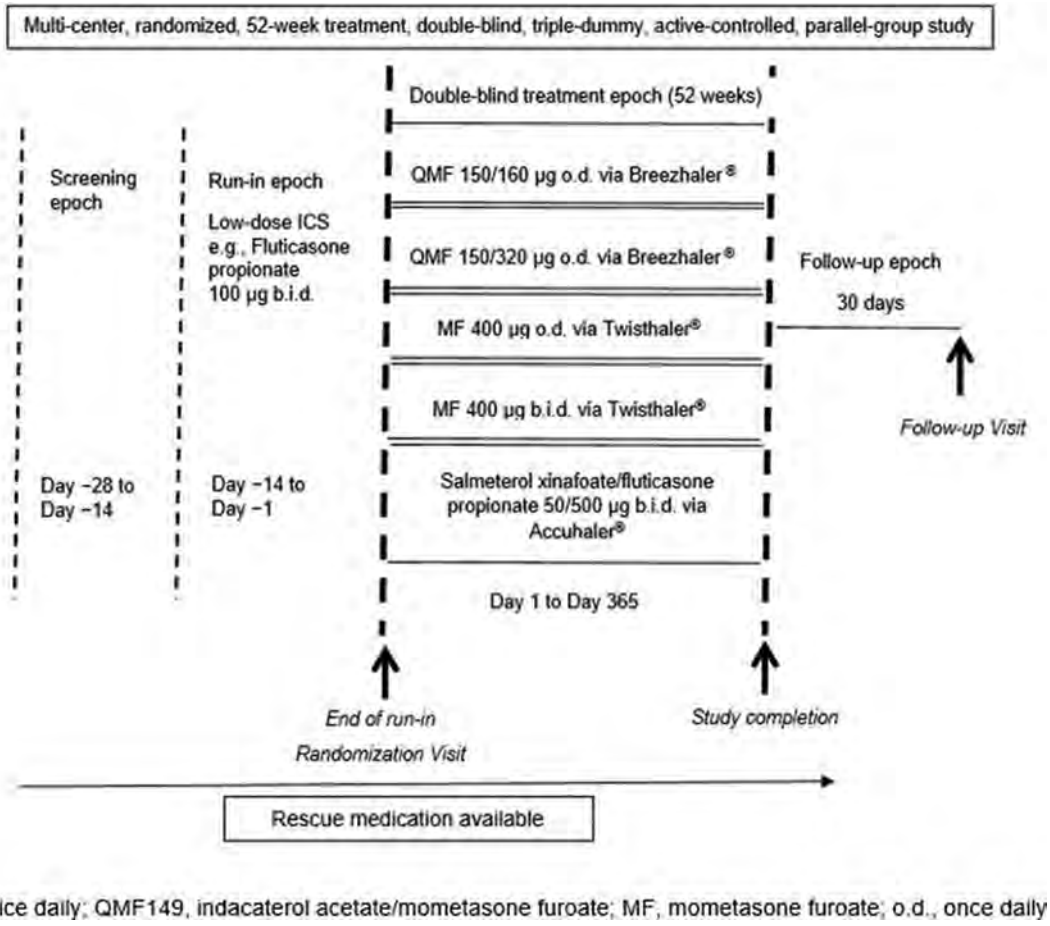
Conclusion In symptomatic asthma patients, IND/MF showed greater effect on reducing rate (75% of moderate-to-severe and 70% of all exacerbations) and time-to-first exacerbations vs MF. The result was apparent even in patients with a low history of exacerbations. These results demonstrate additive benefit of IND in a fixed combination with MF in terms of reduction in exacerbations and supports the use of IND/MF as efficacious maintenance therapy for asthma versus MF alone.

P224 EFFICACY AND LONG-TERM SAFETY OF QMF149 (INDACATEROL ACETATE/MOMETASONE FUROATE) VERSUS MOMETASONE FUROATE AND VERSUS SALMETEROL XINAFOATE/FLUTICASONE PROPIONATE IN PATIENTS WITH INADEQUATELY-CONTROLLED ASTHMA: THE PALLADIUM STUDY

[1]R van Zyl-Smit, [2]M Krull, [3]C Gessner, [4]Y Gon, [5]A Richard, [6]A de los Reyes, [6]X Shu, [6]A Pethe, [6]P D'Andrea. *[1]Division of Pulmonology and UCT Lung Institute, University of Cape Town, Cape Town, South Africa; [2]Institut für Allergie- und Asthmaforschung Berlin IAAB, Berlin, Germany; [3]Universitätsklinikum Leipzig, Germany POIS Leipzig GbR, Lepzig, Germany; [4]Division of Respiratory Medicine, Department of Internal Medicine, Nihon University School of Medicine, Tokyo, Japan; [5]Novartis Pharma AG, Basel, Switzerland; [6]Novartis Pharmaceuticals Corporation, East Hanover, New Jersey, USA*

10.1136/thorax-2019-BTSabstracts2019.367

Rationale Long-Acting Beta2-Agonist/Inhaled Corticosteroids (LABA/ICS) Fixed-Dose Combinations (FDCs) have been found to be safe and effective in asthma management; however, most of the available therapies require twice-daily(b.i.d.) dosing to achieve an optimum therapeutic effect. QMF149 is a once-daily(o.d.) FDC of indacaterol acetate(LABA) and mometasone furoate(MF, an ICS) delivered by the Breezhaler® device. This Phase-III study(NCT02554786; The PALLADIUM Study) is part of the PLATINUM clinical program which supports the development of both QMF149 and QVM149 (indacaterol acetate, glycopyrronium bromide and mometasone furoate). Specifically, the PALLADIUM study evaluates the efficacy and safety of once-daily QMF149 150/160µg and 150/



Abstract P224 Figure 1 Study design

320µg(via Breezhaler®) versus ICS alone: MF 400µg o.d. and 800µg(400µg b.i.d.[via Twisthaler®]) or salmeterol xinafoate/fluticasone propionate(SFC) 50/500µg b.i.d.(via Accuhaler®) in inadequately-controlled asthmatics.

Methods The PALLADIUM study is conducted in patients (age:≥12 to ≤75 years) with pre-bronchodilator FEV_1% predicted:≥50% to <85%, who are symptomatic at screening (ACQ-7 score≥1.5) despite treatment with medium/high stable ICS and/or LABA/ICS low-dose combination, and qualify for medium/high-dose LABA/ICS combination. Patients are randomized to receive QMF149 or MF or SFC for 52 weeks (**Figure**). At week 26, trough FEV_1 (primary endpoint) and asthma control by ACQ-7 score (key secondary endpoint) are to be evaluated in QMF149 versus MF. During 52 weeks, treatment effect on exacerbations in terms of time-to-first exacerbation and rate of exacerbations are to be assessed in all patients. Additional secondary endpoints include the comparison of QMF149 150/320µg versus SFC 50/500µg in terms of trough FEV_1, ACQ-7, PEF and rescue medication use at Week 26 and 52. Safety is also assessed.

Results Of 2216 patients randomized, all have completed the study (52 weeks treatment or premature withdrawal) at the time of abstract submission. Database lock is scheduled for August 2019. The final study results, expected in September 2019, will be included in the final abstract and presentation.

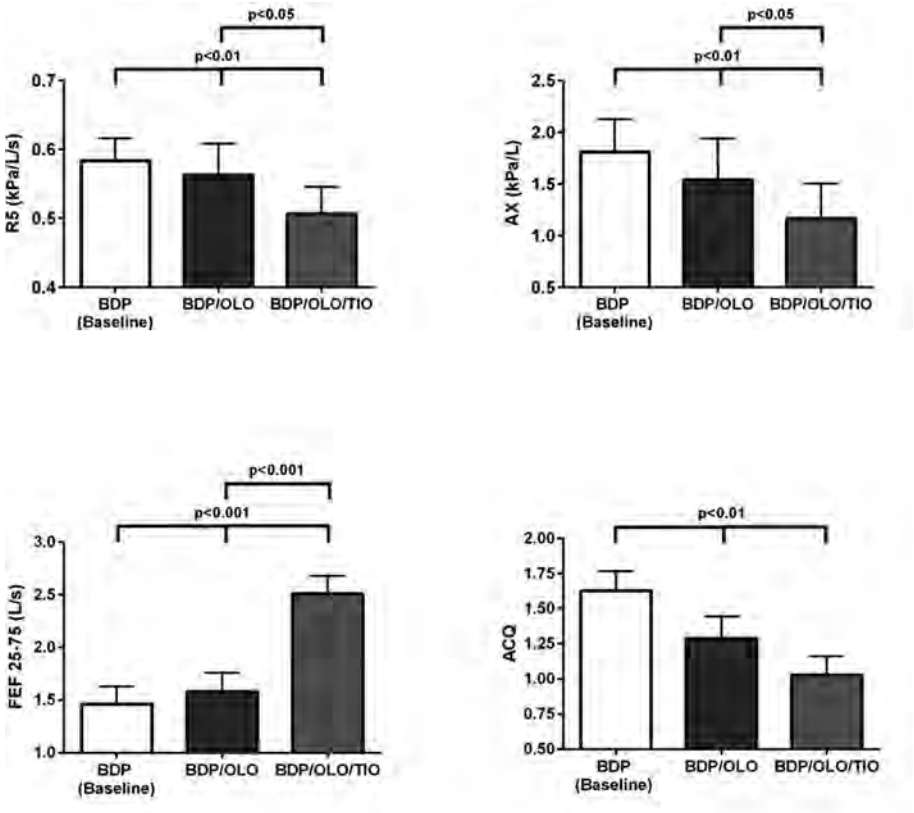
Conclusion This 52-week study is the first to evaluate the efficacy and long-term safety of once-daily QMF149 at different doses(150/160µg and 150/320µg) versus MF(400µg o.d. and 400µg b.i.d.) and versus currently available LABA/ICS standard-of-care SFC 50/500µg b.i.d. in inadequately-controlled asthmatics, in terms of exacerbation reduction, lung function, asthma control and rescue medication use.

P225 COMPARISON OF ICS CONTAINING OPEN TRIPLE AND DUAL THERAPY ON SMALL AIRWAYS FUNCTION IN THE SMOKING ASTHMA PHENOTYPE

CRW Kuo, S Jabbal, B Lipworth. *Scottish Centre for Respiratory Research, University of Dundee, Dundee, UK*

10.1136/thorax-2019-BTSabstracts2019.368

Background Patients with asthma who smoke are difficult to manage and are usually excluded from clinical trials. Smoking not only worsens underlying asthma inflammation and airway hyper-responsiveness but also induces resistance to inhaled corticosteroids (ICS). Small airways dysfunction measured by impulse oscillometry (IOS) is associated with worse control. We therefore investigated for the first time the effects on small airways of adding LABA or LABA/LAMA to ICS in asthmatic smokers.



Effects of randomised treatments with either olodaterol (OLO) or olodaterol/tiotropium (OLO/TIO) added to HFA-BDP (Clenil). P values are depicted for overall repeated measures ANOVA and for the comparison between randomised treatments at trough. Values are shown as means and SEM

Abstract P225 Figure 1

Patients and methods 16 current smokers were enrolled: mean age 44 yr, $FEV_1$84%, $FEF_{25–75}$47%, R5 158%, ACQ 1.69, 20 pack yr.

Patients were converted to a reference ICS as HFA-BDP pMDI (Clenil Modulite) during initial run-in at a median dose of 800µg. Open label olodaterol 5µg od (OLO) or olodaterol 5µg/tiotropium 5µg od (OLO/TIO) was added to HFA-BDP for 2–4 weeks (am dosing) in a randomised cross over design, along with 2–4 weeks run-in and washout periods on HFA-BDP. IOS and spirometry were measured at peak/trough after each treatment (BDP/OLO/TIO or BDP/OLO) and at baseline after run-in and washout (BDP).

Results IOS outcomes after chronic dosing at trough were all improved with BDP/OLO/TIO compared to BDP/OLO (Fig). For the primary end point of total airway resistance (as R5) the mean difference was: 0.06 (95% CI 0.015–0.098) kPa/l/s, peripheral airways resistance (as R5–20): 0.03 (0.003–0.06) kPa/l/s, peripheral lung reactance (as AX): 0.38 (0.08–0.68) kPa/l, resonant frequency (as RF): 2.28 (0.45–4.12) Hz. $FEF_{25–75}$ at trough was also better with BDP/OLO/TIO vs BDP/OLO: 0.93 (0.86 – 0.95) l/s while FEV_1 was not different. There was no difference in peak IOS values between treatments.

Mean change from baseline in ACQ with BDP/OLO/TIO (0.60) but not BDP/OLO (0.34) exceeded MCID of 0.5.

Conclusions Open triple therapy with ICS/LABA/LAMA was superior to dual therapy with ICS/LABA on trough small airway outcomes in asthma patients who smoke. Further studies are warranted in this phenotype to evaluate if such effects on small airways translate into reduced exacerbations when using single triple inhalers.

P226 COMBINED ANALYSIS OF TWO RANDOMIZED CONTROLLED TRIALS OF BUDESONIDE/FORMOTEROL RELIEVER THERAPY IN ADULTS WITH MILD ASTHMA

[1]M Weatherall, [2]M Holliday, [2]C Baggott, [2]I Braithwaite, [2]J Fingleton, [2]J Hardy, [3]RJ Hancox, [4]T Harrison, [5]A Papi, [6]I Pavord, [7]HK Reddel, [2]M Williams, [2]R Beasley. *[1]University of Otago Wellington, Wellington, New Zealand; [2]Medical Research Institute of New Zealand, Wellington, New Zealand; [3]University of Otago, Dunedin, New Zealand; [4]Nottingham NIHR Biomedical Research Centre, Nottingham, UK; [5]Universita di Ferrara, Ferrara, Italy; [6]University of Oxford, Oxford, UK; [7]Woolcock Institute of Medical Research, Sydney, Wellington*

10.1136/thorax-2019-BTSabstracts2019.369

Background This analysis combines two randomised controlled trials with similar protocols recruiting adults with asthma to explore the effects of covariates on the comparison of combination inhaled corticosteroid (ICS)/fast-onset long-acting beta-agonist (LABA) as reliever therapy versus maintenance ICS plus short-acting beta-agonist (SABA) reliever therapy.

Methods A combined individual participant analysis of the Novel START (ACTRN12615000999538) and PRACTICAL (ACTRN12610003774437) studies. These were 52-week, open-label, parallel-group, randomised controlled trials in adults with asthma. Novel START randomised 675 adults using only as-needed SABA to : salbutamol pMDI 100µg two inhalations as-needed for symptom relief, or budesonide Turbuhaler 200µg one inhalation twice daily plus salbutamol pMDI 100µg two inhalations as-needed, or budesonide/formoterol Turbuhaler 200/6µg one inhalation as-needed. PRACTICAL randomised 890 adults using as-needed SABA for symptom relief, with or without maintenance ICS to: budesonide-formoterol Turbuhaler 200/6 one inhalation as-needed; or budesonide Turbuhaler 200µg one inhalation twice daily plus terbutaline Turbuhaler 500µg as-needed. The analysis compared as-needed budesonide-formoterol with maintenance budesonide plus SABA reliever therapy. The primary outcome was the rate of severe exacerbations per participant per year: i.e. hospital/emergency department systemic corticosteroid treatment or the use of at least 3 days of systemic corticosteroids for asthma in the community. Novel START participants were withdrawn if they experienced a severe exacerbation. The other outcomes were moderate or severe exacerbations, and the Asthma Control Questionnaire (ACQ-5) score. Covariates were: age, sex, ethnicity, smoking status, baseline SABA use, baseline ICS use ever, severe exacerbation in previous 12 months, ACQ-5, blood eosinophil count, and FeNO.

Results The severe exacerbation rate was 0.096 per patient-year for as-needed budesonide/formoterol and 0.150 for maintenance budesonide plus as-needed SABA; adjusted relative rate 0.63 (95% CI: 0.45 to 0.89), P=0.01. The adjusted relative rate of any exacerbation was 0.66 (95% CI: 0.49 to 0.88), P<0.001. ACQ-5 did not differ between treatments. There was no evidence of any sub-group differences in response to as-needed budesonide/formoterol versus budesonide maintenance.

Conclusions The rate of severe exacerbations was lower for as-needed budesonide/formoterol therapy compared to budesonide plus as-needed SABA. No evidence of sub-group differences suggests the findings are generalisable across the spectrum of mild asthma in adults.

P227 CLINICAL EFFECTIVENESS, HEALTH-RELATED QUALITY OF LIFE AND PATIENT SATISFACTION AFTER SWITCH FROM METERED DOSE INHALER TO EASYHALER DRY POWDER INHALER IN PATIENTS WITH ASTHMA AND COPD; A REAL-LIFE STUDY

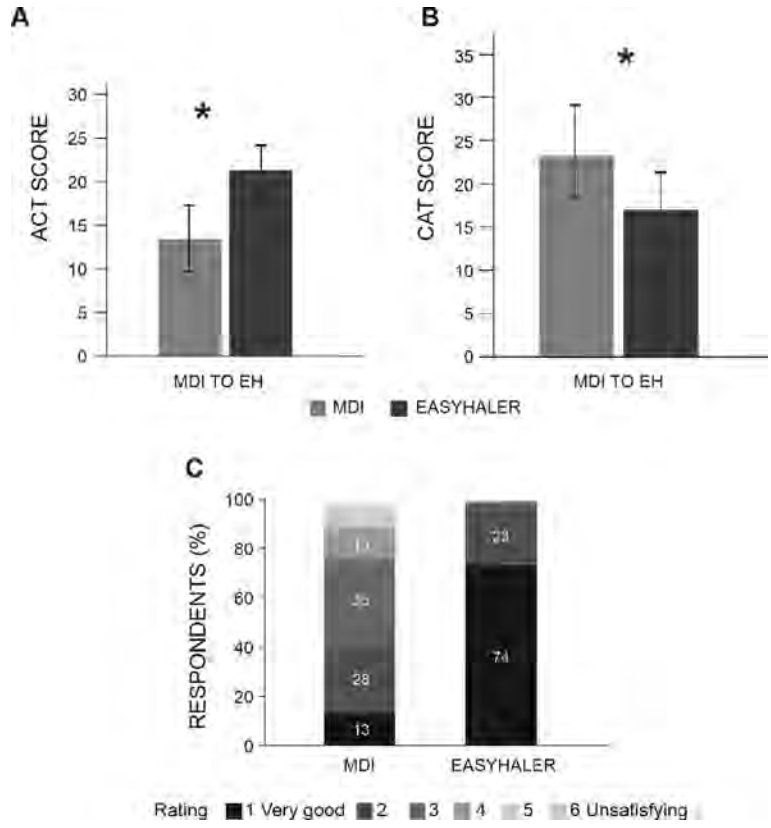
[1]G Gálffy, [2]M Szilasi, [3]L Tamási. *[1]Pulmonary Hospital Törökbálint, Törökbálint, Hungary; [2]Department of Pulmonology, University of Debrecen, Debrecen, Hungary; [3]Department of Pulmonology, Semmelweis University, Budapest, Hungary*

10.1136/thorax-2019-BTSabstracts2019.370

Introduction and objectives Dry powder inhalers (DPIs) are recognized to have significantly lower carbon footprint than metered dose inhalers (MDIs). To take environmental aspects into accout patients with asthma or COPD using MDIs are encouraged to switch to more environmentally friendly inhalers. We studied clinical effectiveness and patient satisfaction among patients with asthma and COPD switching from MDI to Easyhaler DPI treatment in a real-life setting.

Methods Adult patients (>18 yrs) previously suboptimally controlled on therapy via MDI inhalers and requiring treatment with combination of ICS/LABA according to GINA or GOLD guidelines were switched to budesonide/formoterol Easyhaler 160/4.5 µg or 320/9.0 µg per inhalation. Clinical effectiveness assessed by Asthma Control Test (ACT), and COPD assessment test (CAT), health-related quality of life (HRQoL) assessments, and patient satisfaction were performed at recruitment and at 12 weeks.

Results 142 patients with asthma and 95 patients with COPD (78.2%, 56.8% female, mean age 51.0, 65.5 yrs, 14.0%, 45.0% current smokers, respectively) were included in the study. Significant improvements in disease control at 12 weeks after the switch to Easyhaler was observed; patients having



Abstract P227 Figure 1 Assessment of switch from MDI to B/F Easyhaler combination therapy on changes in patient-reported outcomes in patients with A) asthma and B) COPD. C) Effect of switching from MDI to B/F Easyhaler combination therapy on patient satisfication in patients with asthma and COPD.
*$P<0.0001$, ACT and CAT values are mean with 95% CI. ACT Asthma Control Test, *CAT* COPD Assessment Test, *B/F* budesonide/formoterol fumarate, *MDI* Metered Dose Inhaler, *EH* Easyhaler

well controlled asthma based on ACT increased from 7.0% to 80.3%, and patients having a very high impact of COPD on daily life based on CAT decreased from 13.7% to 0.0% ($p<0.001$, for both). Significant increases in HRQoL were also observed at 12 weeks after the switch as measured by mini-Asthma Quality of Life Questinnaire (mAQLQ) or modified Medical Research Counsil dyspnea scale (mMRC) ($p<0.001$, for both). Almost all of the physicians (98.7%) regarded integration of Easyhaler to the patiens' daily life as very well or well accomplished, and 89.8% considered the use of Easyhaler very easy or easy to teach. MDI was rated as a very good inhaler by only 13.4% of the patients at baseline visit, whereas after the 12 weeks of use of Easyhaler device 74.4% of the patients rated Easyhaler as a very good inhaler.
Conclusion Switch from MDI to budesonide/formoterol Easyhaler therapy showed significant clinical and quality of life improvements in patients with asthma and COPD. Patients' overall satisfaction was significantly higher with Easyhaler compared to MDI.

P228 ANALYSIS OF THE POTENTIAL CLINICAL IMPACT OF AN ENVIRONMENTALLY DRIVEN TRANSITION FROM PRESSURISED METERED DOSE INHALERS (PMDIS) TO DRY POWDER INHALERS (DPIS)

D Jenkins, J Johal, J Mahon. *Morph Consultancy Ltd, Worcester, UK*

10.1136/thorax-2019-BTSabstracts2019.371

Introduction and objectives The NHS Long Term Plan includes an action to reduce the carbon footprint of health and social care, including a shift to lower carbon inhalers.[1] We conducted an exploratory analysis of the potential impact of a transition from pMDIs to DPIs on disease control. There is limited evidence quantifying the relationship between inhaler technique and exacerbation risk, therefore we sought other data to support this analysis. The objective was to develop a model which quantifies the relationship between inhaler failure rates and exacerbations and associated hospitalisations.
Methods Scenario analyses were developed using exacerbation rates from NICE economic models. For asthma, these were rates for treated and untreated asthma, as proxies for compliance and non-compliance respectively.[1] For COPD, compliant population exacerbation rates were obtained from the NICE COPD guidelines supporting materials.[2] The relative risk used in the NICE asthma model was applied to this value to estimate the non-compliance exacerbation rate. Estimates were provided per 1 million population using prevalence data from English General Practice.
Results It was estimated that for every 20% of the patient population experiencing treatment failure there would be an additional 4,100 and 5,223 exacerbations of COPD and asthma respectively per million population. Associated hospitalisation rates were estimated to be 287 and 141 for COPD and asthma respectively.
Conclusions A transition from pMDIs to DPIs has the potential to impact on inhaler technique and associated disease control. Our modelling shows that a modest shift could lead to

significant number of avoidable exacerbations and hospitalisations. There is evidence that face to face inhaler technique counselling can reduce treatment failure rates, with a repeat instruction after a period of time being the most effective intervention. This suggests that a robust clinical management strategy will be required to support the transition and minimise (or possibly reduce) exacerbation rates; this is likely to have significant resource implications and opportunity costs.

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1. Asthma: diagnosis and monitoring of asthma in adults, children and young people. Appendices A-P. National Clinical Guideline Centre, 2015.
2. Chronic obstructive disease in over 16s: diagnosis and management. Economic model report. NICE, 2018.

P229 A RETROSPECTIVE DATABASE STUDY OF PERSISTENCE AND ADHERENCE IN PATIENTS WITH ASTHMA IN THE UK (UK-THIN): FLUTICASONE FUROATE/VILANTEROL (FF/VI) VERSUS BECLOMETASONE DIPROPIONATE/FORMOTEROL (BDP/FM)

[1]H Svedsater, [2]M Parimi, [2]Q Ann, [2]CM Gray, [2]M Nixon, [2]N Boxall. *[1]Value Evidence and Outcomes, GlaxoSmithKline, Brentford, UK; [2]Real World Evidence Solutions, IQVIA, London, UK*

10.1136/thorax-2019-BTSabstracts2019.372

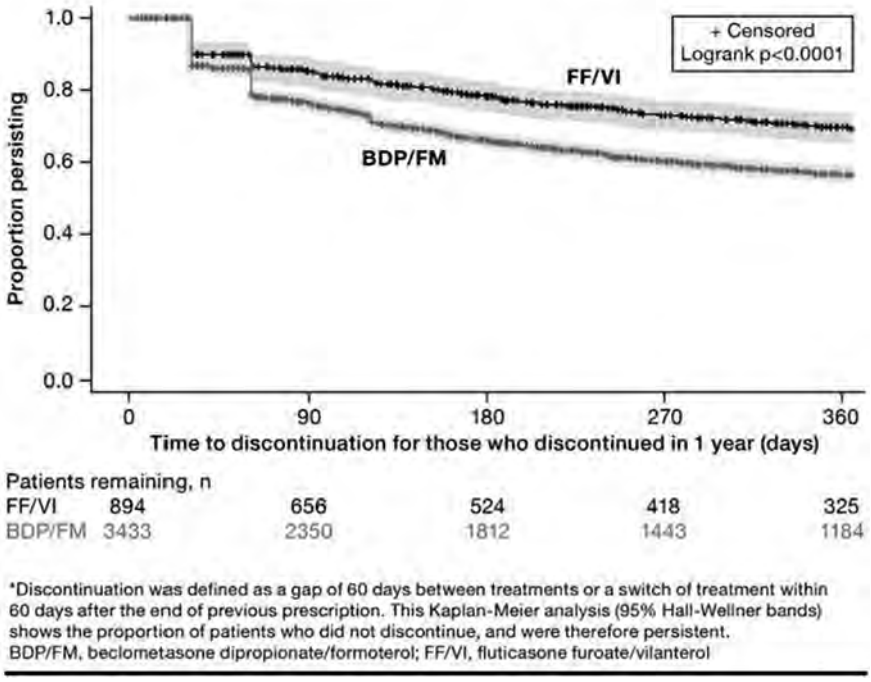
Introduction and objectives A retrospective cohort analysis was conducted comparing persistence with, and adherence to, different inhaled corticosteroid/long-acting-β_2-agonist (ICS/LABA) treatments by asthma patients. Here we report findings from patients initiating treatment with either FF/VI or BDP/FM, the latter administered either as flexible or fixed-dose.

Methods Patients in the UK with data registered in The Health Improvement Network (THIN) database, who had a first prescription (index date) for any ICS/LABA between 1 January 2013–17 January 2018 (study period) and a prior asthma diagnosis, were included if they had ≥12 months medical history prior to index date plus ≥1 post-index ICS/LABA prescription. Patients were excluded if aged <18 years or if there were records for either COPD diagnosis or previous non–study ICS/LABA treatment prior to index date. Study cohorts were matched by propensity score (1:up to 4; greedy method). Primary objective was to compare persistence of comparator ICS/LABAs up to 12 months post-index treatment (time to discontinuation* including switch). Secondary objectives were: proportion of days covered (PDC) and proportion of patients with ≥50% and ≥80% PDC at 12 months post-index; and rescue use (annualised number of short-acting bronchodilator prescriptions/patient) within 12 months after treatment initiation.

Results A total of 894 patients initiating FF/VI were matched to 3433 patients initiating BDP/FM. A higher proportion of patients persisted with FF/VI versus BDP/FM over 12 months (Kaplan-Meier analysis; **Figure**). The likelihood of discontinuing treatment within 12 months after initiation was 31% lower for FF/VI than BDP/FM (index year-adjusted, hazard ratio=0.69; 95% CI 0.60–0.80; p<0.001). Median (interquartile range) PDC was 89.2 (61.6–100.0) for FF/VI and 75.9 (50.5–98.0) for BDP/FM (p<0.0001), with significantly higher odds of achieving ≥50% and ≥80% PDC for FF/VI versus BDP/FM (747/893 [83.7%] vs 2600/3433 [75.7%]; odds ratio=1.50; 95% CI 1.23–1.83; p<0.001 and 526/893 [58.9%] vs 1571/3433 [45.8%]; odds ratio=1.57; 95% CI 1.35–1.83; p<0.001, respectively; per-protocol analyses). Annualised rescue use was numerically higher for FF/VI (9.0) versus BDP/FM (7.7).

Conclusion UK asthma patients initiating FF/VI were more likely to have higher persistence and better adherence to treatment than those initiating BDP/FM.

GlaxoSmithKline plc. -funded study (209967/HO-18–19688).



Abstract P229 Figure 1 Primary objective: Treatment persistence with FF/VI vs BDP/FM – time to discontinuation* at 1 year

P230 A RETROSPECTIVE DATABASE STUDY OF PERSISTENCE AND ADHERENCE IN PATIENTS WITH ASTHMA IN THE UK (UK-THIN): FLUTICASONE FUROATE/VILANTEROL (FF/VI) VERSUS BUDESONIDE/FORMOTEROL (BUD/FM)

[1]H Svedsater, [2]M Parimi, [2]Q Ann, [2]CM Gray, [2]M Nixon, [2]N Boxall. *[1]Value Evidence and Outcomes, GlaxoSmithKline plc., Brentford, UK; [2]Real World Evidence Solutions, IQVIA, London, UK*

10.1136/thorax-2019-BTSabstracts2019.373

Introduction and objectives A retrospective cohort analysis was conducted comparing persistence with, and adherence to, different inhaled corticosteroid/long-acting-β_2-agonist (ICS/LABA) treatments by asthma patients. Here we report findings from patients initiating treatment with either FF/VI or BUD/FM, the latter administered either as flexible or fixed-dose.

Methods Patients in the UK with data registered in The Health Improvement Network (THIN) database, who had a first prescription (index date) for any ICS/LABA between 1 January 2013–17 January 2018 (study period) and a prior asthma diagnosis, were included if they had ≥12 months medical history prior to index date plus ≥1 post-index ICS/LABA prescription. Patients were excluded if aged <12 years or if there were records for either COPD diagnosis or previous non–study ICS/LABA treatment prior to index date. Study cohorts were matched by propensity score (1:up to 4; greedy method). Primary objective was to compare persistence of comparator ICS/LABAs up to 12 months post-index treatment (time to discontinuation* including switch). Secondary objectives were: proportion of days covered (PDC) and proportion of patients with ≥50% and ≥80% PDC at 12 months post-index; and rescue use (annualised number of short-acting bronchodilator prescriptions/patient) within 12 months after treatment initiation.

Results A total of 937 patients initiating FF/VI were matched to 3232 patients initiating BUD/FM. A higher proportion of patients persisted with FF/VI versus BUD/FM over 12 months (Kaplan-Meier analysis; **Figure**). The likelihood of discontinuing treatment within 12 months after initiation was 35% lower for FF/VI than BUD/FM (index year-adjusted, hazard ratio=0.65; 95% CI 0.56–0.75; p<0.001). Median (interquartile range) PDC was 88.2 (61.4–100.0) for FF/VI and 77.7 (50.7–100.0) for BUD/FM (p<0.0001), with significantly higher odds of achieving ≥50% and ≥80% PDC for FF/VI versus BUD/FM (779/936 [83.2%] vs 2447/3232 [75.7%]; odds ratio=1.35; 95% CI 1.09–1.67; p=0.006 and 544/936 [58.1%] vs 1562/3232 [48.3%]; odds ratio=1.28; 95% CI 1.08–1.52; p=0.004, respectively; per-protocol analyses). Annualised rescue use was numerically higher for FF/VI (9.3) versus BUD/FM (5.9).

Conclusion UK asthma patients initiating FF/VI were more likely to have higher persistence and better adherence to treatment than those initiating BUD/FM.

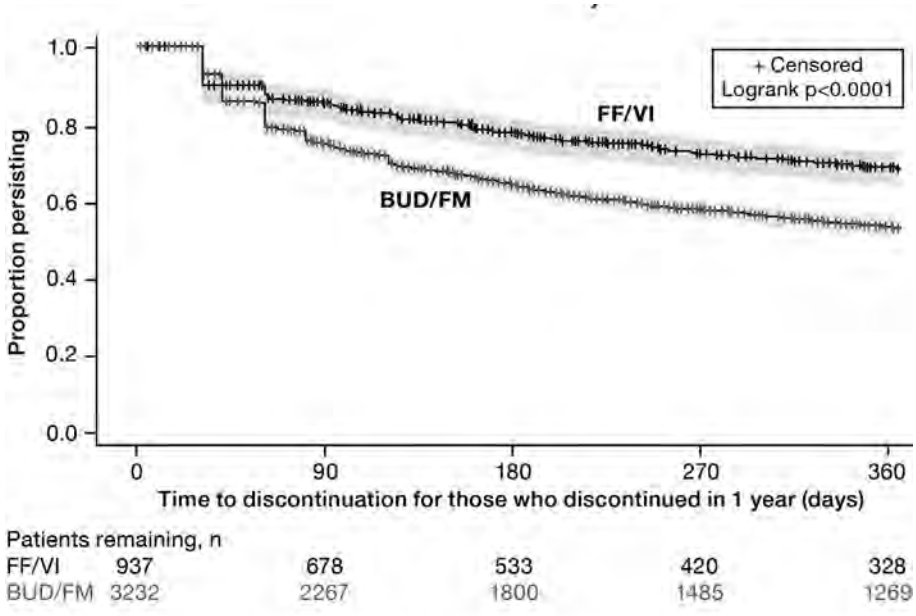
GlaxoSmithKline plc. -funded study (209967/HO-18–19688).

P231 PHARMACOLOGICAL BASIS OF INHALED CORTICOSTEROID (ICS) DOSE EQUIVALENCE AND DURATION OF ACTION

PT Daley-Yates. *GlaxoSmithKline, Uxbridge, UK*

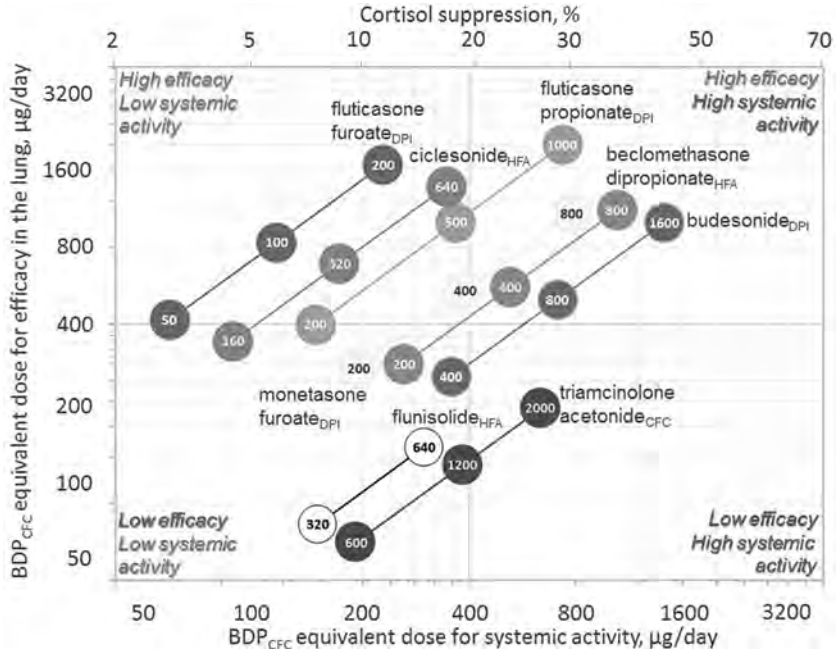
10.1136/thorax-2019-BTSabstracts2019.374

Introduction and objectives Asthma treatment guidelines classify ICS regimens as low-, mid- and high-dose often with reference to the now discontinued beclomethasone dipropionate (BDP_{CFC}) chlorofluorocarbon propellent inhaler (Becotide® circa 1972–2007). The dose-responses for efficacy and



*Discontinuation was defined as a gap of 60 days between treatments or a switch of treatment within 60 days after the end of previous prescription. This Kaplan-Meier analysis (95% Hall-Wellner bands) shows the proportion of patients who did not discontinue, and were therefore persistent.
BUD/FM, budesonide/formoterol; FF/VI, fluticasone furoate/vilanterol

Abstract P230 Figure 1 Primary objective: Treatment persistence with FF/VI vs BUD/FM – time to discontinuation* at 1 year



Abstract P231 Figure 1 Inhaled corticosteroid dose equivalence expressed as BDP_{CFC} equivalent doses for efficacy (%lung GR occupancy at mid-dose interval) and systemic activity (cortisol suppression).

systemic activity are considered similar once doses are adjusted for potency (glucocorticoid receptor (GR) affinity). The validity of this historical approach to dose equivalence was investigated.

Methods The steady-state lung and plasma concentrations for various ICS were derived using published values for the dose fraction available to the lung, lung absorption rate, oral bioavailability and systemic clearance[1]. For efficacy, the extent and duration of GR occupancy in the lung was calculated using the GR dissociation constants[1] and lung concentration-time profile. The amount absorbed from the lung into the systemic circulation was assumed to equal the bioavailable fraction in the lung during the same interval at steady-state and uniformly distributed throughout lung tissue and available for GR binding. For systemic activity, cortisol suppression was calculated using a physiological model that relates endogenous glucocorticoid (cortisol) daily production rate to the exogenous contributions (ICS) converting them into cortisol equivalent exposures using bioavailability, relative potency and systemic clearance[1].

Results Cortisol suppression and lung GR occupancy (mid-dose interval) were calculated for various ICS dose regimens and converted into BDP_{CFC} equivalent doses. The relationship between efficacy in the lung and systemic activity was different for each ICS and hence regimens fell into four categories based on high or low efficacy and high or low systemic exposure relative to BDP_{CFC}400µg/day (Figure 1). For duration of action (≥90% lung GR occupancy) there were also four categories: very short:4–6h (flunisolide, triamcinolone acetonide), short:14–16h (budesonide, BDP), medium:30–40h (monetasone furoate, fluticasone propionate, ciclesonide) and long:>80h fluticasone furoate.

Conclusions Contrary to how ICS dose equivalence is currently viewed in asthma treatment guidelines some regimens can be classified as high for efficacy but low for systemic activity. Furthermore, whilst even low dose ICS regimens can theoretically generate high lung GR occupancy and hence substantial efficacy, the duration of action in the airways and systemic activity can potentially differ widely amongst ICS molecules.

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P232 PATIENT LUNGPOWER AND INHALATION MANEUVER QUALITY WITH INHALERS OF DIFFERENT RESISTANCE

[1]J Haikarainen, [1]M Vahteristo, [2]R Jõgi, [1]S Lähelmä, [1]V Vartiainen, [3]LP Malmberg. *[1]Orion Pharma, Orion Corporation, Espoo, Finland; [2]Lung Clinic, Tartu University Hospital, Tartu, Estonia; [3]Skin and Allergy Hospital, University of Helsinki Central Hospital, Helsinki, Finland*

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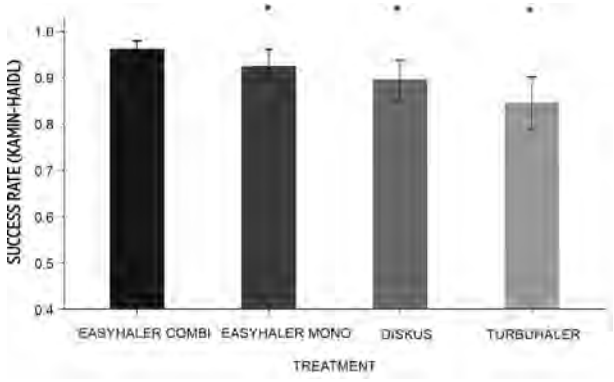
Patient's adherence and ability to correctly perform the inhalation maneuver are challenges often discussed when sufficient control over asthma or COPD is not achieved. Dry powder inhalers (DPIs) rely on patient generated energy to aerosolize the formulation. Inspiratory flow rate is used to evaluate whether the patient is able to use DPIs. However, the power generation is a function of both flow rate and inhaler resistance and hence flow rate alone does not describe the physics involved in the powder deagglomeration nor does it describe the patients ability to inhale sufficiently.

We used modified 'Inhalation Manouvre Quality' –requirements[1] to assess how asthma (n=724) and COPD (n=244) patients performed with various DPIs. The airflow profiles of asthma and COPD were assessed for lungpower, flow acceleration and inspiratory volume after peak flow rate. The unit conversion from peak inspiratory flow rate to lungpower was conducted using device resistances found in literature.

96.1% (n=383), 92.6% (n=202), 89.5% (n=202) and 84.6% (n=181) of the patients met the requirements for successful inhalation for Easyhaler combi (for combination therapy), Easyhaler mono (for monotherapy), Diskus and



Abstract P232 Figure 1 The success rate of inhalations according to criteria presented by Kamin and Haidl for patients with asthma and COPD with Easyhaler (combi and mono), Diskus and Turbuhaler. Error bars represent 95% confidence interval.
Pairwise comparsion by McNemar's test. *p<0.0001

Turbuhaler respectively (figure 1). The mean lungpower values varied between 7.18W and 9.65W for the four devices while the minimum power threshold calculated from the minimum flow rate was 0.58W, 1.15W, 0.29W and 4.36W for Easyhaler combi, Easyhaler mono, Diskus and Turbuhaler, respectively. In terms of lungpower, the poorest performing patients were COPD patients using Diskus. In this patient group 10th percentile cut off was 1.29W, which is sufficient for all the studied DPIs except for Turbuhaler.

For large majority of respiratory patients DPIs provide a feasible treatment option. The Turbuhaler requires largest lungpower and performed worst likely due to its built-in deagglomeration system that requires large flow rates to operate properly.[1] As for other inhalers, the lungpower requirement did not significantly limit the performance in any patient group.

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P233 PATIENT KNOWLEDGE AND OPINIONS OF THEIR HEALTHCARE DEVICES

[1]C Rowe, [1]K Young, [1]S Singh, [1]A Suresh-Nair, [2]O Usmani. *[1]Imperial College London, London, UK; [2]Royal Brompton Hospital, London, UK*

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Inhaled medications are the cornerstone of therapy for chronic obstructive pulmonary disease (COPD) patients, yet ~1/3 of patients make critical errors when using their inhaler devices that can impact on therapeutic benefit. The UK Inhaler Group (UKIG), surveyed their member organisations and identified 5 themes of concern potentially affecting patients' use of inhalers: (1) patient training and knowledge of their inhalers, (2) inhalers in the acute emergency, (3) environmental issues, (4) spacer use and (5) inhalers in schools.

The aims of this study were to assess patients' knowledge regarding use of their inhaler devices and gauge their opinions on inhalers in order to examine patient-relevant factors that influence use of their inhaled medication.

COPD patients (n=138) were individually interviewed before their clinic appointment at a tertiary care centre. A 47-item questionnaire was devised to explore patients' knowledge and opinions related to their inhalers, and their understanding regarding inhaler themes (2 - 5).

Patients' knowledge on inhaler use was found lacking in themes (1 - 4). Of concern, 55/138 (40%) of patients had not had their inhaler technique reviewed by a healthcare professional (HCP) in the last 12 months, demonstrating a clear risk of deterioration in inhaler technique. 90/138 (65%) of patients had not been shown how to use their inhaler for when they had breathing difficulty in an acute emergency. 24/138 (17%) of patients demonstrated knowledge of environmental issues specific to inhalers. In terms of spacer use, interestingly 74/121 (61%) of patients were unable to explain why a spacer was useful. Understanding the accessibility of inhalers in schools was difficult to gauge as these were COPD rather than asthma patients; however universally high ratings of importance were given to the presence of inhalers in schools.

Patients' knowledge in inhaler use is inconsistent and lacking. Importantly, the lack of regular inhaler technique review by HCPs exposes a risk to patient health and contributes to the prevailing critical errors observed. Our data shows that deficiencies of patient knowledge in the main themes identified, particularly in the use of inhalers in an emergency, highlight significant concerns and the need for action to be taken.

P234 IMPROVING IN INHALER TECHNIQUE: A COMMUNITY PHARMACY SERVICE

[1]TGD Capstick, [2]M Burnley, [3]H Higgins. *[1]Leeds Teaching Hospitals NHS Trust, Leeds, UK; [2]Community Pharmacy West Yorkshire, Leeds, UK; [3]NHS Leeds Clinical Commissioning Groups Partnership, Leeds, UK*

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Introduction and objectives Ensuring optimal inhaler technique is critical to the successful management of asthma and COPD, but real-life studies continue to highlight that poor inhaler technique is common. It is critical that new services are developed to improve patient care. As the majority of people with asthma and COPD are managed in primary care where community pharmacies provide front line healthcare, a feasibility project was designed to determine the extent to which inhaler technique could be optimised in this setting.

Methods Fifty community pharmacies applied to and were recruited to participate in this project. Pharmacists and pharmacy technicians attended a 2 hour training session, and were provided with a resource box including placebo inhalers, training aids and patient information leaflets. Patients were eligible for the service if they were prescribed inhalers, could speak and understand English, and consented to share information from the consultation with their GP.

Results Thirty-five pharmacies recruited a total of 380 patients (214 female); 190 (50%) used one inhaler, 175 (46.1%) used two, and 15 (3.9%) used three inhalers. Incredibly, 104 (27.4%) patients had never been shown how to use their inhalers before. The most commonly prescribed inhalers were MDI, Ellipta and Turbohaler in 226 (59.5%), 93 (24.5%), and 32 (8.4%) patients. A mixture of aerosol (MDI or soft mist inhaler) and dry powder inhalers (DPI) were prescribed for 108 (56.8%) patients.

At baseline, good inhaler technique (defined as having no critical errors) was significantly more likely with DPIs than with aerosol inhalers ($p<0.05$). With training, a significant improvement in inhaler technique was achieved for both

Abstract P234 Table 1 Impact of community pharmacy service on inhaler technique in patients with asthma or COPD

	Aerosol Inhaler N=360	DPI N=225	Whole Group N=585	Aerosol vs. DPI, p value
Inhaler Technique At Baseline				
Good Technique	177 (49.20%)	175 (77.80%)	352 (60.20%)	<0.05
Unsatisfactory Technique	183 (50.80%)	50 (22.20%)	233 (39.80%)	
Inhaler Technique After Training				
Good Technique	344 (95.60%)	219 (97.30%)	563 (96.20%)	ns
Unsatisfactory Technique	16 (4.40%)	6 (2.70%)	22 (3.80%)	

DPI = Dry Powder Inhaler; ns = not significant

aerosol ($p<0.05$) and DPIs ($p<0.05$); overall improving from 60.2% to 96.2% of inhalers. See table 1.

Conclusions Poor inhaler technique is common, but a dedicated service provided by community pharmacy staff is effective in improving inhaler technique for almost all patients. However uptake at many pharmacies was low and only 11 patients received the service at the weekend, suggesting that capacity for additional key services is limited in the current climate. Further work is required to determine whether good inhaler technique is maintained and the impact on disease control.

P235 OPTIMISING INHALER TECHNIQUE: WARD-BASED SERVICE FOR ASTHMA & COPD PATIENTS

TGD Capstick, N Azeez, G Deakin, A Goddard, D Goddard. *Leeds Teaching Hospitals NHS Trust, Leeds, UK*

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Introduction and objectives Good inhaler technique is a key component of asthma and COPD management, but many patients are unable to use their inhalers correctly, which puts them at increased risk of exacerbations and hospital admission. Inhaler technique should be checked for every patient admitted to hospital with an exacerbation of asthma or COPD, but is often poorly performed. Consequently a new dedicated service was developed and evaluated to determine the impact on optimising inhaler technique in inpatients with asthma and COPD on future exacerbation rates.

Methods Pharmacy support workers were trained to undertake inhaler technique assessments. Technique was assessed as unsatisfactory, satisfactory or optimal before and after training. In cases of poor technique, a protocol was used to recommend cost-effective treatment changes with patient consent. Follow up within 48 hours reinforced optimal technique.

Results Optimising inhaler technique resulted in a reduction in exacerbations of asthma and COPD. Between 1st October 2018 and 30th June 2019, 278 patients had 616 inhaler technique baseline assessments (303 DPI and 313 aerosol inhalers). This was assessed as optimal for 176 (28.6%), satisfactory for 304 (49.4%), and unsatisfactory for 136 (22.1%) inhalers. Following training and recommended changes of treatment, technique was assessed as optimal for 494 (91.5%), satisfactory for 46 (8.5%), and unsatisfactory for 0 (0%) of inhalers ($p<0.00001$ for both DPI and aerosol inhalers).

Abstract P235 Table 1 Impact of inhaler technique optimisation service on six-month exacerbations in patients with asthma and COPD

	Six month period *prior to* intervention	Six month period *after* intervention*
All Patients (n=99)		
Total number of exacerbations	257	220
Total Number of hospital admissions	156	136.5
Survivors (n=71)		
Total number of exacerbations	169	111
Total Number of hospital admissions	105	49

*Adjusted to incorporate length of time patients survived following the intervention

Improvements in inhaler technique were achieved through training (37.6% of inhalers), inhaler device change (19.0%), or optimising therapy with or without changing inhaler device (30.4%). 64.8% of recommendations were accepted. At follow-up, all patients were happy with the service (data available for 225 patients).

Six-month follow-up data were available for 99 patients (22 asthma, 73 COPD and 4 asthma-COPD overlap). All-cause mortality was 28% (27 COPD). Optimising inhaler technique resulted in a reduction in the total number of exacerbations and hospital admissions in all patients and in the 71 patients still alive at 6 months (see table 1).

Conclusions A dedicated inhaler technique service produces significant improvements in inhaler technique resulting in a reduction in asthma and COPD exacerbations, with high acceptability for patients, and produces financial savings.

P236 CARDIOVASCULAR RISK FOLLOWING THE USE OF LONG-ACTING BRONCHODILATORS OF THE UK'S ASTHMA POPULATION: A NESTED CASE-CONTROL STUDY

AA Almazrua, V Sundaram, JK Quint, CI Bloom. *National Heart and Lung Institute, Imperial College London, London, UK*

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Introduction Recently, Wang *et al* (JAMA, 2018) examined cardiovascular risk following the use of certain inhalers, specifically in incident users of long-acting beta-agonists (LABA) and long-acting antimuscarinic antagonists (LAMA) in an adult Chronic Obstructive Pulmonary Disease (COPD) population. These drugs are increasingly used in asthma patients and we sought to determine whether LABA may raise the risk of cardiovascular disease in patients with asthma in the UK.

Methods Data was derived from primary care records (Clinical Practice Research Datalink) linked to secondary care database (Hospital Episodes Statistics), from January 2004 until January 2017. A cohort of LABA-LAMA naïve asthma patients were identified from which a nested case-control (ratio of 1:4) were matched on age, sex and GP practice was utilised. The outcome was cardiovascular disease (CVD; ischaemic heart disease (IHD), stroke, heart failure, hypertension or arrhythmias). The primary exposure was LABA prescriptions in the year prior to the date of CVD or equivalent date for the controls.

A conditional logistic regression was applied to estimate the association between LABA use and CVD. LABA use was classified into current (<30 days), recent (31–90 days), old (91–180 days) and remote (181–365 days) use. Current users were further categorised into 'incident' users (no prescription preceding the 30 days) and 'prevalent' users (prescriptions including and prior to the preceding -30 days).

Results 357,300 asthma patients were identified of which 13,868 cases and 55,472 controls were eligible for the study. The mean age was 63.9 years, 55% were female. Incident LABA use was associated with 1.62-fold (95% CI, 1.17–2.24, P<0.05) increased odds of CVD, whereas prevalent LABA use had an absent risk, after adjusting for BMI, smoking status, asthma severity, and a history of atopy, COPD, pneumonia, pulmonary embolism, asthma exacerbations, depression, anxiety, GERD, stroke, IHD, heart failure, cardiac arrhythmias, hypertension and cardiac medications.

Conclusion Incident, but not prevalent, LABA use was associated with an increased risk of CVD in asthma patients irrespective of prior CVD status or asthma severity.

Cystic fibrosis and bronchiectasis: updates and controversies

P237 HEALTHCARE UTILISATION OF REMOTE CAPILLARY BLOOD TESTING IN A TERTIARY RESPIRATORY OUTPATIENT SETTING

[1]K McLaren, [2]J Donovan, [1,3]M Loebinger, [1,3]A Shah. *[1]Department of Respiratory Medicine, Royal Brompton and Harefield NHS Foundation Trust, London, UK; [2]Department of Pathology, Royal Brompton and Harefield NHS Foundation Trust, London, UK; [3]National Heart and Lung Institute, Imperial College London, London, UK*

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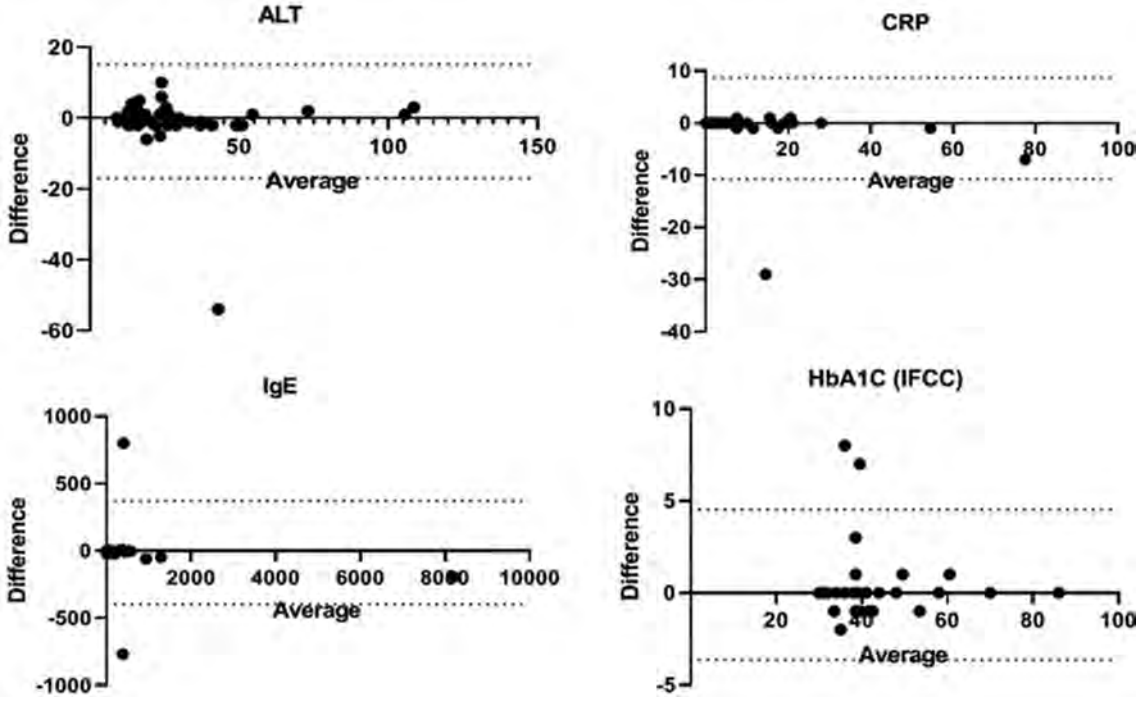
Background In a tertiary respiratory centre, large cohorts of patients are managed in the outpatient setting and require monitoring of inflammatory or disease activity markers and organ toxicity from medications. This either requires utilisation of primary care services for phlebotomy and subsequent physician review of results or frequent visits to tertiary centres. Although remote monitoring, such as telemedicine and wearable technology (e.g. remote spirometry), is being increasingly utilised in the outpatient setting, there is little data analysing the possibility of remote blood test monitoring.

Purpose To identify the potential healthcare utilisation of remote capillary blood testing in a tertiary level chronic lung disease cohort.

Methods A retrospective analysis of blood testing in outpatient cystic fibrosis clinics, assessing frequency, indication and delayed impact upon clinical plans. This was followed by a prospective single centre validation study of finger prick capillary blood testing using a novel capillary blood collection system compared to local standard venesection. Results were analysed using paired T test and Bland-Altman statistical analysis.

Results 18 outpatient clinics with 181 patients were retrospectively analysed. 63 patients underwent blood testing, of which 41 (65%) patients' blood tests were predictable prior to the clinic visit. 16% of patients who underwent blood tests were consequently contacted after the clinic due to actions required from results.

A number of tests (including CPR, IgE, ALT and HbA1c) showed no significant differences (paired T test p≤0.05) between the capillary sample and control (standard venesection), and good method comparison through Bland Altman analysis, suggesting accuracy of remote finger prick monitoring. (see Figure 1) Other tests, including FBC and renal function, showed significant statistical differences between the capillary and venous samples.



Abstract P237 Figure 1 Bland-Altman analysis of venous and capillary blood test results

Following validation it was evident that 23 patients (56%) who underwent venesection for predictable reasons could have provided accurate blood samples by exclusively using remote finger prick monitoring rather than standard venesection.

Conclusions Remote capillary blood testing could potentially be utilised in over half of patients requiring blood monitoring in the outpatient setting to either prevent a hospital visit or be provided in advance of clinic visits to provide contemporaneous clinical data to aid shared management planning.

P238 SUPERIOR YIELD OF POSITIVE BACTERIAL CULTURES FROM SPUTUM INDUCTION VS COUGH SWAB IN CHILDREN, AND ITS UTILITY IN ASSESSING SUCCESS OF PSEUDOMONAS AERUGINOSA ERADICATION THERAPY

[1]D Amin, [2]N Collins, [2]K Kentosova, [2]C Worger-Ridgley, [2]N Murray, [1,2]JC Davies. *[1]Imperial College London, London, UK; [2]Royal Brompton Hospital, London, UK*

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Introduction Cystic Fibrosis (CF) patients most commonly suffer from chronic infections of *Pseudomonas aeruginosa* (PA) which is a very virulent bacteria associated with increased mortality and further hospitalisations. Earlier detection of bacterial cultures can lead to quicker interventions however current sample methods are either too invasive (Bronchoalveolar Lavage) or not sensitive enough (Cough Swabs (CS)). Sputum Induction (SI) uses nebulised Hypertonic Saline (HTS) to instigate a cough reflex within patients that cannot expectorate sputum samples for culture. This project will look into the viability of SI against CS for positive isolations in Paediatric CF patients and particularly focusing on PA therapies directed at eradication (TDE).

Methods Nebulised HTS used an ultrasonic device in three 5-minute intervals for administration along with spirometry and basic observations. This was a retrospective observational cohort study with cross-sectional elements; data was collected at initial SI event and micro-biological results were catalogued post SI to 01/03/2019. N=244 (SI events) involving 145 patients. Data collated on excel and analysis performed using chi-squared tests.

Results Median age of 7 years (IQR= 7 years; Q1= 4, Q3=11). The procedure was well-tolerated in 87% of cases with reasons for poor tolerance including: bronchoconstriction (6%), procedural distress (4%), vomiting (1%) and other (2%).

There was a 24x fold increase in positive bacterial cultures detected on SI samples only against positive cultures on CS only (94 vs 4) and a 13x fold increase when looking at SI vs CS for PA eradication patients (13 vs 1 respectively). The data presented good evidence that PA TDE was working at an adequate rate, 71.3% patients remained PA free post SI (80.4% of SI events).

Conclusion HTS is a mucoactive drug that helps reduce the viscoelasticity of mucus and stimulate the mucociliary escalator providing larger and more representative samples. Thus SI can manipulate patients' management more effectively, which can reduce the mortality of a PA infection. Unfortunately, without Bronchoalveolar Lavage (GOLD standard), the sensitivity of SI cannot be officially confirmed. In conclusion, SI is a superior method over CS for positive bacterial cultures from sputum samples.

P239 ERADICATION OF NEW PSEUDOMONAS AERUGINOSA ISOLATES IN ADULTS WITH CYSTIC FIBROSIS

[1]WL Boyes, [2]R McVean, [2]RJ Bright-Thomas. *[1]The University of Manchester, Manchester, UK; [2]Manchester University NHS Foundation Trust, Manchester, UK*

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Introduction UK national CF registry data 2017 demonstrates that 44.5% of UK adults with CF are chronically colonised with *Pseudomonas aeruginosa* (PA). Chronic PA infection, once established, is usually impossible to eradicate and is associated with reduced life expectancy in CF. The aim of this study was to examine eradication rates, PA strain typing, and treatment regimens used following new isolations of PA at a large UK Adult CF Centre.

Methods Data was examined for all patients not known to have chronic PA infection attending a large regional UK CF Adult Centre isolating PA over a 7 year period. Results were gathered using the hospital online results system, clinic letters and national laboratory strain typing reports for 2012 – 2019. Successful eradication was defined as $\geq$3 sputum samples clear for PA over 6 months with no subsequent isolation of the same strain.

Results 168 patients, not considered chronically colonised with PA were identified. 72 of these isolated PA over the 7-year study period. 19 patients isolated PA on multiple separate occasions resulting in 91 individual PA infection episodes. Examining these episodes in detail:

55/91 episodes were new PA isolates. 46/55 (83.6%) of these successfully eradicated. Unique strains had the highest eradication rate at 20/21 (95.2%), followed by common environmental strains at 19/25 (76.0%) and epidemic (presumed transmissible) strains 3/5 (60.0%). Patients' first PA infection episodes had a higher eradication rate 38/44 (86.4%) than second episodes 7/10 (70.0%). One patient had a third episode and successfully eradicated.

29/91 episodes were identified on strain typing as chronic PA infection: 15/29 (51.7%) were chronic on transfer to the unit and 14/29 (48.3%) had suppressed chronic infection due to long term inhaled antibiotics. The first episode of PA isolation was classed as a failure to eradicate and subsequent episodes as supressed.

7/91 episodes had incomplete data due to transfer or ongoing treatment.

Discussion In adults with CF, eradication rates of new PA isolates are extremely high at our centre but accurate strain typing is essential to distinguish acute from chronic PA infection and unique from epidemic strains.

P240 LUNG FUNCTION AND LOW BONE MINERAL DENSITY IN CYSTIC FIBROSIS

[1]DK Edwards, [2]SB Carr, [1]P Cullinan. *[1]National Heart and Lung Institute, Imperial College London, London, UK; [2]Department of Paediatric Respirology, Royal Brompton Hospital, London, UK*

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Objectives Low bone mineral density (BMD) is a known complication in those with cystic fibrosis (CF), and worsening lung function has been associated with low BMD in COPD patients and asthma patients. Using a large national registry, we aim to explore the relationship between low bone mineral

density (BMD) and lung function in patients with cystic fibrosis.

Methods Using data from 2007–2017 from the UK CF Registry, we investigated the rates of low BMD. Bone mineral density was measured using DEXA scans at the lumbar spine, femoral neck, total hip, and total body. Z-scores were used to determine whether patients had low BMD (z-score≤-1). The population was restricted to those aged 8 and over as reference ranges are not available for younger children.

Results There were 9824 patients included in this analysis, with 18 037 DEXA scans in 6827 patients. Median age at first scan was 22 (IQR: 16–30). Overall, 28% (n=2752) had low BMD. BMD z-scores were lower in males than in females, and this difference increased with age. Patients with low BMD were slightly older (24, IQR: 18–33) than those with normal BMD (21, IQR:14–31) and had lower lung function than those with normal BMD (FEV_1% pred. 63.7, IQR: 45.1–80.9 vs. FEV_1% pred. 74.7, IQR:55.0–89.5).

FEV_1% pred. was correlated with BMD at the lumbar spine (LS), femoral neck (FN), total hip (TH) and total body (TB) ($p<0.0001$ for all). This association remained significant after adjusting for age, sex, and BMI ($\beta=0.01$, $p<0.0001$ for all four areas of DEXA scanning).

Conclusion This exploratory analysis has demonstrated that lung function is associated with bone mineral density in patients with CF. Further work will include investigating the effects of CFRD, oral steroid use, and will look at how these impact on the decline in BMD in patients with CF.

P241 FERTILITY SUCCESS RATES IN ADULT MALES WITH CYSTIC FIBROSIS

J Wilkinson, B Bianco, R Bright- Thomas, M Akhtar, A Heck, AK Webb. *Manchester University NHS Foundation Trust, Manchester, UK*

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Introduction Approximately 99% of men with cystic fibrosis (CF) are born with congenital bilateral absence of the vas deferens (CBAVD). This results in obstructive azoospermia and infertility, however sperm production remains normal in the vast majority of men.

Assisted reproductive technology (ART) methods use surgical sperm retrieval (SSR) to aspirate motile sperm followed by intracytoplasmic sperm injection (ICSI) and implantation to achieve biological parenthood.

The aim of this project was to examine ART success rates in men with CF at a large UK adult CF centre over the last 20 years.

Method Data for all male patients referred to a large UK regional fertility centre were retrospectively reviewed. Demographic data, body mass index (BMI kg/m^2), forced expiratory volume in one second percent predicted ($ppFEV_1$), SSR, ICSI, implantation and pregnancy outcomes were recorded.

Results 50 male patients were referred from an adult CF centre to one fertility centre between 1999–2019. Mean (range) age was 30.1yrs (23- 41yrs). Mean (range) $ppFEV_1$ was 67.5 (25.6–114.8). Mean (range) BMI was 24 (17.1 – 36.7).

40 (80%) patients completed fertility treatment. 40/40 (100%) had viable sperm retrieved by SSR. 38/40 couples proceeded to ICSI and implantation (2 chose not to proceed yet). 32/38 (84.2%) couples had established pregnancy as evidenced by foetal heartbeat at 7 weeks. 30/38 (78.9%) couples have, to date, delivered healthy newborns with no reported genetic abnormalities (2 pregnancies ongoing).

Conclusion Increasing CF adult survival and advances in ART mean that for men with CF and their partners biological parenthood is now commonplace. SSR and ICSI IVF are highly effective fertility treatment options for men with CF related CBAVD.

P242 DOES GASTRO-OESOPHAGEAL REFLUX INFLUENCE THE RESPIRATORY TRACT MICROBIOME IN CYSTIC FIBROSIS PATIENTS?

[1]RW Lord, [2]GG Einarsson, [2]AJ Lee, [1]B Bianco, [3]PJ Whorwell, [2]JS Elborn, [2]MM Tunney, [1]AM Jones. *[1]Manchester Adult Cystic Fibrosis Centre, Manchester, UK; [2]Queen's University Belfast, Belfast, UK; [3]Department of Gastroenterology, Wythenshawe Hospital, Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.385

Background It has been proposed that the increased amounts of gastro-oesophageal reflux seen in cystic fibrosis (CF) patients can lead to reflux aspiration, which in turn may influence the lung microbiome. The aim of this study was to assess microbial community composition of the upper and lower respiratory tracts, and the relationship to intra-oesophageal measures of gastro-oesophageal reflux.

Methods Spontaneous sputum and mouth swill samples were collected from CF subjects (n=17) enrolled in a larger observational study of gastro-oesophageal reflux in CF. All subjects (n=41) had undergone 24 hour combined pH-impedance reflux monitoring. Sampling occurred immediately before reflux monitoring. Genomic DNA was extracted and microbial community profiles determined by sequencing the V4 region of the 16S rRNA marker-gene using the Illumina MiSeq platform. The main measures were alpha-diversity (taxonomic richness, Shannon-Wiener diversity, evenness and dominance) and beta-diversity (PERMANOVA and mean *distance* to group *centroid)*. Reflux measures of interest were selected (total events, proximal events and acid exposure), and based on these the subjects were divided into tertiles for analyses of relationships to microbiome measures.

Results For the sputum samples there was no difference in alpha-diversity for any tested reflux measure. However, for oral rinse samples there were significant differences noted for total reflux for alpha-diversity (richness ($p=0.016$); Shannon-Wiener diversity ($p=0.007$); and dominance ($p=0.007$)). Proximal reflux showed some trend toward significance (Shannon-Wiener diversity ($p=0.093$); evenness ($p=0.113$); and dominance ($p=0.073$)). No significant difference or trend was noted for acid exposure. There were no differences observed in beta diversity for any reflux measure for mouth rinses or sputum samples ($p>0.05$).

Conclusions Our data suggests that intra-oesophageal measures of reflux do not affect the lower respiratory tract microbiome, but may influence the upper respiratory tract microbiome. This may relate to the requirement for reflux to overcome upper airway defences in order to reach the lower respiratory tract, but not the upper respiratory tract. We intend to further investigate this finding using a larger cohort of mouth swill samples (n=24), as well as aiming to repeat these analyses for upper and lower respiratory tract samples following the development of a biomarker of extra-oesophageal reflux.

P243 OUTCOME MEASURES FOR AIRWAY CLEARANCE IN ADULTS WITH CYSTIC FIBROSIS (CF): A RANDOMISED CONTROLLED CROSSOVER TRIAL

[1,5]GE Stanford, [2]F Cathcart, [2]Z Beverley, [3,5]C Short, [4]M Jones, [1]D Bilton, [3,5]JC Davies, [1,5]NJ Simmonds. *[1]Adult Cystic Fibrosis Centre, Royal Brompton Hospital, London, UK; [2]Department of Rehabilitation and Therapies, Royal Brompton Hospital, London, UK; [3]Department of Paediatric Respiratory Medicine, Royal Brompton Hospital, London, UK; [4]Brunel University, London, UK; [5]National Heart and Lung Institute, Imperial College, London, UK*

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Introduction The best outcome measure (OM) for airway clearance (AC) in CF is unknown. Our National Institute for Health Research funded RCT compares standard OMs (sputum weight, FEV_1) to new OMs (electronic impedance tomography (EIT), lung clearance index (LCI), impulse oscillometry (IOS)) to determine the most effective measure of AC. Here we describe our ongoing AC trial, present the challenges related to recruitment, baseline characteristics and OM reproducibility.

Methods Subjects complete the OMs of LCI, IOS and FEV_1 then are randomised to either supervised AC intervention or rest for 30 minutes. LCI, IOS and FEV_1 are repeated straight afterwards. EIT, oxygen saturations and sputum are collected during the rest/AC period. At a subsequent visit the OMs are completed with the other intervention. Sequence allocation is blinded to the research team. Difference in change in the OMs pre- and post- AC/rest is the primary endpoint. Target sample is 96, the sample was calculated with 80% power and significance of 5% for each OM.

Results Recruitment to date (after 19 months): 241 patients pre-screened, 12 await first visit, 6 enrolled, 31 completed (66% of target to date (TTD)). Completed subjects' demographics: 19 male; median age 38yrs (IQR 19.5); 45% F508del/F508del; median FEV_1 70%pred (IQR 29.5). Scheduled visits are at 155% of TTD, but completed visits are at 76% of TTD. The high cancellation rate is primarily caused by patient illness. Median visit length 205 minutes (IQR 47). LCI has the longest duration; ICCs of pre-intervention OMs are good between visits (table).

Conclusion Completion of study visits is challenging, especially due to inclusion/exclusion criteria and requiring patient stability. Recruitment has improved recently with enhanced communication and strategic overbooking. The newer OMs of LCI, IOS and EIT are reproducible and feasible; however, the long duration of LCI may inhibit future use in this cohort. We believe this RCT is the first to evaluate these OMs for use in CF AC trials. The need to identify a more robust OM for AC effect remains paramount for future scientific research and for the application of personalized therapy not only for CF but for other supperative chest diseases.

P244 A QUALITY IMPROVEMENT PROJECT TO OPTIMISE MULTIDISCIPLINARY TEAM COMMUNICATION ABOUT UNPLANNED ADMISSIONS OF CLINICAL TRIAL PATIENTS

[1]R Dobra, [2]K Huband, [2]S Madge, [2]NJ Simmonds, [1]JC Davies. *[1]National Heart Lung Institute, Imperial College, London, UK; [2]Department of Cystic Fibrosis, Royal Brompton Hospital, London, UK*

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Background This is a hugely exciting time for Cystic Fibrosis (CF) research. There are more than 100 drugs in development offering substantial hope for improved health and life-expectancy. Clinical trial participants are asked to inform the trials team promptly of unplanned hospital admissions. Failure to do so results in delayed awareness and reporting of serious adverse events. Awareness on the part of the admitting clinical team would provide a safety net to speed up communication, improve patient safety and facilitate timely completion of regulatory paperwork. We aimed to assess and improve awareness within the MDT of the importance of these issues

Methods Questionnaires were distributed in handover and teaching sessions over two weeks in Feb 2018 to adult/paediatric ward nurses, CF clinical nurse specialists and ward doctors. These were used along with an MDT meeting to identify interventions to be implemented. Questionnaires were redistributed in August 2018 at similar opportunities.

Interventions

1. Talks at educational MDT forums
2. Names of trial patients/team contacts added to ward handover lists
3. Trial participation flagged within all clinic correspondence

Abstract P243 Table 1

Outcome Measure (n=31)	Pre-AC visit 1 median (IQR)	Pre-AC visit 2 median (IQR)	Intraclass Correlation Coefficient (ICC)	Median test time (IQR) (mins)
Forced Expiratory Volume (FEV_1) (litres)	2.37 (1.1)	2.35 (1.1)	0.99	5 (3)
Lung Clearance Index (LCI)*	14.9 (5.8)	16.3 (7.3)	0.92	50.5 (22)
R5-R20 from Impulse Oscillometry (IOS)	0.07 (0.1)	0.07 (0.1)	0.95	6 (3)
ΔEELI from Electronic Impedance Tomography (EIT)	12401 (2240182)	5104 (2149856)	0.94	4 (2)

*n = 30 due to 1 participant only having 1 acceptable LCI test at visit 1

Abstract P244 Table 1 Pre and post intervention responses to questionnaire

	Pre-intervention (25 respondents)	Post- intervention (32 respondents)	Fisher's exact
Number of staff who routinely ask about trial participation	2 (8%)	6 (19%)	0.44
Number of staff who would inform the trial team of an admission if they identified that a patient is on a trial	4(16%)	20 (63%)	<0.001
Number of staff who know how to get in touch with the trials team	5 (20%)	21 (66%)	<0.001

Results Post-intervention, there were significant improvements in the proportions of staff demonstrating awareness of procedures (Table). From February 2017 to January 2018 there was a median (range) of 18 (2–93) days before the trials team were made aware of 8 admissions compared with 2 (1–4) days (5 admissions) in February 2018 to January 2019 ($p<0.001$).

Conclusion Post intervention, the median number of days to trial team awareness of admissions reduced. There was a significant increase in the number of clinical staff who knew to inform the trials team of admissions and how to contact them, but still an inadequate proportion of staff asking about trial participation proactively. We will add a reminder to the admission/clerking proforma and clinic checklist and continue to highlight this message as it is an unmet educational need. We will reassess in one year to establish if improvements are sustained and aim to extend our work to improve communication and integration across multiple aspects of trial delivery. We suggest the principles could be relevant to other specialities conducting clinical trials.

P245 SERRATIA MARCESCENS (SM): A SIGNIFICANT PATHOGEN IN THE ADULT BRONCHIECTASIS MICROBIOME?

S Kalam, A Al-Fahad, H Simmons, V Bradshaw, A Ghareeb, K Lang Ping Nam, G Antunes. *James Cook University Hospital, Middlesbrough, UK*

10.1136/thorax-2019-BTSabstracts2019.388

Introduction and objectives SM is predominantly associated with hospital-acquired sepsis. It occurs naturally in soil and water and has a propensity for antimicrobial resistance. Its role in adult bronchiectasis, risk factors for colonisation and pathogenicity is unknown. We sought to identify characteristics associated with the isolation of this pathogen in sputum samples, antibiotic resistance and clinical outcomes.

Methods A longitudinal, retrospective analysis was conducted in a specialist adult bronchiectasis unit in the North East of England. Patients who had one or more sputum isolate for SM from January 2012 to December 2018, were identified from an Adult Bronchiectasis registry. Demographic, clinical and microbiological data were retrieved from the registry. Colonisation was defined as two positive sputum samples at least three months apart over a 24 month period, while community-acquired was characterised as no hospital admission within two years of the first isolate of SM.

Results A cohort of fifteen patients was identified (3.3% of patients included in the registry). The mean age was 70 years and 60% were males. Ten patients were colonised with SM (66.7%). Twelve patients (80%) were colonised with *Pseudomonas aeruginosa* prior to the isolation of SM. The mean Bronchiectasis Severity Index (BSI) for the cohort was 13.0 (SD=3.88) with no significant difference between the colonised group compared to patients with single isolate (13.1 versus 13.0, respectively; $p=0.576$). Three patients from the colonised group died during the study period. A total of 74 SM isolates were available for analysis. All the isolates were predictably resistant to cefuroxime but sensitive to carbapenem class antibiotics. Resistance to quinolones and temocillin was variable. SM was deemed community acquired in 13 (87%) of cases.

Conclusions SM remains an uncommon pathogen in adult bronchiectasis and is associated with a high BSI or advanced disease. *Pseudomonas aeruginosa* colonisation is usually established prior to its isolation. Antibiotic resistance remained stable and predictable in this cohort of patients. The acquisition of the pathogen in the community for most patients warrants further investigation using genotyping and whole genome sequencing.

P246 A SYSTEMATIC REVIEW OF SELF-MANAGEMENT SUPPORT INTERVENTIONS FOR ADULT BRONCHIECTASIS PATIENTS: A REALIST SYNTHESIS

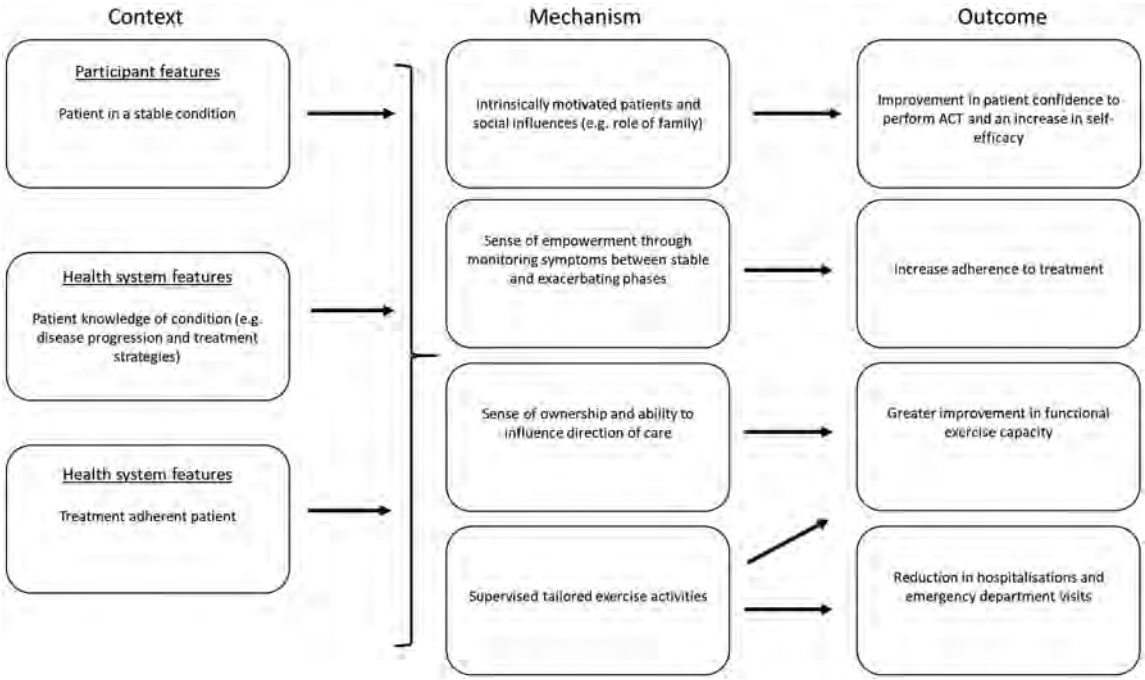
A Tsang, D Lynes, H McKenzie, S Spencer, CA Kelly. *Edge Hill University, Ormskirk, Lancashire, UK*

10.1136/thorax-2019-BTSabstracts2019.389

Background Bronchiectasis is a chronic respiratory condition characterised by abnormal and permanent dilation of the bronchi. It is associated with frequent exacerbations, reduced quality of life and significant burden on patients, families and healthcare services. Self-management interventions are advocated by national and international guidelines and benefits in the management of other airway diseases, such as COPD and asthma, are established. Evidence for the efficacy of self-management in bronchiectasis however remains dearth; a Cochrane systematic review found insufficient evidence to determine whether self-management 1interventions benefit people with bronchiectasis (Kelly et al, 2018).

Objectives An integrative systematic review was undertaken to include all research designs to describe the components of self-management support interventions and investigate what works, for whom and in what circumstances.

Methods A comprehensive database search was conducted on seven databases: MEDLINE Ovid, EMBASE Ovid, CINAHL, EBSCO, AMED, Web of Science Core Collection, and CENTRAL. Cluster searching was performed to supplement electronic database searches to maximise the identification of relevant evidence. Qualitative and quantitative evidence was considered if at least two of the following components of self-management support interventions were included: education, exercise, adherence to treatment, symptom monitoring, airway clearance techniques and action plans. Realist synthesis



Abstract P246 Figure 1

was undertaken to synthesise all eligible studies to produce context-mechanism-outcomes (CMO) configurations to inform the development of an overarching logic model.

Results A total of six eligible studies (n=258) were included in the synthesis (two RCTs, two qualitative studies and two pre-post studies). A summary CMO-configuration identified contexts (adherent patients in a stable condition and patient knowledge of condition) interacted with four mechanisms (e.g. intrinsically motivated patients and sense of ownership and ability to influence direction of care) produced outcomes including improvement in patient confidence, self-efficacy and reduction in hospitalisations (figure 1).

Conclusions Findings from this evidence synthesis broadly corroborate limited evidence about self-management for adult bronchiectasis patients. For future research we recommend targeting components that were least examined (e.g. action planning) with a focus on mental health and the role of social support.

REFERENCE

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P247 'ADULT BRONCHIECTASIS PATIENTS' PERCEPTIONS OF EXERCISE: A QUALITATIVE STUDY'

[1]H Evans, [2]C Kelly. [1]*Royal Liverpool and Broadgreen University Hospitals Trust, Liverpool, UK*; [2]*Edge Hill University, Ormskirk, UK*

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Introduction Bronchiectasis is a chronic respiratory condition characterised by abnormally dilated airways leading to increases in, and pooling of, respiratory secretions. Approximately 5 in every 1,000 adults in the United Kingdom have bronchiectasis. Exercise reduces dyspnoea, increases exercise tolerance and improves quality of life in patients with chronic respiratory disease and is an effective method of secretion clearance.

Patients with bronchiectasis have reduced exercises tolerance and are less active than the general population. Many do not participate in pulmonary rehabilitation but the reasons for this are unclear. No evidence currently exists regarding the attitudes of bronchiectasis patients towards exercise, and barriers to compliance. In order to introduce effective measures to increase adherence to exercise, reasons for poor adherence and potential barriers need to be identified.

Aim To explore the views of adult bronchiectasis patients towards exercise.

Method A qualitative study was carried out, consisting of semi-structured interviews with ten adult patients with bronchiectasis at a single site in the north west of England. Perceptions of exercise, potential barriers to exercise and potential facilitators of exercise were explored. Thematic analysis was used to code the data and identify themes.

Findings Five main themes were identified following the analysis:

1. Facilitators to exercise e.g. enjoyment, pacing and adaptation, self–motivation.
2. Barriers to exercise e.g. embarrassment regarding symptoms, breathlessness, fear of exacerbating symptoms.
3. Exercise has a positive impact on health and life expectancy
4. Grief regarding loss of ability
5. Definitions of exercise

Conclusion These findings suggest that there are a number of shared facilitators and barriers to exercise between bronchiectasis patients. Participants recognised that exercise was positive, but had differing perceptions on what 'exercise' actually entailed. Future research needs to further explore potential barriers and facilitators to exercise in this patient group on a larger scale. This could then lead to the use of behaviour change models to aid participation in exercise. These findings indicate that healthcare professionals should consider

bronchiectasis patients holistically in order to aid compliance with exercise. Healthcare professionals need to reflect on their role in exercise advice and prescription, and the language used when doing so.

P248 OPERATIONALISING THE CFHEALTHHUB CRITERIA FOR CHRONIC PSEUDOMONAS AERUGINOSA INFECTION AMONG ADULTS WITH CYSTIC FIBROSIS IN CLINICAL PRACTICE

[1]LA Hitchcock, [1]ZH Hoo, [2]R Curley, [2]MJ Wildman. [1]*University of Sheffield, Sheffield, UK*; [2]*Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK*

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Background *Pseudomonas aeruginosa* (PA) status guides the clinical management of cystic fibrosis (CF). The Leeds criteria are most commonly used to determine PA status in CF research but they are based on microbiological results alone and lack sensitivity among adults with CF. The CFHealthHub criteria (Hoo et al, Eur J Clin Microbiol Infect Dis 2018) incorporate additional information and in theory, are more sensitive. However, these criteria contain multiple components and may be more complex to operationalise.
Aim To evaluate how easy and reliable it is for a 'novice' to operationalise the CFHealthHub criteria after basic training.
Method A 3rd year medical student with no prior CF exposure was given an introduction to CF, PA, and the CFHealthHub criteria, and trained to extract relevant data from electronic patient record to operationalise the CFHealthHub criteria. The student then retrieved the necessary data and determined the PA status for 186 adults with CF in Sheffield during 2016. The student also recorded the specific criteria fulfilled, and the start and end times to operationalise each PA status. The correct PA status according to the CFHealthHub criteria was independently determined by two CF clinicians. Agreement between clinicians and the student was determined using kappa statistics. The time taken by the student to operationalise the CF criteria for each adult was calculated. The 186 adults with CF were divided into six equal cohorts to determine the student's efficiency over time.
Results Among 186 adults, 116 (62.4%) have chronic PA infection. The student deemed 113 adults (60.8%) to have chronic PA infection. Clinicians and the student agreed on the PA status for 175 (94.1%) adults, with a Cohen's kappa coefficient of 0.88 (95% CI 0.80–0.94). The mean time per adult taken by the student to operationalise the CFHealthHub criteria was 6.2 minutes (95% CI 5.6–6.8 minutes). The time taken reduced with each successive cohort (ANOVA p-value <0.001) whilst the accuracy remained similar.
Conclusion It is feasible to train a novice to operationalise the CFHealthHub criteria to a high degree of accuracy. As the novice gained more experience in operationalising the criteria, the process took less time.

Abstract P248 Table 1 Performance of the student in operationalising the CFHealthHub criteria with each successive cohort of adults with CF

Cohort number	Agreement between the student and clinicians Number of adults (%)	Time taken by the student to operationalise the CFHealthHub criteria (minutes) Mean (95% CI)
1	30 (96.8)	9.68 (7.97–11.39)
2	26 (83.9)	7.32 (5.89–8.75)
3	30 (96.8)	5.68 (4.11–7.25)
4	30 (96.8)	5.19 (4.09–6.30)
5	31 (100.0)	5.23 (4.40–6.05)
6	28 (90.3)	4.03 (3.20–4.86)

P249 CF BOOST – ENGAGING THE DISENGAGED

H Green, M Clegg, F Dowdall, V Kendall, L Kinsey, J Hildage, H Oxley, J Pickles, A Jones. *Manchester University NHS Foundation Trust, Manchester, UK*

10.1136/thorax-2019-BTSabstracts2019.392

Background In our large adult CF centre, we adhere to national guidelines on the management of cystic fibrosis (CF) but have noticed that even the best 'standard CF care' does not suit all patients. We have a cohort of patients that deteriorate rapidly despite receiving excellent advice from the CF MDT. These patients are typically non-adherent to medications and physiotherapy, have low BMIs, frequently exacerbate, rely on intravenous antibiotics and have accelerated lung function decline. Furthermore, these patients often have psychological difficulties and struggle to communicate optimally with the MDT.
Objectives We aimed to develop an outpatient based service to provide intensive multidisciplinary support to these patients with key objectives being to improve: communication and engagement with the CF MDT; adherence; nutrition; lung function and to give enhanced psychosocial support.
Methods The CF BOOST (Cystic Fibrosis Better Outpatient Outcome Support Team) service was developed consisting of 1 consultant, 2 specialist nurses, 2 physiotherapists, 1 dietician and the psychosocial team. Each enrolled patient receives intensive home support using a combination of phone calls, texts, emails and home visits. Weekly MDT meetings are held to discuss progress, problems and patient feedback and priorities. A summary of discussions and proposed individualised action plan is immediately discussed with the patient.
Results 7 patients are now enrolled in the service. The first patient to enrol has now completed 12 months of CF BOOST support. This patient is now taking all oral medication and regular nebulised antibiotics for the first time in their life and has had a sustained 10% (absolute) increase in FEV1. BMI has risen from 16.2 to 21.8 (without enteral feeding or supplements), intravenous antibiotic days have halved, anaemia and hypoalbuminaemia have resolved and mean CRP is the lowest it has been in a decade. All 6 more recently enrolled patients are also showing favourable outcomes e.g. improved lung function, BMI, adherence and engagement and decreased intravenous antibiotic frequency. The use of text messaging has hugely improved all patients' engagement and communication.
Conclusions Using an alternative approach with rapidly deteriorating, non-adherent, disengaged patients can result in significant improvements in patient outcome and satisfaction.

P250 THE MICROBIAL LANDSCAPE OF THE UPPER AND LOWER RESPIRATORY TRACT IN PWCF AND HEALTHY INDIVIDUALS

[1]GG Einarsson, [2]RW Lord, [1]AJ Lee, [3]JA Smith, [1]JS Elborn, [2]AM Jones, [1]MM Tunney. *[1]Queens University Belfast, Belfast, UK; [2]Manchester Adult Cystic Fibrosis Centre, Manchester, UK; [3]Respiratory and Allergy Clinical Research Centre, Wythenshawe Hospital, Manchester, UK*

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Background Historically during microbiological observations sputum has been thought to represent the 'lower' airway or the lung environment. However, during expectoration sputum passes through the oropharynx, potentially resulting in contamination by oropharyngeal microorganisms.

Methods Matched sputum (SPU) on oropharyngeal rinse (OPR) samples were collected from people with cystic fibrosis (PWCF; n=40) and healthy volunteers (HV; n=6). Genomic DNA was extracted and microbial community profiles determined by sequencing the V4 region of the 16S rRNA marker gene using the Illumina MiSeq platform. Changes in microbial community composition, alpha- (richness, Shannon-Wiener diversity, evenness, dominance) and beta-diversity (ADONIS [PERMANOVA] and mean *distance* to group *centroid)* were compared between sampling sites (SPU vs. OPR) within groups (PWCF and HV), and between cohorts (PWCF vs. HV).

Results At the level of phyla, CF-SPU showed significant enrichment in the mean relative abundance for Proteobacteria when compared to CF-OPR, HV-OPR and HV-SPU samples ($p=4.10*10–^{15}$). Conversely, CF-OPR, HV-OPR and HV-SPU samples contained significantly higher levels of Firmicutes compared to CF-SPU samples ($p=8.24*10–^{11}$). For the main genera, CF-SPU demonstrated higher relative abundance of *Pseudomonas* spp. ($p=1.80*10–^{6}$; FDR-adjusted) when compared to CF-OPR, HV-OPR and HV-SPU. Similarly, for *Streptococcus* spp. the observed relative abundance was higher in CF-OPR, HV-OPR and HV-SPU samples when compared to CF-SPU ($p=5.50*10–^{5}$; FDR-adjusted). Comparison between PWCF and HV showed significantly lower alpha-diversity in PWCF when compared to HV, with CF-SPU showing significantly lower richness, Shannon-Wiener diversity and evenness ($p=8.76*10–^{11}$, $p=3.21*10–^{10}$ and p=0.02, respectively) and higher dominance ($p=1.54*10–^{8}$) when compared to CF-OPR, HV-OPR and HV-SPU, respectively. For beta-diversity, permutation-based statistical testing showed a significant difference between CF-SPU and CF-OPR (ADONIS; Bray-Curtis; $R^2=0.241$; p=0.001; 999 permutations). In addition, comparison between PWCF and HV showed a significant difference in community structure between the two groups (ADONIS; Bray-Curtis; $R^2=0.321$; p=0.001; 999 permutations).

Conclusion CF sputum samples differ considerably in their microbial community composition and structure when compared to oropharyngeal communities, suggesting a limited role for oropharyngeal contamination in determining their microbial community composition of CF-SPU. Furthermore, we show that oropharyngeal communities in PWCF lack most CF specific pathogens, and demonstrate a unique community signature when compared to healthy individuals.

Clinical studies in COPD: new evidence to guide practice

P251 IMPORTANCE OF SPUTUM CULTURE IN PATIENTS HOSPITALIZED FOR EXACERBATED CHRONIC OBSTRUCTIVE PULMONARY DISEASE

EJ Soto Hurtado, M Arredondo López, E Salcedo Lobera. *Pneumology Service, Hospital Regional Universitario, Málaga, Spain*

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Introduction and objectives Patients with Chronic Obstructive Pulmonary Disease (COPD) suffer episodes of clinical instability characterized by worsening of respiratory symptoms, known as exacerbations. The most frequent etiology of the exacerbations are respiratory infections. Sputum cultures can be useful in the management of the exacerbation and should be performed in patients with frequent exacerbations, severe obstruction or exacerbations that require mechanical ventilation. The aim of the present study was to review the frequency with which sputum culture is requested in hospitalized COPD patients and to verify its usefulness in the management of exacerbations.

Material and methods This is a one-year, retrospective, descriptive and analytical study of the patients admitted to our Pneumology Service between January 2017 to January 2018 with the diagnosis of exacerbated COPD. We collected demographic data, respiratory function, BODE severity index, exacerbations in the last year, and sputum culture.

Results We studied 193 patients with a mean age of 71±10 years, a smoking index of 62.8±28.9 pack/year (72% exsmokers) and 2.0±1.4 exacerbations per year. The mean FEV1 was 40±16% with a predominance of GOLD type 3. Of the total of hospitalized patients, cultures were requested in 122 (63%) being positive 44 (23%) and negative 78 (40%). Patients with positive cultures (23%) suffered more exacerbations in the year (2.6±1.9) than with negative cultures (2.0±1.3); p<0.029. We did not find significant differences when comparing age, FEV1, BODE index, smoking index or 6-minute walk test (6MWT). Regarding the type of cultivated bacteria, *P. Aeruginosa* was isolated in 25% of the cases, in the majority of the cases in severe COPD patients (91%). *H. Influenzae* in 27.3%, being 66% in severe patients.

Conclusions In our hospitalized patients, sputum cultures were requested in more than half of them. *P. Aeruginosa* and *H. Influenzae* were the most common microorganisms among patients with severe and very severe COPD. Sputum cultures are more useful in patients with a history of frequent exacerbations.

P252 COPD READMISSION RATES: TURNING THE TIDE

RE Sobala, KP Conroy, ND Lane, SC Bourke. *North Tyneside General Hospital, North Shields, UK*

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Introduction Readmission rates post COPD exacerbation are increasing. In 2014 the National COPD Audit showed 90 day all- cause readmission rates had risen, from 31% in 2003, to

Abstract P252 Table 1

Outcome	Pre-Intervention		Post-Intervention	
	Number of patients	Percentage (%)	Number of patients	Percentage (%)
Readmission within 30 days	19	35.2	15	25.9
Readmission within 90 days	24	44.4	24	41.4
Mortality within 30 days	4	7.4	1	1.7
Mortality within 90 days	6	11.1	5	8.6

43%. We assessed whether by addressing key modifiable factors we could decrease readmission rates and turn the tide.

Method The areas identified were: optimising COPD management including vaccination, hospital initiated smoking cessation, pulmonary rehabilitation and home ventilation, identification and treatment of cardiac and mental health comorbidities, identifying re-exacerbations (10–14 day bacterial surge), and promoting healthy nutrition and physical activity.

Pre-discharge usual inpatient teams were asked to address the key elements above. We aimed to undertake a structured review of all patients within 14 days of discharge. Patients discharged under the care of the Supported Discharge Service were reviewed at home. For other patients, slots were created within existing clinics and non-attenders were then offered a telephone review.

Results 54 index admissions were collected prior to initiating the review and compared to 58 admissions post review implementation. Demographics of both groups were similar with a mean PEARL score of 4.

Pre-intervention, 24 patients (44.4%) were readmitted within 90 days of discharge and 19 patients (35.2%) were readmitted within 30 days. Post review implementation 24 patients (41.4%) were readmitted within 90 days of discharge and 15 patients (25.9%) were readmitted within 30 days. The most common readmission reason was IECOPD.

Of the 58 patients eligible for review, 38 patients attended. Non-attendance was more often due to lack of arrangements being made (n= 17) than failure to attend (n= 3). 90 day readmission rates in those reviewed was 14 patients (36.8%) compared to 10 patients (50%) in those not seen.

Discussion Due to a mean PEARL score of 4, our patient demographic had a high likelihood of readmission within 90 days. Numerically there were fewer 90 day readmissions for patients who attended a structured review, however this did not achieve statistical significance. The study was under-powered. Whilst this was a small project, hospital admissions for COPD are rising; the potential benefits to patients and the NHS are large.

P253 EVALUATION OF THE OTTAWA COPD RISK SCALE (OCRS) AT ROYAL STOKE UNIVERSITY HOSPITAL (RSUH), UK IN PREDICTING ADVERSE OUTCOME IN COPD EXACERBATION

M Marathe, S Oh, K Leech, H Stone, I Hussain. *Royal Stoke University Hospital, Stoke, UK*

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Background The OCRS is a 10 point score designed to estimate short term adverse outcomes within 14 days (1). The score is made up of admission observations, investigations (including PCO2) and comorbidities. Adverse outcomes include death within 30 days, NIV/intubation, significant coronary events and early readmission. The aim of this project was to validate this score for the population at RSUH, UK and compare it to more established scores such as PEARL.

Methods We performed a retrospective review of 129 patients who presented to the emergency department at RSUH in December 2018. We used electronic records to calculate each patient's OCRS and determine the rate of adverse outcomes. We used the pre-existing BTS COPD audit forms to compare the patient's PEARL and DECAF scores.

Results Figure 1 shows the number of patients per score and the rate of adverse outcomes. 45 patients had no Arterial Blood Gas (ABG) and 42 patients had no electrocardiograms on admission. All 4 patients with OCRS score of 0 who had an adverse outcome had no ABG.

		Specific Primary Adverse Outcomes:						Any adverse outcomes:	
OCRS score	Number	Death within 30 days	Higher monitoring	NIV/ intubation	MI	Coronary treatment or dialysis	Readmission within 14 days	Absolute number	Percentage
0	21	1	0	0	0	0	4	4	19%
1	20	2	0	1	0	0	4	6	30%
2	24	4	0	1	0	0	4	5	21%
3	26	4	1	1	0	1	6	8	31%
4	21	3	0	1	0	0	5	8	38%
5	10	1	0	2	0	0	1	4	40%
6 - 9	7	1	0	3	2	0	1	5	71%

Abstract P253 Figure 1

The PEARL score gave a more useful estimation of readmission with 7% 30-day-readmission for PEARL score 0 – 1 and 40% 30-day-readmission for PEARL score 5 – 7. The 30 and 90 day readmission rates for the OCRS categories were calculated and showed no correlation.

Discussion Although the OCRS does seem to predict adverse outcomes in the highest scores (above 6), it does not help to differentiate between the lower scores. However, there are several limitations to this retrospective study including the inconsistent availability of admission ABGs, particularly in the lower risk groups. If this was available, a clearer risk stratification may have been possible. It is unclear however whether advocating ABGs during a busy acute take purely for the aim of risk stratification is justified.

The PEARL score, which was designed to predict re-admission risk, was able to predict more successfully the 30 and 90 day readmission rates. We recommend using this score in supporting discharge and targeting resources aimed at reducing readmission.

P254 ASSOCIATION OF LOW SERUM CREATININE AND MORTALITY IN COPD

A Afzal, K Heyes, S Baksi, S Khalid. *Royal Blackburn Teaching Hospital, Blackburn, UK*

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Introduction BODE index is used commonly in patients with COPD to predict mortality and relies on the body mass index (BMI). Muscle mass has been shown to be better predictor of mortality than BMI in COPD.[1] In the DECAF model,[2] low serum creatinine was not evaluated as a marker for increased mortality for patients with COPD. Serum creatinine levels are routinely checked during acute admissions and as the levels are partly dependent on muscle mass, it may be possible that it can be used as a predictor for increased mortality in these patients.

Objective The aim of this study is to determine whether there is any significant association between low serum creatinine and mortality in patients with severe COPD.

Methods Retrospective analysis of serum creatinine values at admission and within the last 1 year prior to admission with mortality at 30 days and 1 year after admission in patients admitted with acute type 2 respiratory failure due to COPD over period of one year to a respiratory ward (N=130). The statistics were calculated using Chi-squared test.

Results The results are shown in table 1. The results suggest significant relationship between the 1 year pre-admission creatinine values and mortality at 1 year (p=0.0003). At 30 days, there does not appear to be a significant relationship between low creatinine and mortality.

Conclusions The relationship with mortality appears to be stronger with pre-admission creatinine values rather than the admission values and appear to show highest risk of mortality at 1 year after admission.

Abstract P254 Table 1 Relationship between low serum creatinine and mortality at 30 days and 1 year

	Died within 30 days	Alive at 30 days	P value	Died within 1 year	Alive at 1 year	P vlaue
Low admission creatinine (N=31)	7	24	p=0.107	17	14	P=0.068
Normal or high admission creatinine (N=99)	11	88		36	63	
Low creatinine within 1 year before admission (N=48)	6	42	p=0.734	30	18	p=0.0003
Normal or high creatinine in year before admission (N=82)	12	70		25	57	

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P255 THE RELATIONSHIP BETWEEN BODY MASS INDEX AND COPD EXACERBATIONS

[1]RJ Jose, [2]A Manuel, [3]JA Wedzicha, [3]GC Donaldson. *[1]UCL Respiratory, Centre for Inflammation and Tissue Repair, London, UK; [2]University of Liverpool, Liverpool, UK; [3]National Heart and Lung Institute, Imperial College London, London, UK*

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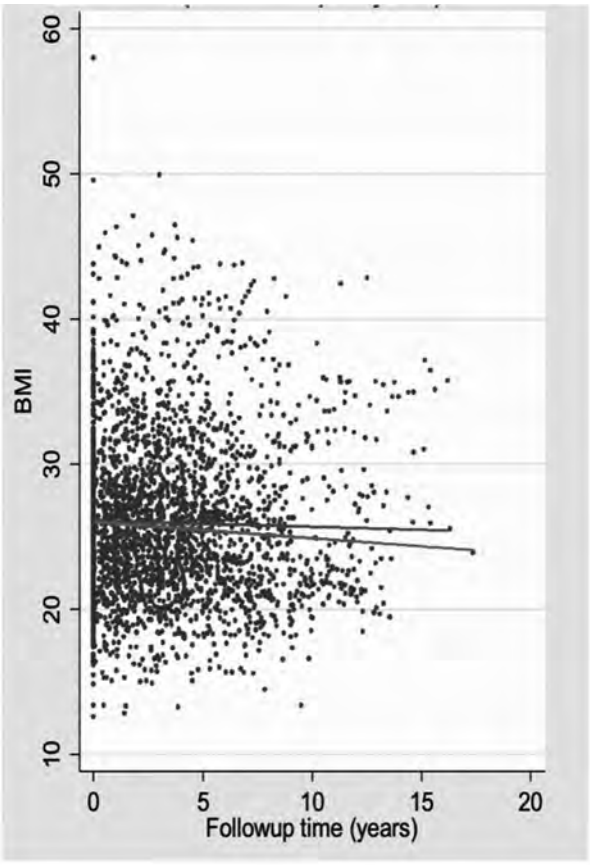
Introduction It is unclear if adipose tissue has a detrimental or protective effect in COPD. Whilst in various chronic diseases a protective effect of adipose tissue against mortality has been observed, adipose tissue promotes a low-grade chronic pro-inflammatory state that may be deleterious in COPD patients.

Methods Data were analysed from a well-established prospective cohort of 475 COPD patients. Exacerbations were defined by symptomatic criteria (Seemungal, Donaldson *et al*. 1998). BMI (Kg/m^2) was the average value over follow-up. Random effect models were used to analyse the interaction between BMI over time and frequent ($\geq$2/year) and infrequent exacerbators.

Results Patients had a mean (SD) age of 68.8 (8) years and 64.6% were males. Mean (SD) FEV1% and FEV1/FVC was 47.6 (16.6) and 0.47 (0.12), respectively. 160 (34.0%) were smokers at recruitment and the mean smoking pack years was 52.3 (37.4). BMI was <20, 20 – 25, and >25 in 10%, 36% and 54% of patients. Median number of observation days was 1172 (IQR 682–2024) and the median number of exacerbations per year was 2.28 (IQR 1.11 – 3.62).

Compared to BMI 20–25, FEV1 decline over time was slower in those with BMI>25 (+8.02 (95% CI 3.2 – 12.8) vs -39.9 (95% CI -48.0 - -31.7) ml/year, and faster in those with BMI <20 (-60.2 (95% CI -68.4 - -52.0) vs +28.3 (95% CI 19.4 – 37.2) ml/year.

At the onset of COPD exacerbations, patients with a higher BMI were more likely to report wheeze (OR 1.02, p=0.026) and sore throat (OR 1.03, p=0.034) but not increased breathlessness (OR 0.98, p=0.56), cough (OR 1.00, p=0.813) or sputum volume (OR 0.99, p=569). BMI did not have an effect on symptom duration (IRR 1.00, p=0.800). COPD patients with frequent exacerbations had a faster rate of decline in BMI compared to infrequent exacerbators (-0.071 kg/m^2/year vs -0.042 kg/m^2/year, p=0.007, Figure 1).



Abstract P255 Figure 1 BMI declines faster over time in frequent exacerbators. Dot plot of BMI (Kg/m^2) over time (years). Top line represents infrequent exacerbators and the bottom line represents the frequent exacerbators

Conclusions In COPD patients BMI has a significant impact on lung function decline over time and on reported exacerbation symptoms. Importantly, BMI declines faster in frequent exacerbators compared to infrequent exacerbators, suggesting that reducing exacerbation frequency may prevent BMI and lung function decline.

P256 PATIENTS' PERCEPTIONS OF COPD EXACERBATIONS LEADING TO HOSPITALISATION

[1]A Pooler, [2]MA Allen. *[1]Keele University, Stoke on Trent, UK; [2]University Hospital North Midlands, Stoke on Trent, UK*

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Background There is much attention around the physiological factors around the admission but psychological factors, especially the patients voice and perceptions are often poorly considered. These issues could hold vital clues which need to be considered in their long-term care of their COPD.

Aim To uncover the patient voice and perceptions of why they were admitted to hospital with an acute exacerbation of COPD.

Methods A random selection of patients who were readmitted within a 30-day period over 4 months of winter 18/19, undertook a semi-structured interview about self management/pre admissions factors and asked to complete the Hospital Anxiety and Depression score (HADs), Ways of Coping Checklist (WOC) and Multi-Dimensional Health Locus of Control (MDHLOC) questionnaires. The group was spilt into those who scored highly in the HADS for anxiety and depression (score above 15 on the scales) and those who did not.

Abstract P256 Table 1

	Males (n=12)	Females (n=12)
Abnormal levels of depression as scored by HADs (score >16)	10 (83%)	11 (92%)
Abnormal levels of anxiety as scored by HADs (score >16)	6 (50%)	9 (75%)
External locus of control (LOC)	7 (58%)	11 (92%)
Abnormal ways of coping	6 (50%)	12 (100%)

Results All 24 contacted patients agreed to participate; M:F 1:1, with a mean age of 72.3 years. (see results table 1). All reported feeling frightened by their increased breathlessness and felt the only thing to do was to phone for an ambulance. They responded overwhelmingly that they did not want to self-manage their condition with plans and rescue medications and that they felt the only solution would be to get to the hospital or they might die from their exacerbation. There was an overwhelming fear of death, despair and despondency with their condition and the resultant admissions. Those with co morbid anxiety or depression felt a lack of support for their conditions which they felt were never considered in relation to their overall management of their COPD.

Conclusions The patient voice is strong and should be listened to. These findings suggest a more holistic approach to long term care of people with COPD. More attention should go to listening to their fears and supporting them than handing out home rescue medications which are often left untouched.

P257 EFFECTIVENESS OF A HOLISTIC COPD EARLY SUPPORTED DISCHARGE SERVICE

K Converso, H Bakere. *Royal Devon and Exeter Hospital, Exeter, UK*

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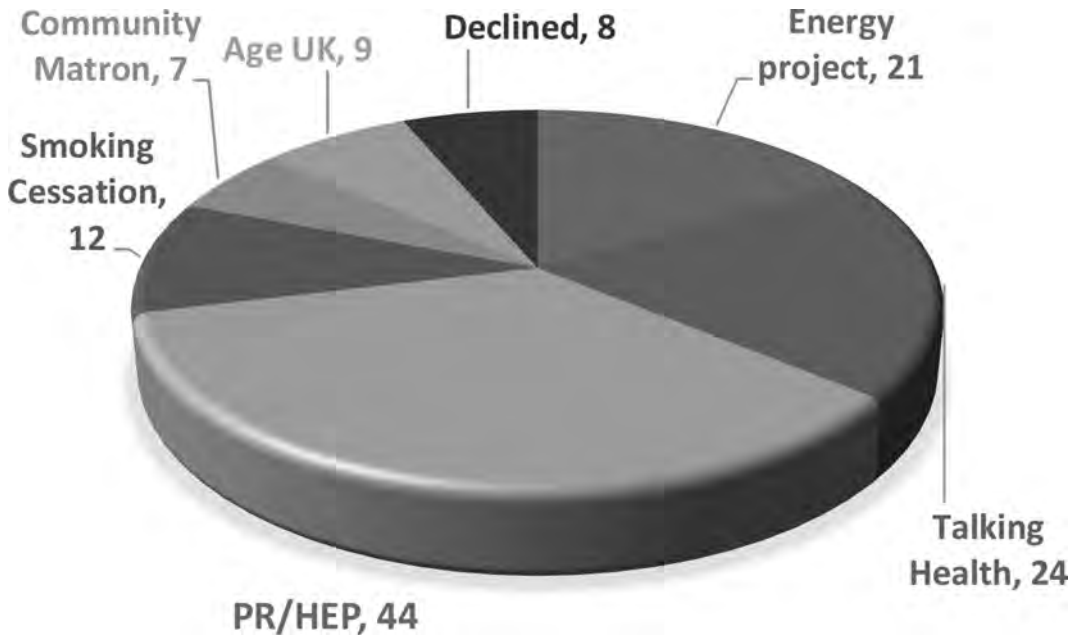
In the Exeter COPD early supported discharge program we have aimed to facilitate early discharge, optimise medical management, promote exercise and mental well being and particularly address the patients unmet psychosocial needs. We assessed our impact in the first 6 months of running this service.

The service consists of a team of 2.5 specialist Respiratory Nurses and 1.2 Physiotherapists supported by a Respiratory Consultant

We addressed social issues by working with partner organisations including a Local energy efficiency project which works to improve the quality of patient's homes through insulation and heating upgrades, Talking Health a mental health support project, Pulmonary Rehabilitation, Smoking Cessation, Community Matrons, Dieticians and other voluntary services such as Age Concern.

We proactively encouraged pulmonary rehabilitation uptake and if patients are unable to attend Pulmonary Rehabilitation



Abstract P257 Figure 1 Referal by service

(PR) we devise a Home Exercise Programme (HEP) with them and set a realistic goal.

The service has seen a total of 125 patients over a 6 month period. Since the service has been running our COPD length of stay has dropped from 6.87 days (winter17/18) to 5.24 days (winter18/19), 90 day readmission rate has dropped from 40% to 25%.

92% of patients had an onward referral to an additional support service as listed above.

Patients were encouraged to set personal exercise goals, 16 patients set personal goals with our support ;these ranged from 'stay out of hospital for 3 days in a row' to 'walking into town/2 miles a day/joining more social activities'. All patients who set personal goals met them. Patient feedback was excellent. 'Exactly what I needed', 'This kept me out of hospital'.

An economic analysis showed that the service more than payed for its staff and other costs by saving bed days and in fact generated a net saving of £27000. (Saving generated by hospital bed days saved £112,500; staff and other costs were £85,572).

As well as keeping patients in the community, optimising treatment and promoting self-management this service has helped patients bridge various service gaps and addressed their psychosocial wellbeing.

P258 EVALUATION OF THE FEASIBILITY OF PROVIDING PATIENTS WITH A SELF-MANAGEMENT COPD TOOLKIT FOR BREATHLESSNESS – 'BREATH-IN-A-BAG'

[1]L Clinch, [2]L Houchen-Wolloff, [3]K McSporran, [1]AC Murphy. [1]*University Hospitals of Leicester NHS Trust, Leicester, UK*; [2]*University of Leicester, Leicester, UK*; [3]*Leicestershire Partnership Trust, Leicester, UK*

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Introduction Exacerbations of COPD are frightening experiences for patients; breathlessness is a key feature and many patients feel a sense of panic. Patients may seek medical help without firstly trying to manage their breathlessness themselves at home. National COPD guidelines recommend higher doses of inhaled short-acting beta-2 agonists (SABA), with the most effective way of administering via a metered dose inhaler (MDI) with a spacer device. A hand-held fan has also been shown to reduce the sensation of breathlessness. We studied the feasibility of providing patients with a breathlessness self-management toolkit.

Methods A subset of patients with COPD admitted between January-March 2019, Glenfield Hospital, Leicester were given a cloth-bag containing a salbutamol inhaler, Aerochamber Plus, hand-held fan, and a COPD self-management plan. Patients were advised to keep the pack separate from their routine treatments and somewhere easily accessible should an increase in breathlessness occur. At this time patients were encouraged to follow the written/pictorial instructions on the bag,

Abstract P258 Table 1 Respondents with correct answer to the statements in the pre- and post questionnaires.

	Pre-Questionnaire (n=71)		Post-Questionnaire (n=70)	
Using a spacer device will increase the amount of drug getting into my lungs compared to using an inhaler on its own	51	72.80%	67	95.70%
I can inhaler up to 10 puffs of salbutamol at a time using the spacer if I am very breathless	46	65.70%	59	93.70%
A spacer device with an aerosol spray inhaler is often as good for my breathlessness as a nebuliser	28	40%	46	85.20%
Using a fan and moving it around my face will reduce the feeling of breathlessness	21	29.6%	44	62.9%

educatingthe patient to firstly increase their bronchodilator and to use a hand-held fan. Patients were asked to complete unvalidated COPD knowledge questionnaires pre- and one-month post intervention.

Results A total of 106 out of a possible 391 (27%) COPD patients were provided with the 'Breath-in-a-Bag', (mean age 70.1, 46% male, FEV_1mean 48% predicted, FEV_1/FVC 0.47). Pre- questionnaires were returned by 71 (68%) patients, with 70 (66%) post. 46 (65%) patients knew that they could inhale up to 10 puffs of salbutamol at a time using the spacer when very breathless, however only 21 (29.6%) were aware that a hand-held fan can be used to reduce breathlessness. Knowledge improved in relation to medicine use for breathlessness (Table 1). Comments from patients included;

'I follow the instructions on the bag when breathless'

'I feel less frightened'

Conclusion The exacerbation bag was feasible to deliver to patients during an admission by COPD Nurses on the Respiratory Wards. The bag was appreciated by patients and carers. Preliminary data suggests that patient knowledge on managing breathlessness has improved following the implementation. A fully powered trial is warranted to establish the efficacy of the intervention.

P259 A BETTER APPROACH TO COPD CASE FINDING IS REQUIRED IN PEOPLE WITH HIV

[1]PJ Collini, [1]C Mitchell, [1]DH Dockrell, [2]R Hubbard, [3]R Lawson. *[1]University of Sheffield, Sheffield, UK; [2]University of Nottingham, Nottingham, UK; [3]Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK*

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Perhaps because of infections and viral effects, COPD is more common and develops at an earlier age in people with HIV (PWH). Consequently, international guidelines advocate screening for COPD in this population. However, HIV specific evidence is sparse so there is no consensus on the best approach. Guidelines have adopted protocols used in the general population or remained vague. We sought to determine who would be identified by applying the European AIDS clinical Society 2018 (EACS) or Global Initiative for Chronic Obstructive Lung Disease 2019 (GOLD) COPD diagnosis and assessment protocols to a cohort of PWH in a typical UK HIV service.

Consecutive people routinely attending HIV monitoring clinic visits were surveyed for self-reported respiratory symptoms, smoking and other exposures and past respiratory diagnoses. At the same visit we measured FEV1 and FVC using spirometry. We evaluated what proportions that would warrant confirmatory spirometry or meet criteria for COPD according to EACS and GOLD.

181 PWH (median age 46 years, 32% female, 38.1% black) completed all investigations. 60 (33.1%) had ever smoked and 77 (42.5%) reported household exposure to biofuel smoke. 128 (68%) reported at least one of chronic cough, phlegm, wheeze or an MRC breathlessness score >1. 24 (13.3%) had a FEV1/FVC<0.7. 85 (47%) and 7 (3%) warranted spirometry assessment while 19 (10.5% median 46 years, IQR 39–52) and 3 (1.3%) were diagnosed with COPD according to GOLD and EACS criteria respectively. 10 reported an existing diagnosis of COPD (median 53.5 years IQR 48.5–58.25) of whom 9 met the GOLD but only 3 met the EACS criteria for spirometry assessment.

As in other cohorts of PWH, we found chronic respiratory symptoms were very common, there was a high prevalence of COPD at a younger average age and COPD is underdiagnosed. The GOLD criteria performed better than EACS to successfully identify 90% of those with known COPD and 10 previously undiagnosed cases. However, GOLD criteria indicated almost half the cohort needed confirmatory spirometry.

The results suggest that to maximise COPD case finding HIV clinics should use broad symptom, exposure and demographic criteria and have ready access to diagnostic spirometry.

Abstract P259 Table 1 A better approach to COPD case finding is required in people with HIV

	All HIV		GOLD COPD		GOLD eligible		EACS COPD		PMH COPD	
Total	181		19		85		3		10	
Age > 40	54	29.8%	17	89.5%	64	75.3%	3	100.0%	9	90.0%
Exposure										
Ever Smoker	60	33.1%	13	68.4%	46	54.1%	3	100.0%	7	70.0%
>10py smoker	49	27.1%	11	57.9%	38	44.7%	3	100.0%	6	60.0%
Biofuel Smoke HAP	77	42.5%	10	52.6%	50	58.8%	3	100.0%	3	30.0%
Symptoms										
MRC>1	80	44.2%	14	73.7%	70	82.4%	3	100.0%	9	90.0%
Chronic cough	63	34.8%	7	36.8%	46	54.1%	3	100.0%	7	70.0%
Chronic phlegm	54	29.8%	6	31.6%	39	45.9%	3	100.0%	7	70.0%
Chronic wheeze	37	20.4%	9	47.4%	30	35.3%	3	100.0%	2	20.0%
Spirometry										
FEV1/FVC<0.7	24	13.3%	19	100.0%	19	22.4%	3	100.0%	3	30.0%

GOLD COPD Spirometry confirmed COPD using GOLD 2019 criteria, GOLD eligible: Symptoms & Exposures warranting confirmatory spirometry using GOLD 2019 criteria, EACS COPD Spirometry confirmed COPD using EACS 2018 criteria, PMH: past medical history, HAP household air pollution, MRC: Medical Research Council Breathlessness Score

P260 IMPROVING END OF LIFE CARE FOR PEOPLE WITH COPD; OUTCOMES OF A NEWLY ESTABLISHED INTEGRATED PALLIATIVE COPD MDT

[1]AC Boland, [2]CM Kane, [3]J Ward, [4]C Hosker, [5]AE Wilkinson, [1]SDW Miller, [6]S Gillon. *[1]Department of Respiratory Medicine Leeds Teaching Hospitals NHS Trust, Leeds, UK; [2]Sue Ryder Wheatfields Hospice, Leeds, UK; [3]St Gemma's Hospice, Leeds, UK; [4]Leeds and York Partnership NHS Foundation Trust, Leeds, UK; [5]Leeds Community Healthcare Trust, Leeds, UK; [6]Department of Palliative Medicine Leeds Teaching Hospitals NHS Trust, Leeds, UK*

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Introduction Individuals with severe COPD have a significant symptom burden resulting in multiple hospital attendances and health care usage. With the aim of improving the accessibility of end of life care for these patients, and as a consequence reducing hospital attendance, we established an integrated palliative COPD MDT.

Methods The hour-long monthly MDT has representation from, respiratory medicine both primary and secondary care based, hospital palliative care team, two hospices and psychiatry.

A list of patients with frequent COPD related admissions is generated from the hospital readmissions data and reviewed by a respiratory consultant identifying patients with markers of severity who would benefit from a discussion. Patients referred by any members of the MDT are also discussed.

Data on actions following MDT and new referrals generated was collected. The total number of admissions and bed days in the 6 months before and after the first discussion at the MDT was also analysed. Patients who died during this time period were excluded.

Results In the first 9 months, 69 discussions took place about 55 unique patients. Meantime of the first discussion to death was 94 days (13.4 weeks)

39 patients had a full 6-month pre and post dataset. (Table 1)

55 (73%) patients had a change in their management plan, with new referrals generated to; Respiratory specialist 36; Palliative Medicine 19; Hospice services (including day hospice, breathlessness management programmes etc) 20.

The symptoms of COPD can be made worse by concurrent conditions such as anxiety or depression. The presence of a liaison psychiatrist, towards the end of the pilot period, allowed discussion of 9 patients where this was most complex to ensure that their mental health needs were also being addressed.

Conclusion This short monthly MDT has demonstrated the positive benefits of integrated working across organisational boundaries for a vulnerable group of patients with COPD. We have demonstrated a reduction in acute healthcare usage, therefore, enabling patients to spend more time out of the hospital. Outcomes are thought to be due to: shared expertise; ensuring care is optimised and not duplicated, and enabling patients to access all services available to them.

Abstract P260 Table 1 6 months prior to MDT discussion vs 6 months post MDT discussion

	Pre MDT	Post MDT	Reduction
Admissions	142	81	43%
Bed days	1086	787	28%

P261 PRIMARY CARE REVIEW OF PATIENTS ON LONG-TERM AZITHROMYCIN FOR CHRONIC LUNG CONDITIONS

[1]T Tembo, [2]J Higgins, [2]R Mohammed, [2]L Greenhalgh, [3]H Francis, [1]G Ng Man Kwong. *[1]Pennine Lung Service, Oldham, UK; [2]NHS Oldham, Oldham, UK; [3]Milltown Alliance, Oldham, UK*

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Long-term Azithromycin (LTA) can be effective in reducing infective exacerbations of Chronic Obstructive Pulmonary Disease (COPD) and Bronchiectasis but has potential side effects affecting liver, prolonging the QT interval and hearing.[1 2] We aimed to identify current LTA prescribing and monitoring practices in primary care.

Method Retrospective study of patients with chronic lung conditions on LTA for a minimum of 6 months identified from primary care records.

Results Overall 40 patients on LTA were identified from a GP cluster group (7 practices covering population of approximately 50,000) of whom 35 were suitable for inclusion. Average age 66 years (range 28–87 years, male 54%), COPD 18/35 (51%), Bronchiectasis 16/35 (46%) of whom 6/16 (38%) had an additional diagnosis of asthma. Mean duration on LTA was 4.5 years (range 1–12 years), 26/35 (74%) had LTA initiated in secondary care and the commonest dosing was 250 mg 3 times a week 25/35 (71%). Baseline sputum and ECG was obtained in only 16/35 (46%) respectively despite 12/35 (34%) having cardiac comorbidities. Regular liver function tests (LFT) were performed in 32/35 (94%) but only 12/35 (34%) had hearing monitored. Potential drug interactions were identified in 12/35 (34%) patients. Where matched data was available (20 patients) the mean (median) 12 month pre- and post-LTA exacerbation rate was 5.4 (4.5) and 2.1(1.5) episodes respectively ($P << 0.01$).

Conclusion In our sample LTA appeared to reduce exacerbation rate with the majority of patients having LFT monitoring. However less than half had baseline ECG and sputum sampling and potential drug interactions were identified in one-third of patients. We therefore recommend reliable monitoring and follow-up of patients on LTA to reduce the risk of unfavourable side effects.

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P262 CAN WE IMPROVE UPON CLINICIAN PREDICTION OF SURVIVAL IN ADVANCED COPD USING CLINICALLY MEASURABLE PROGNOSTIC FACTORS?

[1]MA Jones, [2]NJ Greening, [2]R Free, [2]G Woltmann, [2]T Ward, [2]MC Steiner, [2]RA Evans. *[1]Leicester Medical School, Leicester, UK; [2]Leicester NIHR BRC Respiratory Theme, Respiratory Sciences, University of Leicester, Leicester, UK*

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Introduction and objectives Although advanced COPD is associated with poor survival, individual trajectories are difficult to predict and clinician ability to recognise those in the last year of life is unknown. Factors which are prognostic for mortality have been identified across the spectrum of COPD severity. Whether they retain prognostication in advanced disease is also unknown. We investigated clinician prognostication and clinically measurable prognostic factors for mortality in patients with advanced COPD.

Methods Patients were recruited from an advanced COPD service between October 2013 and July 2018 forming a prospective observational cohort. Measures collected at baseline included spirometry, MRC dyspnoea grade, body mass index (BMI), four metre gait speed (4MGS), exacerbation history, home-oxygen use and presence of comorbidities. Clinicians' prediction of one year mortality was recorded in response to the 'Surprise Question': 'Would I be surprised if this patient died within the next 12 months?'. Receiver operating characteristic (ROC) analysis was performed to determine the accuracy of clinician assessment of prognosis. Mortality data were censored at February 2019. Survival analysis was performed using multivariate Cox regression.

Results 398 were patients recruited, 59% male, 24% current smokers, mean±SD age 66±9 yr, FEV_1% predicted 35±13%, BMI 26±7 kg/m^2, 88% MRC dyspnoea scale grade ≥4, 29% used home oxygen, 91% had a COPD exacerbation in the past year, and 88% had co-morbidities. Average follow-up time was 888 days, 145 deaths (36%) occurred and one-year mortality rate was 12%. The positive and negative predicted values for clinicians' prediction of one-year mortality were 24% and 93%, with an area under ROC of 0.65. Adjusted time to event analysis for patients with complete baseline data (n=277) showed older age, lower BMI and slower 4MGS were independently associated with increased risk of mortality (Table 1).

Conclusions In patients with advanced COPD, clinicians do not accurately identify those within the last year of life. Alongside age and BMI, 4MGS is an independent predictor of mortality in advanced COPD. A prognostic scoring system including these indices has the potential to assist clinicians identify patients in the last year of life supporting proactive development of advance care plans.

Abstract P262 Table 1 Multivariate Cox regression analysis of survival in patients with advanced COPD

		HR	SE	CI	p-value
Age at first CRA (years)		**1.05**	**0.02**	**1.02 – 1.08**	**<0.001**
FEV_1 (L)		0.54	0.24	0.23 – 1.28	0.16
MRC dyspnoea scale grade		0.94	0.24	0.8 – 1.54	0.81
4m gait speed (m/s)		**1.38**	**0.18**	**1.07 – 1.79**	**0.01**
BMI (kg/m^2)		**1.03**	**0.01**	**1.01 – 1.06**	**0.01**
Home oxygen use	No	1			
	Yes	1.27	0.35	0.74 – 2.17	0.39
COPD exacerbation(s) in	No	1			
previous 12 months	Yes	3.12	1.87	0.96 – 10.11	0.06
Comorbidity present	No	1			
	Yes	1.59	0.69	0.68 – 3.74	0.28

Covariates: high to low except for 4m gait speed and BMI where lower gait speed and BMI are associated with increased mortality
BMI = body mass index; FEV1= Forced expiratory volume in one second; MRC = Medical Research Council dyspnoea scale grade

P263 RELATIONSHIP BETWEEN COMORBIDITY AND QUALITY OF LIFE IN THE PATIENT WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

[1]EJ Soto Hurtado, [2]J Bujalance Zafra, [3]L García López, [3]I Millán Pinilla, [3]MJ Bujalance Zafra. *[1]Pneumology Service, Hospital Regional Universitario, Málaga, Spain; [2]Pneumology Service, Hospital El Ángel. Medical Department Ibermutuamur, Málaga, Spain; [3]Andalusian Health Care Service, 'Victoria' Health Center, District of Primary Health Care, Málaga, Spain*

10.1136/thorax-2019-BTSabstracts2019.406

Objectives To describe the profile of the patient with Chronic Obstructive Pulmonary Disease (COPD) in a health center, to know the comorbidity and its relationship with the quality of life.

Methods Cross sectional study. Of the patients included in the Clinical Care Program for patients with COPD at the Health Center (N=443), all patients who had been evaluated for quality of life in 2018 by their doctor through the COPD Assessment Test (CAT) were studied (n=129). Variables analyzed: age, sex, body mass index (BMI), smoking habit, GOLD obstructive pattern, degree of obstruction, dyspnea according to the Medical Research Council (MCR), quality of life with CAT, number and type of exacerbations and comorbidities, treatment of COPD, total drugs. Descriptive statistics, bivariate analysis.

Results Age 72.02±9.46 (male 78.29%). Ex-smoker 62.02%, active smoker 37.98%, BMI 27.64±5.05. Correct diagnosis with spirometry 85%. According obstructive pattern GOLD 1: 25 (19.84%); GOLD 2: 64 (50.8%); GOLD 3: 31 (24.6%) GOLD 4: 6 (4.76%). Dyspnea MRC 1.7±0.96, with significant dyspnea (≥2) 51%. Quality of life with CAT 13.5±8.2, with a significant impact (>10) 58.9%. The patients had 129 exacerbations: mild 21 (17.7%), moderate 87 (70.7%), and severe with admission 15 (12.1%). Average comorbidities: 4.17 (2.59%). Average of drugs: 8.24±4.28. The most commonly drugs for COPD were LAMA (87) 67.4%; LABA (66) 51.16%; Inhaled corticosteroids (50) 38.76%; SABA 38 (29.46%); SAMA 28 (21.71%). Comorbidity: hypertension (69%), arthrosis (42%), dyslipidemia (38%), diabetes (36%), obesity (32%), gastrointestinal disorder 30%, heart failure (24%), ischemic heart disease (23%),

arrhythmia (20%), peripheral arterial disease (19.4%), sleep apnea syndrome (18.6%), anxiety (13%), osteoporosis (11.6%), hyperuricemia (11.6%), depression (11.5%), cerebrovascular disease (10.8%), lung cancer (0.01%). The GOLD grade (P<0.001), the number of drugs (p=0.01), the presence of heart failure (p=0.08) and lung cancer (p=0.01) were associated with poorer quality of life in the patient COPD in the bivariate analysis.

Conclusions The profile of our patient COPD is a male ex-smoker, overweight, polymedicated, with comorbidity, being the most frequent: hypertension, osteoarthritis, dyslipidemia and diabetes, with a moderate obstruction to airflow, significant dyspnea and an average impact on his quality of life. Addressing comorbidity in COPD patients can improve quality of life.

P264 GLOBAL TREATMENT GUIDELINES AND PATTERNS IN COPD: FOCUS ON TRIPLE THERAPY

[1]N Sharma, [1]B Singh, [1]MK Siddiqui, [2]E de Nigris, [3]U Holmgren, [3]C Cabrera, [3]S Arnetorp. *[1]PAREXEL International, Mohali, India; [2]AstraZeneca, Cambridge, UK; [3]AstraZeneca Gothenburg, Mölndal, Sweden*

10.1136/thorax-2019-BTSabstracts2019.407

Introduction and objectives To review treatment guidelines for COPD and disease patterns across countries, and compare these with recommendations in the 2018 GOLD Report, with a focus on triple therapy.

Methods A targeted Embase®/MEDLINE® literature search was performed to identify COPD treatment guidelines (the most recent update) and studies of real-world treatment patterns in patients with moderate-to-very severe COPD (January 2006–March 2017) in Australia, Canada, China, France, Germany, Italy, Spain, the UK and the USA, all of which have at least one set of national guidelines for COPD management.

Results Fifteen COPD guidelines (13 national/2 global) and 45 studies on treatment patterns were reviewed. Overall, national guidelines broadly reflected the 2018 GOLD Report, with recommendations for COPD treatment based on the severity of airflow limitation, symptoms and exacerbations. No guidelines provided recommendations regarding inhaler device nor expressed a preference for a particular device type. All guidelines recommended escalation to triple therapy for symptomatic patients on dual therapy with frequent exacerbations, but differed as to whether triple therapy should be a step-up from LAMA/LABA or ICS/LABA. Guidelines differed in terms of COPD assessment and classification. Notably, no guidelines other than the GOLD Report used A–D categories based on symptoms/exacerbation risk. In general, the real-world pattern of care diverged from GOLD recommendations. In several countries, if compared strictly with guidelines, ICS-containing regimens were often over-prescribed, i.e. prescribed to low-risk patients. The use of dual and triple therapy was noted in patients with severe airflow limitation. However, use of triple therapy was reported in 60% of patients with only mild-to-moderate COPD severity, despite being prescribed less frequently than recommended in GOLD D patients overall.

Conclusions Although national guidelines for COPD treatment generally reflected the 2018 GOLD Report, real-world treatment patterns deviated from GOLD recommendations. No guidelines other than the GOLD Report used A–D categories based on symptoms/exacerbation risk. Future national guidelines should also consider recent updates to treatment recommendations in the 2019 GOLD Report and provide more precise guidance on drugs to be used based on exacerbation risk, symptoms and eosinophil levels.

P265 THE EFFECT OF HIGH FREQUENCY AIRWAY OSCILLATIONS ON THE LUNG CLEARANCE INDEX WHEN COMPARED TO A PLACEBO DEVICE

[1]E Daynes, [1]NJ Greening, [1]J Owers-Bradley, [2]S Sidiqqui, [1]SJ Singh. *[1]NIHR Biomedical Research Centre- Respiratory, Leicester, UK; [2]Department of Infection, Immunity and Inflammation, University of Leicester, Leicester, UK*

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Introduction It is reported that 2.7–33% of patients with COPD report sputum retention. This disparity is due to variability in outcomes. Current measures of sputum retention are labour intensive and with large variance, therefore there is a need for an objective measure. This study aims to explore the use of the Lung Clearance Index (LCI) as a surrogate measure of sputum clearance.

Methods Participants were recruited to complete the LCI as part of a randomised controlled trial. Participants used an oscillating device or a placebo for eight weeks. The LCI was derived from a multiple breath washout using an open circuit Innocor system using 0.2% sulphur hexafluoride (SF6). Participants breathed at tidal volumes and the washout was performed on room air. The test was terminated with participants reached 1/40th of the starting concentration. From the multiple breath washout the LCI and conducting and acinar slopes were analysed (S_{cond}/S_{acin})

Results 104 participants were recruited to this study. 53% of participants reported $\geq$3 on the COPD assessment test (CAT) sputum scale. Patients with $\geq$3 or <3 on the CAT sputum scale had a similar LCI (10.0905, 10.4851 respectively) however demonstrated higher (worse) S_{acin} (0.693, 0.504) suggesting an alteration in peripheral airways. Those receiving the placebo had a greater deterioration of the LCI comparatively to the active group (+0.6059 placebo, +0.3693 active). The S_{acin} improved greater in the intervention group (-0.178 active, -0.0476 placebo). These results were amplified when analysed according to the CAT sputum score (LCI CAT $\geq$3 0.3423, CAT <3 0.4164, S_{acin} 0.2603, 0.0911).

Conclusion During the study phase, both groups saw a worsening of their LCI however those receiving the active treatment had a better preservation of this. The S_{acin} improved greater in those using the active treatment and this was amplified when analysed in those with higher self-reported sputum.

The epidemiology and impact of difficult infections

M1 DO CLIMATE CHANGES INFLUENCE ENVIRONMENTAL ASPERGILLUS FUMIGATUS LOAD AT THE MANCHESTER UNIVERSITY NHS FOUNDATION TRUST ADULT CYSTIC FIBROSIS CENTRE?

[1]JA Coleman, [2]AM Jones, [2]LJ Collier, [3]MD Richardson, [2]RJ Bright-Thomas. *[1]University of Manchester, Manchester, UK; [2]Manchester Adult Cystic Fibrosis Centre, Wythenshawe Hospital, Manchester University NHS Foundation Trust, Manchester, UK; [3]Mycology Reference Centre, Wythenshawe Hospital, Manchester University NHS Foundation Trust, Manchester, UK*

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Aspergillus fumigatus is a ubiquitous opportunistic fungal pathogen found commonly in the outside and indoor environments. It is known to cause allergic disease in patients with cystic fibrosis (CF) who, unlike unaffected individuals, are less able to clear spores. There is little literature looking at the relationships between the amount of *Aspergillus fumigatus* in the environment and the weather. This study investigates how the *Aspergillus* levels in the environment of the Manchester Adult CF Centre vary with climate.

Methods Air samples were analysed from nine areas outside and within the Manchester Adult CF Centre, with at least 15 samples taken in each area over a 14-month period. Climatic information including mean, maximum, and minimum temperature and humidity, sunshine hours, mean wind speed and maximum gust, and rainfall, were obtained from a nearby meteorological office weather monitoring station. The *Aspergillus fumigatus* spore counts were then correlated with the 10 different meteorological factors to identify any associations.

Results The outdoor *Aspergillus* level was positively correlated to the daily maximum and mean temperature ($r=0.378$ $p=0.015$ and $r=0.356$ $p<0.022$ respectively) and negatively correlated to mean wind speed and maximum gust ($r=-0.465$ $p=0.002$, and r-0.427, $p=0.005$) on the day of sampling. Indoor *Aspergillus* levels also correlated with wind speed and gust, and maximum temperature, in a number of areas on the ward. *Aspergillus* counts were dramatically lower throughout the sampling period in an area on the ward with high air exchange rates. Maximum temperature; mean wind speed and maximum gust on the day before sampling were also correlated with outdoor *Aspergillus* level ($r=0.372$ $p<0.016$, $r=-0.374$ $p=0.016$ and $r=-0.342$ $p=0.029$ respectively). Rainfall, sunshine and relative humidity were not related to outdoor *Aspergillus* level ($p>0.05$).

Conclusion The environmental A*spergillus fumigatus* burden is positively associated with increased temperature and negatively associated with wind speed. Temporal changes in weather parameters appear to influence *Aspergillus fumigatus* burden for a subsequent 24 hour period. Climatic conditions will influence exposure to this pathogen for susceptible individuals, including patients with CF.

M2 PSEUDOMONAS AERUGINOSA (PA) BIOFILM-FORMING POTENTIAL AND METABOLOMIC PHENOTYPES DIFFER BETWEEN CHRONICALLY INFECTED PATIENTS WITH CYSTIC FIBROSIS (CF) AND NON-CF BRONCHIECTASIS (BX)

[1,2]WD Smith, [1]RA Murphy, [1]A Simbo, [1]OL Fletcher, [1,3]SJS Cameron, [1]EE Bardin, [1]Z Takats, [2]C Hogg, [1]A Filloux, [1,2]A Bush, [1,2]JC Davies. *[1]Imperial College London, London, UK; [2]Royal Brompton Hospital, London, UK; [3]Queens University Hospital, Belfast, UK*

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Chronic Pa infection in CF is linked to biofilm formation in the airways and there is modest evidence for this process in Bx. Pa demonstrates numerous other phenotypes which may play a role in enabling persistence in these diseases. We have previously demonstrated that Pa metabolome and virulence-related metabolites, including rhamnolipids and quorum sensing molecules, can be characterized using direct-from-sample mass spectrometry.[1] We hypothesized that these techniques would demonstrate disease specific differences in Pa strain characteristics.

Methods Pa strains from chronically infected patients (CF, $n=70$; Bx from all causes, including idiopathic Bx, but excluding CF, $n=70$) were cultured in rich media in a static crystal violet biofilm assay before measuring adherent biofilm biomass. Growth over the same time period was assessed for each strain. Separately Pa strains were cultured on agar before laser assisted mass spectrometry analysis.

Results CF strains demonstrated 1.7 fold greater biofilm biomass than Bx strains ($p=0.02$). Biofilm biomass correlated with bacterial growth rate (Spearman r 0.64 (95% CI 0.53–0.73), $p<0.0001$) though the increased biofilm biomass of CF strains persisted after growth correction. Mass spectrometry analysis was successful in 126 Pa strains. As observed before, there was considerable overlap in the principle component analysis of CF and Bx Pa metabolome. A supervised partial least squares-discriminant analysis (PLS-DA) demonstrated separation of the groups. Five component cross validation accuracy 0.89, $R2=0.81$, $Q2=0.63$. In future, we hope to identify the spectral features causing this separation.

Conclusion We demonstrated differences in Pa biofilm biomass and metabolome from CF and Bx patients, which may relate to variation in Pa airway adaptation. Possible explanations include pathophysiological (eg. surface liquid composition, pH) or therapeutic differences (eg. drugs to aid airway clearance, short and long-term antibiotics). Understanding features of Pa adaptation in CF and Bx could lead to identification of biomarkers of disease severity and novel approaches to treat Pa airway infection.

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M3 PSEUDOMONAS AERUGINOSA INDUCES INFLAMMATION IN BRONCHIAL EPITHELIAL CELLS VIA THE P38 MAP AND SYK TYROSINE KINASE PATHWAYS

[1]MS Coates, [1,2]K Ito, [1,3]EWFW Alton, [1,3]JC Davies. [1]*National Heart and Lung Institute, Imperial College, London, UK*; [2]*Pulmocide Ltd., London, UK*; [3]*Royal Brompton and Harefield NHS Foundation Trust, London, UK*

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Objectives *Pseudomonas aeruginosa* (*Pa*) infection is a major cause of inflammation in cystic fibrosis airways, initially mediated by bronchial epithelial cells, which are vital for the immune response. Kinase activation, such as MAP and Tyrosine kinases, are integral to inflammatory responses to *Pa*, therefore are potential targets for novel anti-inflammatory therapies. This study aims to determine which kinases are involved in *Pa*-induced inflammation.

Methods BEAS-2B bronchial epithelial cells were treated with kinase inhibitors against p38 MAPK (p38), MEK, JNK, Syk and c-Src at 1 μg/ml, for 2 hours, followed by *Pa* infection at 2.5×10^7 CFU/ml, for 5 hours. CXCL8 and IL-6 release were measured by sandwich ELISA. Combinations of inhibitors and novel narrow spectrum kinase inhibitors (NSKI) against p38, Src and/or Syk kinases were used to investigate synergistic effects of blocking multiple pathways. Synergy of compound combinations was calculated using the Chou-Talalay method.

Results An inhibitor of p38 showed 85.8% ($p<0.05$) and 74.7% inhibition of CXCL8 and IL-6, respectively, and a Syk inhibitor showed 99.5% ($p<0.0001$) and 100% ($p<0.05$) inhibition, respectively. MEK and JNK kinase inhibitors showed little inhibition of CXCL8 or IL-6, and the c-Src inhibitor inhibited CXCL8 only. Combinations of p38 and Syk/c-Src inhibitors showed synergistic inhibition of CXCL8, but not IL-6. An NSKI targeting p38, Src and Syk kinases showed significant inhibition of CXCL8 at 0.1 μg/ml (101%, $p<0.01$) and IL-6 at 0.001 μg/ml (100%, $p<0.01$), demonstrating greater potency than the single inhibitors alone.

Conclusion *Pa*-induced CXCL8 and IL-6 release is highly dependent on both p38 and Syk kinases, and inhibition of multiple selected pathways can lead to synergistic effects. Further investigation is planned to elucidate the possible role of Syk kinase in p38 activation. This study shows a potential for inhibitors of multiple specific kinases as potent anti-inflammatory therapies.

M4 PSEUDOMONAS AERUGINOSA INHIBITS ASPERGILLUS FUMIGATUS IN VITRO THROUGH MULTIPLE MECHANISMS, INCLUDING PYOVERDINE PRODUCTION

[1,2]DA Hughes, [1,2]D Armstrong-James, [3]JS Elborn, [1,2]JC Davies. [1]*National Heart and Lung Institute, Imperial College London, London, UK*; [2]*Royal Brompton and Harefield NHS Foundation Trust, London, UK*; [3]*Department of Medicine, Queen University Hospital, Belfast, UK*

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Objectives *Pseudomonas aeruginosa* (*Pa*) and *Aspergillus fumigatus* (*Af*) are the commonest bacterial and fungal pathogens in CF airways. *In vitro* studies suggest a complex co-inhibitory interaction between the organisms, with the fluorescent *Pa* siderophore, pyoverdine, central to this mechanism. We hypothesised that this would be strain-dependent and aimed to explore this further in 2 co-infection models.

Methods 21 clinical *Pa* isolates from CF patients were selected from our bacterial repository in addition to lab strains (*PA01*, *PA14*), and PA14NR transposon mutants lacking pyoverdine (*pvdD*, *pvdF*) and pyocyanin (*phzM*, *phzS*). An *Af* lab strain (*Af293*) and clinical *Af* isolate were used. 10 CF *Burkholderia cenocepacia* (*Bc*) and *Staphylococcus aureus* (*Sa*) isolates were selected. An *Af* lawn was generated by suspending 3.3×10^5 conidia/ml in 0.5% LB agar, onto which 10 μl of 16 hr bacterial broths were spotted. 72 hr co-cultures (37°C) were imaged at 24 hr intervals in lab (clearance zone estimation) and UV light (semi-quantitative measure of fluorescence). A 96-well plate co-culture model using sterile *Pa* culture filtrates (PCF) and anti-fungal drugs (Posaconazole, Amphotericin B) above *Af* cultures quantified this interaction effect using the metabolic Resazurin assay.

Results *Pa* lab strains and some clinical *Pa* isolates produced clear zones of *Af* inhibition, whilst others produced none. *Af* clearance was linked to strong UV fluorescence (high pyoverdine production) although not exclusively as *pvdD* inhibited *Af* growth. No *Sa* inhibited *Af* growth but some *Bc* isolates did. Indirect *Af* inhibition was quantified and confirmed using lab strain PCFs in 96-well plates. Established *Af* was less susceptible to anti-fungals and PCF than was early conidial growth.

Conclusion *Pa* isolates inhibit *Af* growth, both in direct co-culture and indirectly in a strain-dependent manner; pyoverdine is important but not exclusively so. Further genetic mutants are being used to explore these mechanisms.

M5 THE MULTIPLE SCLEROSIS DRUG, GLATIRAMER ACETATE, ACTS AS A RESISTANCE BREAKER WITH ANTIBIOTICS FROM DIFFERENT CLASSES AGAINST CYSTIC FIBROSIS STRAINS OF PSEUDOMONAS AERUGINOSA

[1]RA Murphy, [2]J Harrison, [3]S Schelenz, [1,3]JC Davies. [1]*Imperial College London, London, UK*; [2]*Cycle Pharmaceuticals, Cambridge, UK*; [3]*Royal Brompton and Harefield Trust, London, UK*

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Objectives Glatiramer acetate (GA), licensed for the treatment of multiple sclerosis, has modest antimicrobial activity against *Pseudomonas aeruginosa (Pa)*[1]. Due to its chemical similarities to antimicrobial peptides, we investigated GA as an antibiotic resistance breaker of *Pa* when used in combination with the common antimicrobials: tobramycin (TOB), ceftazidime (CAZ), ciprofloxacin (CIP) and colistin (CST).

Methods Strains PAO1 and PA14 were inoculated into Mueller-Hinton broth at starting optical density (OD_{600}) of 0.05 ($\sim 5 \times 10^6$ CFU/mL). Antibiotic (TOB, CAZ, CIP or CST) was added at antibiotic-specific concentrations, ± 50 μg/mL GA. Cultures were incubated shaking (200rpm) in a 96-well plate for 16 hrs at 37°C and growth measured by hourly OD_{600}. Serial dilution colony counts were performed on 16 hr cultures.

Results Growth curves indicated GA improved the efficacy of TOB and CAZ against PAO1 and PA14, effects confirmed by colony counting. Maximal effect was seen at different antibiotic concentrations (table 1). GA improved the efficacy of CIP against PA01 but not PA14; GA did not enhance killing of either strain by CST.

Conclusion The repurposed drug, GA, increased efficacy of TOB & CAZ with an up to ~80-fold decrease in Pa

Abstract M5 Table 1

	TOB (optimal conc)	Fold decrease in CFU with GA	CAZ (optimal conc.)	Fold decrease in CFU with GA	CIP (optimal conc.)	Fold decrease in CFU with GA	CST (conc.)	Fold decrease in CFU with GA
PAO1	1 mg/L (n=3)	44	128 mg/L (n=2)	86	0.5 mg/L (n=3)	8	4 mg/L (n=3)	No difference
PA14	1 mg/L (n=3)	42	128 mg/L (n=2)	32	0.5 mg/L (n=3)	3	4 mg/L (n=3)	No difference

number. Little effect was seen with CIP and was absent with CST, possibly due to similar modes of action on the bacterial cell membrane. Co-administration of GA could allow lower doses/shorter courses of antibiotic to be just as/more effective against *Pa* in CF, limiting side effects, or could enhance efficacy. Differences between CF clinical Pa strains were previously observed for TOB and are being explored further as this approach may best be applied in a personalised fashion.

M6 OUTCOMES OF PULMONARY MYCOBACTERIUM ABSCESSUS INFECTION

WG Flight, NE Hough, SJ Chapman. *Oxford University Hospitals NHS Foundation Trust, Oxford, UK*

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Background Treatment of *Mycobacterium abscessus* pulmonary disease is challenging with frequent side effects. There is little published data from UK settings to guide treatment decisions in *M. abscessus* infection.

Methods Patients at our centre with ³1 respiratory sample positive for *M. abscessus* from 2014 to 2019 were identified. Health records were reviewed retrospectively to determine factors associated with *M. abscessus* infection and clinical outcomes. Clearance of *M. abscessus* was defined as ³6 negative samples over ³12 months off treatment.

Results Thirty-seven patients were identified of whom 24 (64.9%) had cystic fibrosis (CF), 10 (27.0%) bronchiectasis, 2 (5.4%) COPD and 1 (2.7%) asthma. Median age at first *M. abscessus* isolate was 21 years (range 13–56) and 70 years (56–89) among CF and non-CF patients respectively.

ATS/IDSA criteria for NTM-pulmonary disease were met in 21/37 (56.8%) of cases. Six patients (16.2%) had a single isolate only. Initial isolates were smear-positive in 21/37 (56.8%). Susceptibility testing for Amikacin revealed 66.7% of initial isolates were sensitive, 25.0% intermediate and 8.3% resistant. Equivalent values for Clarithromycin were 20.0%, 12.0% and 68%.

Thirteen patients (35.1%) isolated ³1 other NTM (*M. avium* complex n=10, *M. fortuitum* n=2, *M. gordonae* n=2 and *M. triplex* n=1). Eighteen patients with CF (75%) had features of *Aspergillus* lung disease (ABPA n=9, *Aspergillus* sensitisation n=5 and *Aspergillus* bronchitis n=4) compared with 3 (23.1%) among non-CF patients.

Induction therapy was given to 22/37 (59.5%) patients (including 18/24 (75%) with CF and 4/13 (30.8%) without CF). Median duration of induction therapy was 6 weeks (range 3–12). Maintenance antibiotic therapy was prescribed to 17/22 (77.3%) of treated patients.

Culture conversion was seen in 16/24 (66.7%) of CF patients compared with 4/13 (30.8%) of non-CF patients. Among CF patients with culture conversion, 11/16 (68.8%) had received treatment while all four of the non-CF patients who received treatment failed to convert. Clearance of *M. abscessus* was confirmed in 12/37 patients (32.4%) of whom 6 had received treatment.

Conclusion Most patients with *M. abscessus* isolates met ATS/IDSA criteria for NTM-pulmonary disease. Culture conversion was more common in patients with CF but often occurred spontaneously in both groups.

M7 SHOULD WE BE PAYING MORE ATTENTION TO NUTRITIONAL STATUS IN NON-TUBERCULOUS MYCOBACTERIAL LUNG DISEASE?

[1]N Hussain, [2]M Kagka, [2]E Weekes, [1]R Breen, [3]H Milburn. *[1]Department of Respiratory Medicine, Guy's and St Thomas' NHS Foundation Trust, London, UK; [2]Department of Nutrition and Dietetics, Guy's and St Thomas' NHS Foundation Trust, London, UK; [3]King's College London, London, UK*

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Introduction The prevalence of non-tuberculous mycobacterial pulmonary disease (NTMPD) disease is growing, however data surrounding nutritional factors and disease activity are sparse. The association between vitamin D levels and tuberculosis is well recognised; this is yet to be replicated in NTMPD. Higher mortality rates are associated with low BMI scores in NTMPD. We aimed to assess nutritional status of patients with NTMPD and to link this with disease activity and outcome.

Methods Patients with NTMPD were identified and recruited in clinics. Baseline and 6-month follow-up assessments included blood tests, CT chest imaging, and nutritional and frailty status. Nutritional status was correlated with disease severity and outcome using correlation analysis and logistic regression. A total of 29 patients have been included in analysis to date.

Results We found significant negative associations between albumin levels and disease activity as measured by ESR and CRP (r_2=-0.441, p=0.045 and r_2=-0.458, p=0.014 respectively). There was a significant negative correlation between vitamin D levels at 6-months and ESR (r_2=- 0.818, p=0.013); vitamin D levels were significant predictors of ESR levels (F (3,1), p=0.018).

Higher BMI scores correlated with lower disease activity on chest imaging (r_2=-0.691, p=0.009). Poor gait scores correlated with higher disease activity on radiology and number of symptoms ((r_2=-0.423, p=0.028). More time taken to complete 5-chair stands was associated with increased disease activity on imaging (r_2=0.474, p=0.012). Gait scores were

Abstract M7 Table 1 Results from correlation analysis looking at associations between nutrition (using data from blood tests and mid-upper arm circumference (MUAC) and BMI scores) and frailty tests (gait and time taken to complete 5 chair-stands), and disease activity as measured by ESR, CRP, number of symptoms, and radiology. Significant results are displayed in bold with underlining

Variables	*Symptoms (baseline)*	*Radiology: Disease severity (baseline)*	*Baseline ESR*	*Baseline CRP*
Vitamin D (baseline)	R_2=0.00; P=0.99	R_2=0.53; P=0.80	R_2=0.123; P=0.62	R_2=0.100; P=0.644
Albumin (Baseline)	R_2= -0.353; P=0.06	R_2= -0.218; P=0.256	R_2= -0.441; **P=0.045**	R_2= -0.458; **P=0.014**
Vitamin B12 (baseline)	R_2= -0.317; P=0.186	R_2= -0.182; P=0.455	R_2= -0.159; P=0.587	R_2=0.109; P=0.667
Ferritin (baseline)	R_2= -0.038; P=0.865	R_2= -0190; P=0.398	R_2=0.102; P=0.708	R_2= 0.730; **P≤0.05**
BMI (baseline)	R_2= -0.230; P=0.240	R_2= -0.60; P=0.76	R_2= -0.211; P=0.358	R_2= -0.46; P=0.821
MUAC (baseline)	R_2= -0.250; P=0.190	R_2= -0.62; P=0.750	R_2= 0.94; P=0.68	R_2= -0.035; P=0.858
Gait score (baseline)	R_2= -0.423; **P=0.028**	R_2= -0.423; **P=0.028**	R_2= -0.305; P=0.191	R_2= -0.069; P=0.736
5 x chair-stands time (Baseline)	R_2= -0.286; P=0.148	R_2= 0.474; **P=0.012**	R_2= -0.52; P=0.833	R_2= -0.165; P=0.410
VARIABLES	***Symptoms (6-months)***	***Radiology: Disease severity (6-months)***	***ESR at 6-months***	***CRP at 6-months***
Vitamin D (6-months)	R_2= -0230; P=0.428	R_2= 0.235; P=0.419	R_2= -0.818; **P=0.013**	R_2= -0.246; P=0.466
Albumin (6-months)	R_2= -0.184; P=0.759	R_2= 0.244; P=0.362	R_2= -0.097; P=0.804	R_2= -0.466; P=0.093
Vitamin B12 (6-months)	R_2= -0.453; P=0.161	R_2= -0.264; P=0.432	R_2= -0.103; P=0.870	R_2= -0.47; P=0.904
Ferritin (6-months)	R_2= 0.232; P=0.445	R_2= -0.60; P=0.845	R_2= -0.378; P=0.403	R_2= -0.437; P=0.207
BMI (6-months)	R_2= -0.047; P=0.874	R_2= -0.691; **P=0.009**	R_2= -0.145; P=0.756	R_2= 0.177; P=0.602
MUAC (6-months)	R_2= -0.43; P=0.869	R_2= -0.354; P=0.178	R_2= -0.286; P=0.456	R_2= -0.027; P=0.927
Gait Score (6-months)	R_2= 0.293; P=0.332	R_2= 0.59; P=0.856	R_2= -0.522; P=0.230	R_2= -0.138; P=0.703
5 x chair-stands time (6-months)	R_2= -0.86; P=0.744	R_2= -0.28; P=0.915	R_2= 0.319; P=0.402	R_2= 0.879; P=0.319

also significant predictors of ESR (3,16) p=0.028. A further two patients with very poor levels of nutrition and frailty died before the 6-month follow-up

Frailty tests were not significant predictors of outcome as reflected by change in radiology findings after 6 months p<0.05.

Conclusions Lower BMI scores and lower levels of vitamin D and albumin are associated with higher levels of disease activity in NTMPD, reflecting an association between nutritional status and disease activity. Patients who score poorly on frailty tests seem to have higher disease activity. These results suggest that we should be paying more attention to nutritional status in NTMPD. We plan to expand on this data in order to assess whether nutritional factors have a further association with outcome.

M8 NON-TUBERCULOUS MYCOBACTERIA TESTING IN BRONCHIECTASIS IN THE UK: DATA FROM THE EMBARC REGISTRY

[1]S Finch, [2]R van der Laan, [1]M Crichton, [3]I Clifton, [4]T Gatheral, [4]P Walker, [5]C Haworth, [6]A Hill, [7]M Loebinger, [7]P Goeminne, [8]S Aliberti, [9]E Polverino, [10]A De Soyza, [1]JD Chalmers. *[1]University of Dundee, Dundee, UK; [2]INSMED, New Jersey, USA; [3]St. James University Hospital, Leeds, UK; [4]Aintree University Hospital, Liverpool, UK; [5]University of Cambridge, Cambridge, UK; [6]University of Edinburgh, Edinburgh, UK; [7]Royal Brompton Hospital, London, UK; [8]University of Milan, Milan, Italy; [9]Hospital Clinic i Provincial de Barcelona, Barcelona, Spain; [10]Newcastle University, Newcastle, UK*

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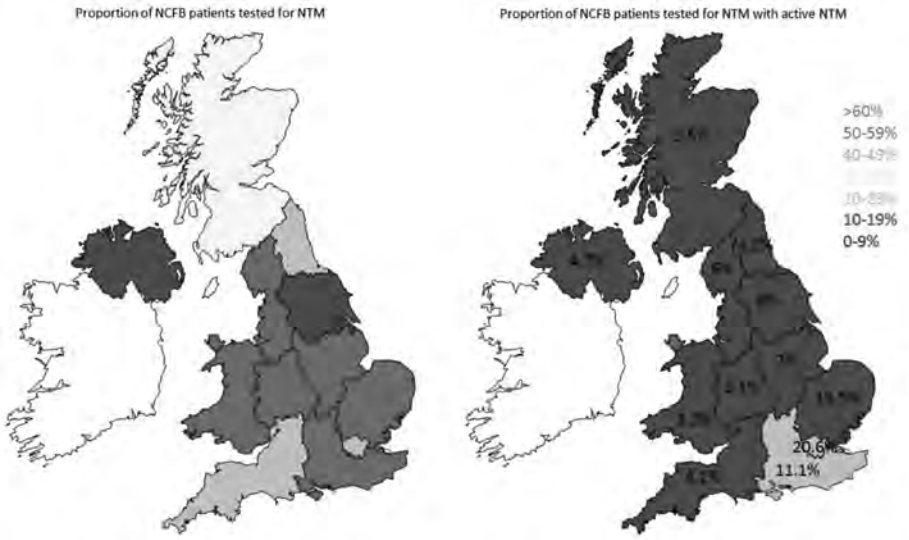
Introduction Non-tuberculous mycobacterial (NTM) infections are frequently observed in bronchiectasis patients. Guidelines recommend testing for NTM in this setting and especially



Abstract M8 Figure 1

when treating with long-term macrolides, due to a substantial risk for emergence of macrolide resistant infections when patients are exposed to macrolide monotherapy. This study aims to investigate NTM testing in the UK bronchiectasis population from the EMBARC registry.

Methods The EMBARC registry is an international prospective observational study of patients with CT-confirmed bronchiectasis. Patient data is entered at baseline and annual follow-up. One of the 30 participating countries is the UK and patient data was analyzed for NTM testing in the 9 level 1 regions of England, Scotland, Wales and Northern Ireland.

Results From the 16,891 patients enrolled in the EMBARC registry between January 2015 and March 2019, Patients were 58% female and the median age was 68 years (interquartile range 58–75) with a similar and age distribution among regions. Nearly 30,000 patient years of follow-up data were available. From the 6076 UK enrolled patients across 87 UK centres, 1047 (17.2%) were tested for NTM at least once and 8.2% of them had a positive NTM isolate. NTM testing varied substantially between the regions with the lowest testing rate in Northern Ireland (8.3%) and highest rate in Scotland (35.5%). Macrolides were prescribed for bronchiectasis treatment in 12–34% of the patients with the highest frequency in Northern Ireland but the average testing for NTM in this population was only 24.8% (highest testing frequency 60.9% in Scotland and lowest 7.5% in Yorkshire and Humber).

Conclusions Both ERS and BTS bronchiectasis guidelines recommend NTM testing in bronchiectasis but the testing was only performed in 17.2% of the UK patients enrolled in EMBARC. Less than a quarter of UK bronchiectasis patients initiated on macrolides are tested for NTM with a wide regional range for NTM testing (7.5–60.9%). Greater awareness of NTM testing recommendations is needed.

M9 PSYCHOSOCIAL IMPACT OF MYCOBACTERIUM ABSCESSUS INFECTION IN ADULTS WITH CYSTIC FIBROSIS

[1]SFH Zaki, [2]KSA Chapman, [2]SJ Chapman, WG Flight [2]. [1]*University of Oxford, Oxford, UK*; [2]*Oxford University Hospitals NHS Foundation Trust, Oxford, UK*

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Background People with cystic fibrosis (CF) are at increased risk of psychological morbidity but any additional impact of infection with transmissible pathogens such as *Mycobacterium abscessus* on psychological status is unclear. We hypothesised that *M. abscessus* infection may lead to an additional psychological burden, perhaps as a result of complex treatment regimens or enhanced measures to prevent cross-infection.

Methods Patients with CF and a history of *M. abscessus* infection attending our centre were identified. The Hospital Anxiety and Depression Scale (HADS) and the CF Quality of Life (CFQoL) scores at annual review before and after diagnosis of *M. abscessus* infection were compared. Controls with CF but no history of *M. abscessus* infection were identified and matched for age, sex and lung transplant status. Most recent HADS and CFQoL scores in the two groups were compared, with better psychological wellbeing represented by lower HADS and higher CFQoL scores.

Results Twenty-five patients with a history of *M. abscessus* infection and 25 controls were included. The groups were well matched with mean age 30.0 (SD=11.0) in the *M. abscessus* group and 29.6 years (SD=9.7) among controls. Male:female ratio was 15:10 in both groups. Mean FEV1%-predicted was 60.1% (SD=21.9) in the M. abscessus group and 69.1% (SD=23.1) among controls. Mean body mass index was 21.6 kg/m^2 (SD=5.3) and 21.5 kg/m^2 (SD=3.8) respectively.

Mean HADS score in the *M. abscessus* group was 13.0 (SE=3.0) compared to 7.8 (SE=1.7) for controls. The mean CFQoL score was 68.8 (SE=5.1) in the *M. abscessus* group compared with 71.5 (SE=4.6) for controls. When including all recorded questionnaire scores, there was an inverse correlation between HADS and CFQoL scores (R^2=0.657, n=110) with individual patient R^2 values ranging from 0.0006 to 0.8751.

7/25 (28%) patients had complete HADS and CFQoL data before and after *M. abscessus* infection. Mean HADS was 7.7 (SE=2.4) before and 8.1 (SE=2.8) after *M. abscessus* infection while the mean CFQoL increased from 71 (SE=7.8) to 79 (SE=6.5).

Conclusions *Mycobacterium abscessus* infection in adults with CF may be associated with lower psychological wellbeing. Larger studies are required to confirm this association and explore possible causes.

Real world studies with antifibrotics in IPF

M10 PERSISTENCE ON ANTIFIBROTIC MEDICATION IN IDIOPATHIC PULMONARY FIBROSIS (IPF) IS NOT DEPENDENT ON DISTANCE TRAVELLED TO TERTIARY CENTRE

[1]A Babu, [1]T McLellan, [1]P Verghese, [1]E Harris, [1]K Harding, [1]N Simler, [1]C Fiddler, [1]H Parfrey, [2]F Woodhead, [1]M Thillai. [1]*Royal Papworth Hospital, Cambridge, UK*; [2]*Glenfield Hospital, Leicester, UK*

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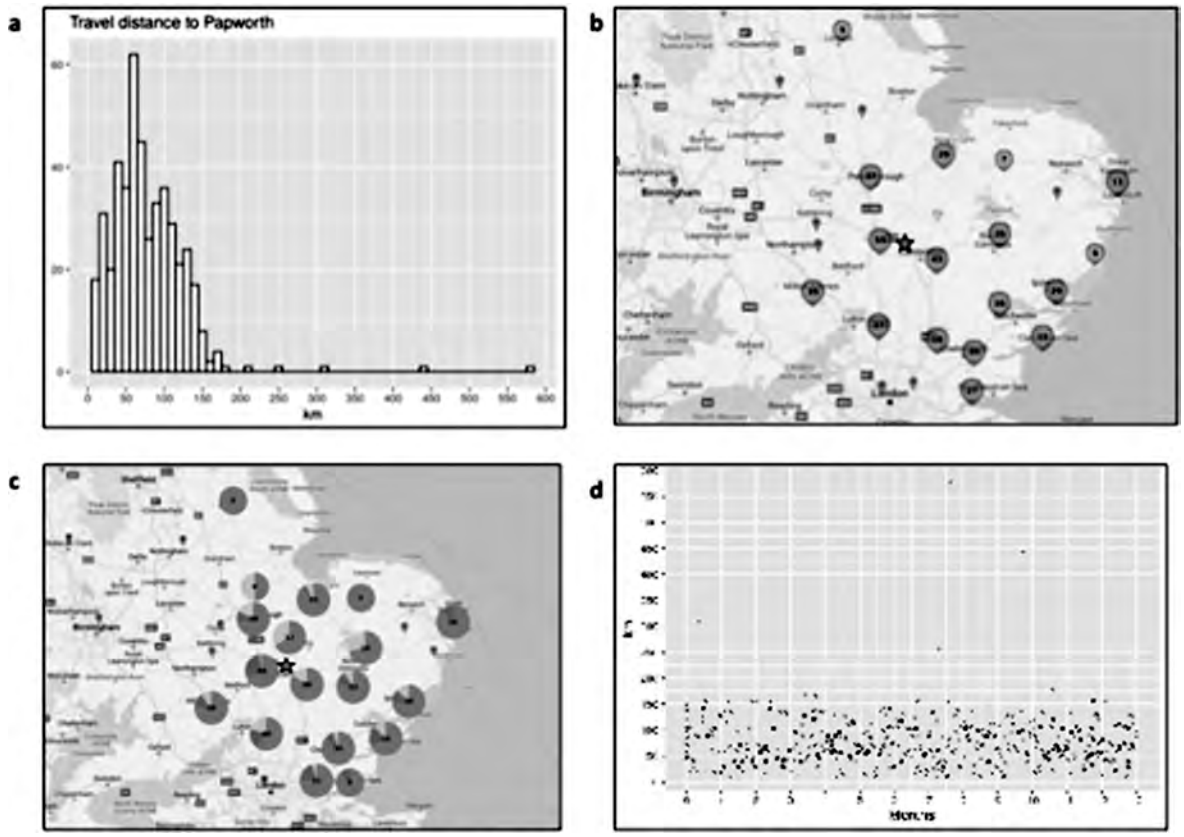
Antifibrotic medications (pirfenidone or nintedanib) are recommended in IPF patients who meet lung function criteria. Whilst effective in slowing FVC decline, they are associated with side-effects including GI disturbance, fatigue and skin rash. Discontinuation rates as a result of these effects have been reported as high as 21% for Pirfenidone and 26% for Nintedanib.[1] [2] Currently, Royal Papworth is the largest prescriber of antifibrotics in the East of England and patients travel up to 2.5 hours (sometimes on smaller A roads) to attend outpatient clinics. Our aim was to investigate whether there is a correlation between distance travelled and drug persistence.

We performed a retrospective analysis of 447 patients with IPF treated from 2013 to 2019. All patients started on medication are recorded on a database; this was accessed on 25/06/19. Data on drug persistence was coupled with patient postcode. Statistical analysis was performed with Graphpad Prism.

The majority of patients (95%) travelled less than 135 km. The furthest distance was 577 km (Truro), figure 1a. Median distance was 71 km, mean 78 km (mean time by car was 61 minutes) and mode 60 km. A heatmap (performed using BatchGeo software) showed a clustering of postcode data around 17 towns (figure 1b). We then performed an analysis based on whether patients persisted on drug at 0–3 months,



Abstract M10 Figure 1 a) Distance travelled to Papworth; b) Clustering of postcodes around 17 towns; c) Clustering related to persistence (Green ≤3 months, Blue = 3–6 months, Red>6 months); d) Correlation between distance travelled (km) and persistence (months) on antifibrotic

3–6 months or >6 months (figure 1c). This showed no difference across 9 geographical clusters. We next performed a complete analysis of distance travelled from postcode vs. persistence (in months) on antifibrotic for all 447 patients and found no correlation (figure 1d).

Our data suggest that distance travelled does not appear to be a factor in drug persistence. This is important as many IPF patients are elderly (the mean age in our data set was 71 years) yet remain keen to travel to our centre, despite the long journey. We have initiated shared care to alternate visits between our hospital and their referring centres and this (in conjunction with virtual clinics) may be an improved method of managing patients with IPF, given the lengths they travel to get treatment.

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M11 NINTEDANIB AND PIRFENIDONE FOR IDIOPATHIC PULMONARY FIBROSIS (IPF) IN NORTH EAST ENGLAND – REAL LIFE DATA

[1]CJ Murphy, [1]C Donaldson, [1]L Langlands, [1]S Wiscombe, [2]AJ Simpson, [1]IA Forrest. *[1]Department of Respiratory Medicine, Newcastle upon Tyne Hospitals NHS Foundation Trust, Newcastle, UK; [2]Institute of Cellular Medicine, Newcastle University, Newcastle, UK*

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Introduction Licensed anti-fibrotic medication (AFM) for IPF is limited to Pirfenidone and Nintedanib. Pirfenidone has been prescribed by the Newcastle Interstitial Lung Disease Service (NILDS) since March 2014 and Nintedanib since December 2015. Patients are referred to the NILDS by twelve regional trusts. Diagnosis of IPF is confirmed by the NILDS MDT before patient assessment for suitability of AFM.

Methods Multi-centre retrospective cohort review of all patients on Pirfenidone and Nintedanib since the beginning of local AFM prescription.

Aims Evaluation of the basic characteristics of non-trial, 'real life' patients on AFM in a North East cohort.

Results Up until June 2018, 194 patients had been prescribed Pirfenidone, 98 (50.5%) had stopped it, 45 (23.2%) were still taking it and 51 (26.3%) patients had died on Pirfenidone.

Diagnoses for patients on Pirfenidone were definite IPF (n=107, 55.2%), working diagnosis IPF (n=21, 10.8%), probable IPF (n=45, 23.2%), Combined Pulmonary Fibrosis and Emphysema (n=20, 10.3%) and others (n=1, 0.5%). Of those stopping Pirfenidone, 37 (37.7%) patients switched to Nintedanib. Mean age for patients taking Pirfenidone was 73 years, 85% males.

212 patients had been prescribed Nintedanib, 62 (29.2%) had stopped it, 113 (53.3%) were still taking it and 37 (17.5%) patients had died on Nintedanib.

Diagnoses for patients on Nintedanib were definite IPF (n=106, 50.0%), working diagnosis IPF (n=33, 15.6%), probable IPF (n=36, 17.0%), CPFE (n=36, 17%) and others (n=1, 0.4%). Of those stopping Nintedanib, 26 (41.9%) patients switched to Pirfenidone. Mean age for patients taking Nintedanib was 72 years, 81% males.

In both treatment cohorts most patients had more than one side effect cited as the cause for stopping medication (see table 1).

Abstract M11 Table 1 Side effects cited as causes for stopping anti-fibrotic medication

Patients who stopped Nintedanib (n=62)		Patients who stopped Pirfenidone (n=98)	
Diarrhoea/loose stools	15 (24%)	Loss of appetite/anorexia	18 (18%)
Nausea/vomiting	13 (21%)	Nausea/vomiting	16 (16%)
Other/unclear	12 (19%)	Lung function change	15 (15%)
Weight loss	7 (11%)	Weight loss	12 (12%)
Abnormal LFTs	7 (11%)	Rash/photosensitivity	12 (12%)
Loss of appetite/anorexia	7 (11%)	"GI side effects", gen unwell	8 (8%)
Abdominal pain	6 (10%)	Dizziness	7 (7%)
VTE/CVD	5 (8%)	Diarrhoea/loose stools	6 (6%)
Lung function decline	4 (7%)	Stomach pain/heart burn	5 (5%)
Abnormal FBC	3 (5%)	Headaches	5 (5%)
Deterioration	3 (5%)	Deranged LFTs	4 (4%)
Generally unwell	2 (3%)	Fatigue	4 (4%)
Patient choice	1 (2%)	SOB/hypoxia	4 (4%)
Total	**85**	Transplant	3 (3%)
		Patient choice	2 (2%)
		Lethargy	2 (2%)
		Itch	2 (2%)
		Insomnia	2 (2%)
		Other	19 (19%)
		Total	**146**

Mean treatment duration at last known patient contact was 12.2 months (range 1–46) for Pirfenidone and 10.1 months (range 1–34) for Nintedanib.

Conclusions Gender and age distribution for both AFM groups was similar to other UK IPF patient cohorts. Longer treatment duration in the Pirfenidone group may be due to increased length of medication availability. Side effects are often multiple in nature but both AFMs can be tolerated with specialist support for an extended period of time.

M12 52 MONTH FOLLOW UP OF PATIENTS WITH IPF RECEIVING NINTEDANIB VIA THE COMPASSIONATE USE PROGRAMME

[1]K Ward, [2]P Ind, [1]D Woods, [1]J Springett, [1]C Dos Santos, [1]C Hunt, [1]R Coker. [1]*Hammersmith Hospital, Imperial College Healthcare NHS Trust, London, UK*; [2]*National Heart and Lung Institute, Imperial College London, London, UK*

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Introduction In 2015 nintedanib became available on a compassionate use programme (CUP) to patients with idiopathic pulmonary fibrosis (IPF), after the 2014 publication of the INPULSIS trial[1] and before receiving National Institute for Health and Care Excellence (NICE) approval in England and Wales in January 2016.[2] NICE subsequently approved nintedanib with the same limited forced vital capacity (FVC) criteria as for pirfenidone: 50–80% predicted (pred). The nintedanib CUP allowed patients with FVC >80% pred to receive anti-fibrotic treatment, and many have continued to take nintedanib for over 4 years.

We have reviewed our single centre cohort of real-life IPF patients and examined outcomes.

Abstract M12 Table 1 Nintedanib compassionate use programme patient demographics and outcomes compared to INPULSIS-1 trial patients

	Nintedanib compassionate use programme (52 months observation)		INPULSIS-1 nintedanib group (1) (12 months study)	
Number of patients	23		309	
Number of males/females	19/4	83% male	251/58	81% male
Age at baseline in years (y) [1]	73.5	SD 6.7	66.9	SD 8.4
Ethnicity White European/other	17/6	74% White European	198/111	64% White European
Mean FVC at baseline (ml)	2792	SD 1241	2757	SD 735
Mean FVC at last measure before 1/6/19 (ml)	2427	SD 1224		
Mean FVC% predicted at baseline	91.5	SD 25.1	79.5	SD 17.0
Mean difference FVC over total FU period (ml)	-443	SD 470		
Total follow up period first FVC to last FVC in months	31	SD 14	12	Fixed follow up 1 year
Rate of change of FVC	-253	SD 372	-95	95% confidence interval
(ml per year) from baseline to date of last FVC				
Mean difference in FVC as% change from baseline	-16.4	SD 14.7		
Mean% change per year compared with baseline	-10.1	SD 14.4		
Eligible for anti-fibrotics via NICE ie FVC 50–80% pred	4	26%		
Number FVC >80% pred	17	74%		
Number with FVC >90% pred	15	65%		
Number with FVC >100% pred	7	30%		
Number with FVC <50% pred	2	9%	Excluded from trials	
Mean number of months on nintedanib	30.4	SD 16.2	10.3	SD 3.4
Number still on nintedanib at end of study (1/6/2019 for compassionate use patients and 12 months for trial patients) [2]	10	43%	231	75%
Number of responders (where FVC did not fall >10% of baseline per year)	14	61%	447/634 INPULSIS-1 and 2 combined	71%
Number progressing on treatment (FVC drop >10% per year)	9	39%	31	10%

Key: FVC=forced vital capacity;%=percentage; pred=predicted; ml=millilitres; SD=standard deviation; Baseline=First lung function after 1/2/2015 and before drug started [1] Ages: 4 over 80, 10 over 75, 15 over 70 y. [2] 13 stopped: 5 stopped for GI reasons, 2 died on drug, 1 had PE, 2 patient choice, 2 lost to FU, 1 progressed on treatment

Methods We retrospectively identified patients who consented to receive nintedanib under the CUP from 1st February 2015 and who had more than one FVC recorded. We obtained demographic, lung function and mortality data from the electronic medical record. We collected data to 1st June 2019. We compared CUP patients to the patients in the INPULSIS trial (1) performing statistics using GraphPad Prism.

Results Our patients were older, had higher baseline FVC measurements and were followed for longer, but had greater reductions in lung function over time (table 1). Six of 23 (26%) patients died over a 52 month period in our observational study compared to 35 out of 638 (5.5%) over 12 months in INPULSIS 1 and 2 combined.[1]

Discussion We studied real-life IPF patients who tended to be older than in the pivotal regulatory clinical trial.(1) Direct statistical comparisons were not possible without the raw data but baseline absolute FVC values were similar. However, our patients represent earlier or milder disease: 74% would not have qualified for nintedanib on NICE criteria. These data provide insights into treatment of older and high FVC patients with nintedanib.

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M13 FROM INTERSTITIAL LUNG DISEASE (ILD) MULTIDISCIPLINARY TEAM MEETING (MDT) TO ANTI-FIBROTIC MEDICATION – REVIEW OF REGIONAL MDT REFERRALS

[1]CJ Murphy, [1]C Donaldson, [1]L Langlands, [1]S Wiscombe, [2]AJ Simpson, [1]IA Forrest. [1]*Department of Respiratory Medicine, Newcastle upon Tyne Hospitals NHS Foundation Trust, Newcastle, UK*; [2]*Institute of Cellular Medicine, Newcastle University, Newcastle, UK*

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Introduction NICE guidelines recommend diagnosis of idiopathic pulmonary fibrosis (IPF) only with the consensus of an MDT.[1] Patients with (suspected) ILD in the North East are referred from 12 regional trusts to the Newcastle Interstitial Lung Diseases Service (NILDS) MDT for discussion. NILDS is the regional prescriber for anti-fibrotic medications (AFM) Nintedanib and Pirfenidone.

Aims To review the referrals made to the NILDS MDT, establish the number of patients diagnosed with IPF and those prescribed AFM at first follow up.

Abstract M13 Table 1 Reasons for not prescribing anti-fibrotic medication (n=127, multiple causes in n=8 cases)

Above therapeutic window	53	42%
Alternative diagnosis	37	29%
Other	15	12%
Active cancer	9	7%
Below therapeutic window	7	6%
Patient choice	4	3%
Not suitable candidate (e.g. frail)	4	3%
Unclear reasons	3	2%
Already on anti-fibrotics	2	2%
Died	1	1%

Method Retrospective review of all NILDS MDT patient lists over a twelve month period (January – December 2016) and review of MDT and subsequent clinic follow-up outcomes.

Results 659 patients were referred to the MDT. In 43 (6.5%) cases no records or minimal information could be found, leaving 616 patients for analysis. New patients referred into the NILDS who were diagnosed with IPF at the MDT (n=118) were seen within 9.1 weeks of the MDT taking place (range: -1 day – 34.7 weeks).

In total (NILDS and non-NILDS patients), 199 (32.3%) patients were diagnosed with IPF or included IPF in the differential diagnosis.

72/199 (36.2%) patients were started on AFM at the first outpatient appointment following the MDT – 48/72 (66.7%) on Nintedanib and 24/72 (33.3%) on Pirfenidone.

127/199 (63.8%) patients did not receive AFM. Reasons for not prescribing AFM (see table 1) were multiple in nature for 8 patients.

This review did not include patients receiving AFM at later stages in their follow-up period or those discussed at MDTs prior to 2016.

Conclusion Promising results were shown for mortality, PFS and lung function for patients on antifibrotics, although this data may favour commencement of nintedanib as first line therapy, given the lower rates of treatment discontinuation by 3 months. Patients who were able to tolerate antifibrotic therapy for the first 3 months were shown to have a significantly improved mortality.

M14 HAS ANTIFIBROTIC THERAPY ALTERED OUTCOMES IN PATIENTS WITH IDIOPATHIC PULMONARY FIBROSIS? A REAL WORLD ANALYSIS

WA Wright, P Nightingale, D Dosanjh, A Crawshaw, DR Thickett. *University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK*

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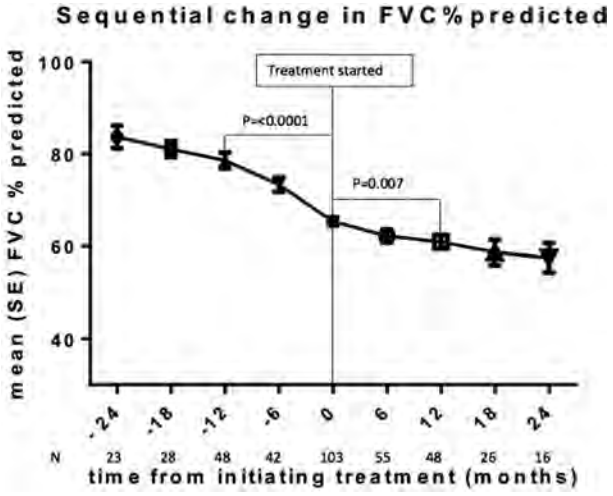
Introduction Pirfenidone and nintedanib are the only disease-modifying treatments available for idiopathic pulmonary fibrosis (IPF). Clinical trials have demonstrated a disease-stabilising effect of these medications in controlled conditions. Our aim was to test their efficacy, tolerability and safety in routine clinical practice.

Methods Data was collected retrospectively on patients with IPF seen in the ILD MDT between 2011–2017. This included patients treated with antifibrotics and those untreated, but with an FVC% predicted in the treatment range (control patients). Variables collected from the electronic patient records included demographics, lung function, survival, progression-free survival (PFS) – progression defined as 10% reduction in FVC or death – and drug tolerability outcomes including discontinuations.

Results Of 104 patients prescribed antifibrotics, 54 received pirfenidone only, 36 received nintedanib only and 14 received both. There were 64 control patients. The 365-day mortality rate was 25.3% for the antifibrotic group and 35.5% for the control group (p=0.169). PFS at 6 months was significantly improved in the antifibrotic group (73.7%) compared to the control group (54.8%) (p=0.015). At 12 months, PFS was improved in the antifibrotic group (49.5% in the antifibrotic group and 37.1% in the control group), although the result



Abstract M14 Figure 1 The decline in mean FVC% predicted from 24 months prior to starting antifibrotics (-24) to 24 months after starting treatment. 0 is the point antifibrotics were started. Patients with <1 year follow up included here. The number of patients with FVC data at each time point is presented. Standard error of each mean is also presented

was not statistically significant (p=0.127). The 12-month post-treatment mean decline in FVC% predicted (4.8±6.7%) was significantly less than the 12-month pre-treatment decline (11.7±12.2%) (p=0.041). Antifibrotic discontinuation by 3 months was significantly higher for patients on pirfenidone (31.7%) than those on nintedanib (11.4%) (p=0.026). By 12 months, discontinuation was higher in the pirfenidone group (48.3%) than the nintedanib group (40%) but the difference was not statistically significant (p=0.431). The 365-day mortality rate for the antifibrotic group, excluding patients who discontinued treatment within 3 months, was 20.3% and the difference between this and the control group (35.5%) was statistically significant (p=0.043).

Conclusion Promising results were shown for mortality, PFS and lung function for patients on antifibrotics, although this data may favour commencement of nintedanib as first line therapy, given the lower rates of treatment discontinuation by 3 months. Patients who were able to tolerate antifibrotic therapy for the first 3 months were shown to have a significantly improved mortality.

M15 ANTIFIBROTIC MEDICATIONS FOR IDIOPATHIC PULMONARY FIBROSIS (IPF): A REAL WORLD SINGLE CENTRE EXPERIENCE OF 447 PATIENTS OVER A 6 YEAR PERIOD

E Harris, K Harding, T McLellan, A Babu, P Verghese, H Parfrey, N Simler, C Fiddler, M Thillai. *Royal Papworth Hospital, Cambridge, UK*

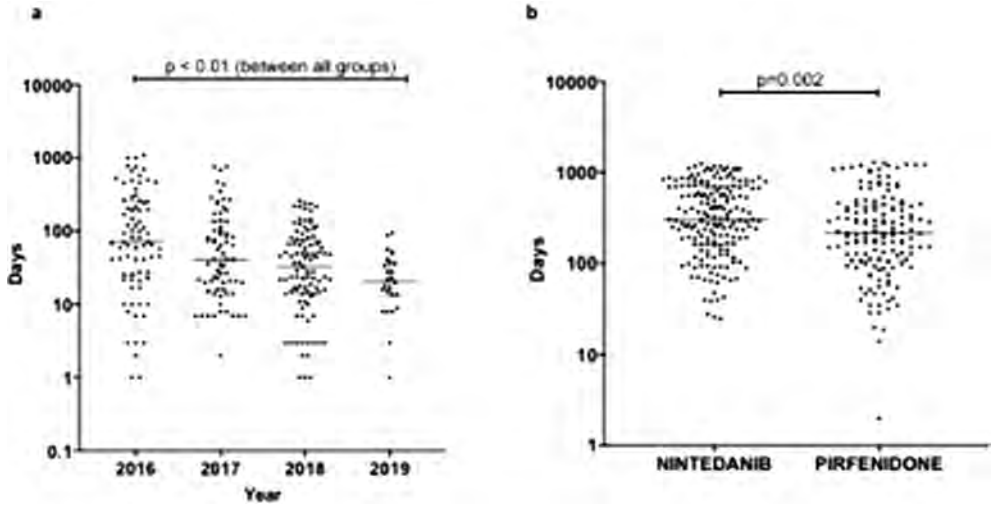
10.1136/thorax-2019-BTSabstracts2019.423

We report a retrospective analysis of 447 patients with IPF treated from 2013 to 2019 at the Royal Papworth Hospital UK. In terms of single centre data, we believe this is the largest collection reported to date. All patients started on medication are recorded on a database; this was accessed on 25/06/19. Statistical analysis was performed with Graphpad Prism.

Mean age was 71 years with male predominance (87%). Over the 6 year period, more patients were started on pirfenidone (58%) vs. nintedanib (42%). However when analysed from late 2015 onwards (when both drugs were fully available) we found an increase in nintedanib (59%) vs. pirfenidone (41%). Time from diagnosis at MDT to initiation of medication steadily dropped from a mean of 196 days in 2016, 112 in 2017, 56 in 2018 and 28 in the first 6 months of 2019 (figure 1a, p<0.01).

Drug persistence is improving; 56 patients persisted >6 weeks in 2015 (85% of patients started that year), 75 (95%) in 2016, 79 (96%) in 2017 and 111 (97%) in 2018. These findings mirrored persistence >6/12 months. Nurse led telephone clinics began in 2017 to review medications at 6 weeks post drug initiation. These may have increased persistence; 46 of 78 patients (59%) persisted >6 months in the 12 months prior to starting clinics vs. 72 of 91 (79%) in the following 12 months.

113 (25%) of all patients switched between antifibrotics and this is becoming more common over time. Reviewing all new patients prescribed medication from 01/01/16–01/01/19,



Abstract M15 Figure 1 a) Time from diagnosis to antifibrotic intiation (lines show median and IQ range); b) Time on drug i.e. persistence (patients from 2016–2019) (lines show median and IQ range)

73 out of 176 (41%) patients stopped nintedanib and 83 of 148 patients (56%) stopped pirfenidone. Fewer patients experienced a dose reduction on nintedanib (42%, predominantly due to lower GI side-effects) compared to pirfenidone (63%, predominantly nausea and fatigue). Median duration on nintedanib was significantly greater (304 days) vs. pirfenidone (214 days) figure1b, p=0.002.

Accepting inherent limitations of retrospective data, we show differences in drug prescribing, decrease in time to initiating treatment and increase in persistence over time. This may reflect an increased learning curve for managing side-effects as well as novel management strategies e.g. virtual MDT, shared care and nurse led clinics.

Bronchiectasis: clinical phenotyping and outcomes

M16 BLOOD AND SPUTUM EOSINOPHILS, INTERLEUKIN 5 AND BRONCHIECTASIS

[1]V Chew, [1]R Davidson, [1]J Davison, [2]K Jiwa, [1]G Davies, [1]G Jones, [2]A De Soyza. *[1]Freeman Hospital, Newcastle, UK; [2]Newcastle University, Newcastle, UK*

10.1136/thorax-2019-BTSabstracts2019.424

Aim Bronchiectasis is thought to be a neutrophilic lung disease. However, increasingly it is recognised in some patients eosinophils may predominate. We have reported previously a significant minority of patients have eosinophilic predominant sputum cytology even in the absence of known asthma. As IL-5 is a key mediator of eosinophil activation, we aim to study the correlation between IL-5 and eosinophil in both serum and sputum.

Method 120 patients were recruited into the study from our regional bronchiectasis service. We report data on the first 51 fully analysed. The level of IL-5 in both serum and sputum were measured with the MSD Kits. Sputum eosinophil were counted and serum eosinophil were recorded from routine FBC. Data which includes IL-5 and eosinophil levels in both serum and sputum were analysed to find a correlation with each measurement.

Result Blood and sputum eosinophil showed a good correlation with a coefficient of 0.694. Interestingly no correlation was found for other comparisons with a coefficient of 0.042 between serum and sputum IL-5, 0.349 between serum IL-5 and serum eosinophil and 0.055 between serum IL-5 and sputum IL-5.

Abstract M16 Table 1 Correlation data between each measurement

	Serum IL-5	Sputum IL-5	P Blood Eosinophil	Sputum Eosinophil
Serum IL-5	1	0.042	0.349	0.055
Sputum IL-5	0.042	1	0.346	0.365
P Blood Eosinophil	0.349	0.346	1	0.694
Sputum Eosinophil	0.055	0.365	0.694	1

Conclusion Our data suggest there is a good correlation between sputum and blood eosinophil in bronchiectasis. We could not find a correlation between other markers. This may be due to the heterogeneity of bronchiectasis where only a certain subset of patients are predominantly eosinophilic driven and compartmentalization of inflammation within the lung separating it from systemic compartments. The study sample size is being increased in order to exclude a type 1 error. It is plausible that other cytokines beyond IL-5 contribute to eosinophilia in sputum.

M17 INVESTIGATING INDOLEAMINE 2,3 DIOXYGENASE (IDO) ACTIVITY IN BRONCHIECTASIS AND COPD

R Potter, L Huan, A De Soyza, A Mellor. *Institute of Cellular Medicine, Newcastle University, Newcastle upon Tyne, UK*

10.1136/thorax-2019-BTSabstracts2019.425

Introduction Chronic obstructive pulmonary disease (COPD) and bronchiectasis are both progressive and largely irreversible inflammatory lung diseases. Bronchiectasis is a chronic airway inflammation syndrome associated with excessive mucus production. Indoleamine 2,3-dioxygenase (IDO) activity as evidenced by kynurenine/tryptophan ratio is a marker interest as prior evidence suggests a potential role in COPD, pneumonia and TB. Available data suggests that IDO might be upregulated during COPD exacerbations but data are conflicting. IDO may be important in both antibacterial responses and adaptive immunity.

Methods We interrogated a biobank of samples with clinical metadata. Sputum and serum samples were analysed using HPLC to detect kynurenine (KYN) and tryptophan TRY) levels and IDO activity inferred by K/T ratios.

Results The COPD and HV patient cohorts were significantly smaller than in bronchiectasis (58, 25 and 150 samples respectively), and the number of matched sputum samples was 65. In bronchiectasis and healthy volunteer patients increasing age positively correlated with IDO activity ((K/T ratio; p=0.0204, p=0.0062) in blood samples. Additionally IDO activity in sputum was higher in more severe bronchiectasis (p=0.0221), asthma (p=0.0443) and immunodeficiency status (p=0.0449). A significant difference was seen in the IDO activity of bronchiectasis sputum when compared to blood samples of bronchiectasis. A significant positive correlation was seen between KYN levels in plasma and age (p=0.01), whereas a negative correlation was seen between this and immunodeficiency (p=0.046). The K/T ratio of the plasma showed a positive correlation with age as well (p=0.012). In the sputum a positive correlation was seen between KYN and bronchiectasis severity index (p=0.025), pseudomonas history (p=0.045), and with comorbid COPD/BCOS (p=0.022). In contrast IDO in COPD samples had no correlation with no clinical parameters.

Conclusion This suggests that IDO activity in sputum varies by severity and aetiology in Bronchiectasis. It may prove useful in defining distinct subgroups. Further study to understand the differences in IDO activity during stable state and after treatment for exacerbations will help further define the role of this pathway in Bronchiectasis and COPD.

M18 HEPARIN-BINDING PROTEIN AS A BIOMARKER INFLAMMATION, SYMPTOMS AND SEVERITY IN BRONCHIECTASIS

H Abo-Leyah, HR Keir, A Shoemark, S Finch, A Smith, H Barclay, JD Chalmers. *University of Dundee, Dundee, UK*

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Introduction HPB is stored in azurophilic granules and secretory vesicles of neutrophils. It is released rapidly in the context of neutrophilic inflammation. HBP acts as an opsonin to enhance phagocytosis of pathogens but is also pro-inflammatory and promotes endothelial and epithelial dysfunction. We sought to investigate the role of HBP in bronchiectasis.

Methods 121 adult patients with CT confirmed bronchiectasis were included. HBP concentration in sputum supernatant was measured using a validated ELISA assay. Severity of disease was evaluated using the bronchiectasis severity index (BSI) and FACED, forced expiratory volume in 1 second (FEV1) and correlated with established markers of bronchiectasis severity including neutrophil elastase (NE). Patients were followed-up for 3 years for longitudinal outcomes.

Results HBP concentrations showed a moderate positive correlation to other neutrophilic markers in sputum such as NE ($r=0.52$, $p<0.0001$). HBP concentrations showed a positive correlation to MRC dyspnoea score ($r=0.32$, $p=0.004$) and a negative correlation to FEV1 ($r=-0.24$, $p=0.0086$). Higher sputum HBP was associated with more severe radiological disease ($r=0.39$, $p<0.001$) and severity indices BSI ($r=0.445$, $p<0.0001$) and FACED ($r=0.34$, $p=0.001$). During long term follow-up a level of HBP above the population median was associated with a shorter time to first hospitalization and exacerbation (Hazard Ratio (HR) 3.37, 95%CI 1.81–6.27, $p<0.0001$) and exacerbations (HR 1.49 95% CI 0.98–2.26, $p=0.06$).

Conclusions HBP is a potential biomarker of airway inflammation and disease severity in patients with bronchiectasis. Future studies should establish whether HBP has prognostic or therapeutic implications and determine its role in the pathogenesis of bronchiectasis.

M19 A PILOT STUDY OF ENDOTYPING IN BRONCHIECTASIS

[1]V Chew, [1]R Davidson, [1]J Davison, [1]G Davies, [1]G Jones, [2]K Jiwa, [1,2]A De Soyza. *[1]Freeman Hospital, Newcastle, UK; [2]Newcastle University, Newcastle, UK*

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Aim Bronchiectasis is increasingly common and has diverse aetiologies. It is commonly viewed as a neutrophilic disease but our prior data has shown some patients are highly eosinophilic. We aimed to extend this by undertaking multikine cytokine analysis.

Method 53 patients of varying bronchiectasis severity were recruited in our regional bronchiectasis service. Multiple cytokines (Vascular Endothelial Growth Factor (VEGF), Tissue Necrosis Alpha(TNF-A), Interleukin 4,5,6,10,17 were measured with MSD kits. We counted sputum eosinophil and recorded blood eosinophils from routine FBC. We compared our data against the severity based on the bronchiectasis severity index (BSI) which classifies the disease severity into mild, moderate and severe and compared using ANOVA.

Abstract M19 Table 1

Serum Cytokines	Range(min-max)	P Value
VEGF(pg/ml)	13.39–275.17	0.237
TNF-A(pg/ml)	0.49–2.75	0.262
IL-2(pg/ml)	0–0.39	0.827
IL-4(pg/ml)	0–1.3	0.364
IL-5(pg/ml)	0.02–29.52	0.148
IL-8(pg/ml)	2.69–20.38	0.028
IL-10(pg/ml)	0.083–3.73	0.906
IL-17(pg/ml)	0–4.07	0.23
Sputum Eosinophil	0–24.8	0.252
Blood Eosinophil	0.02–0.83	0.608

Results Of the 53 patients 9 patients had mild BSI severity, 22 were moderate and 22 were severe. Levels of VEGF, TNF-a, Interleukins 4,5,6,10,17, sputum and blood eosinophils were not correlated with the severity of bronchiectasis, all P values of >0.05. These data extend our observations in 110 patients where TNF and VEGF were not correlated with BSI. IL-8 was statically significant but not a pattern that was expected. This may be due to the sample size.

Conclusion We saw no statistically significant association between the level of cytokines and eosinophils in both blood and sputum with the severity of bronchiectasis. This may reflect the sample size and larger studies should be conducted. There was a large range for each parameter detected however suggested bronchiectasis is highly heterogenous. Future studies targeting distinct pathways may need to consider enriching for certain endotypes.

M20 DEVELOPMENT OF THE NEW ZEALAND BRONCHIECTASIS REGISTRY

[1]B Diggins, [2]W Good, [1]P Dawkins, [1]B Poot, [3]E Stroil-Salama, [4]L Morgan, [1]CA Wong. *[1]Middlemore Hospital, Auckland, New Zealand; [2]University of Auckland, Auckland, New Zealand; [3]The Lung Foundation of Australia, Brisbane, Australia; [4]Concord Repatration General Hospital, University of Sydney, Sydney, Australia*

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Introduction The prevalence of bronchiectasis in New Zealand (NZ) is higher than comparable countries (180/100,000 population)[1]; the burden and severity of disease are incompletely understood. Bronchiectasis registries such as EMBARC (>14,000 participants) and the Australian Bronchiectasis Registry (ABR, 1360 participants) have improved understanding of bronchiectasis and identified future research priorities. The aim of the NZ Bronchiectasis Registry (NZBR) is to contribute to the understanding of bronchiectasis aetiology and management, both in NZ and internationally. It is closely aligned with ABR and supported by Lung Foundation Australia.

Methods NZBR shares data fields with ABR and EMBARC, with additional fields to reflect unique socio-demographic characteristics of NZ participants. NZBR is a multi-centre, prospective, observational study enrolling consecutive patients in NZ. Participants are identified from existing clinical and research databases, and from inpatient and outpatient encounters. Eligible adult participants have a clinical diagnosis of bronchiectasis, excluding cystic fibrosis, confirmed on CT thorax. All participants are seen face-to-face and provide written consent.

Demographics, clinical information, exacerbation history (including antibiotic prescription data) and health-related quality of life assessment are collected at enrolment and annual review. Data is entered into a secure online platform, which sits alongside ABR in REDCap.

Results National ethical approval is in place. Enrolment began at the primary site in June 2018, shortly followed by a second site. Two additional sites have local research governance approval. To date, 117 participants have been enrolled across 2 sites: 63/117 females (53.8%); mean age 62.4 (±15.6) years. 45/117 (38.4%) of participants are of Māori or Pacific Island origin; 41/117 (35.0%) participants live in the most deprived socioeconomic quintile.

Conclusion These early steps have paved the way for a national bronchiectasis registry and are an early indicator of health inequalities for bronchiectasis in NZ. NZBR will contribute to a regional Australasian Bronchiectasis Registry to create a comprehensive longitudinal dataset across Australia and NZ, to help establish the burden of disease, promote changes in clinical practice and improve clinical outcomes. Future plans include addition of paediatric sites and increased collaboration with international registries.

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M21 CLINICAL REVIEW OF NEBULISED COLOMYCIN FOR PSEUDOMONAS COLONISATION IN COPD AND NON-CF BRONCHIECTASIS

C Anyanor, J Horno, T Havelock. *University Hospital Southampton, Southampton, UK*

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Introduction Colonisation with *Pseudomonas aeruginosa* is a complication of bronchiectasis and chronic bronchitis and is associated with more severe disease and lower quality of life. Colomycin (colistimethate sodium) has potent activity against *P aeruginosa*. It is licenced for nebulised treatment of pseudomonas colonisation in CF but not non-CF bronchiectasis or chronic bronchitis. In this study we demonstrate that nebulised colomycin therapy (NCT) can be an effective treatment of pseudomonas colonisation in non-CF bronchiectasis and chronic bronchitis.

Abstract M21 Table 1 Summary data comparing the outcomes of patients who had a trial of colomycin

Patients undergoing trial of NCT	total group	successful trial	unsuccessful trial
Number	34	16	18
Bronchiectasis	26	13 (81.3)	13 (72.2)
COPD	13	6 (37.5)	7 (38.9)
Female	26	13 (81.3)	13 (72.2)
Mean age	68.8	70.6	67.2
pretrial eradication	21	9 (56.3)	12 (66.7)
pretrial pseudomonas in sputum	27	13 (81.3)	14 (77.8)
Mean admissions 2 yr pre-trial	1.65	1.31	1.94
Pseudomonas clearance post trial	14	11 (68.8)	3 (16.7)
Mean admissions post trial	1	0.56	1.44
Mean reduction in admissions	0.62	0.75	0.5

Method Adults with non-CF bronchiectasis or chronic bronchitis given a trial of NCT trial in the Southampton Respiratory Centre (SRC) 2017–2018 were identified from a clinical database. Data were gathered from the digital record as part of a service review.

Results 34 patients had a trial of NCT. 25 patients passed the initial trial which was conducted in the SRC, trial failure was due to treatment intolerance or a drop in FEV1>15%. Of those who passed the trial, 7 could not continue the treatment for >1 month due to either side effects or a decrease in FEV1>15% on review. A successful trial was defined as treatment for >1 month.

Conclusion NCT can be difficult to tolerate but in patients who are able to tolerate therapy it is effective in reducing burden of pseudomonas and hospital admissions.

M22 NEBULISED ANTIBIOTIC CHALLENGES: CAN THE PROCESS BE MADE MORE EFFICIENT FOR PATIENT AND CLINICIAN?

J Forrester, C Paramasivan, C Pickover, C Sander. *Cambridge University Hospital Trust, Cambridge, UK*

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Aim We hypothesis that current recommended nebulised antibiotic challenge procedures, particularly the 30 minute post nebuliser spirometry, may not alter clinical decisions whilst incurring unnecessary clinician time and service provision

Background Nebulised antibiotics are an alternative therapy option in patients with lung disease that often colonise specific bacteria in sputum. BTS guidance for Bronchiectasis (2018) provide a standard framework for the procedure of assessing patients' suitability for these medications. At present the procedure recommends spirometry; pre nebuliser, immediately post, 15 minutes post and 30 minutes post. If any FEV1 does not drop >15% over the test time then they are suitable. Conversely ERS recommend immediate and post 30 minute spirometry with a 10% allowance. These recommendations, however, come with little evidence backing particularly regarding timings of spirometry post nebulisation

Method We completed a retrospective review of patient data going back to 2015. For each challenge the spirometry was collected pre, immediately and 30 minutes post.

Results 70 patients underwent testing from September 2015. Based on BTS guidance 2 patients were deemed unsuitable from immediate post spirometry (2.86%). Using the ERS guidance 6 patients were deemed unsuitable immediately post (8.57%). 1 patient assessed had a drop at 30 minutes but initial spirometry was stable. No patient had changes that altered clinical decisions

Discussion This small data set presents evidence that spirometry beyond the immediate post may not provide information that alters clinical decision. Patients were deemed unsuitable based on immediate post nebuliser and not based on subsequent spirometry.

It may be suitable, therefore, to propose alternative assessment methods whereby immediate spirometry is completed and if stable the patients are suitable. In the event of symptoms being reported or drop in spirometry then further spirometry at 30 minutes should be completed. This could have profound implications on appointments, clinician time and costing.

M23 DOES PSEUDOMONAS AERUGINOSA COLONISATION CAUSE MORE RAPID DECLINE IN FEV1 IN NON-CYSTIC FIBROSIS BRONCHIECTASIS?

[1]K Millington, [2]F Hamilton, [2]H Casey, [3]F Easton, [1]A Malin. *[1]Royal United Hospital, Bath, UK; [2]United Hospitals Bristol, Bristol, UK; [3]Musgrove Park, Taunton, UK*

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Background Cystic Fibrosis (CF) colonisation with *Pseudomonas aeruginosa* (PSA) is associated with decline in pulmonary function. In non-CF bronchiectasis this link is unclear. We carried out a retrospective review of a large cohort of non-CF bronchiectasis patients to determine if pulmonary function decline is associated with PSA colonisation.

Method A retrospective review of a non-CF bronchiectasis cohort in a large District General Hospital was performed. Database-driven, electronic patient records from the bronchiectasis service were reviewed. Baseline patient data including PSA infection were collected and categorised into three groups: never infected (p=72); intermittently isolated (p=41); and colonised (p=118). PSA culture on more than one occasion within 3 months defined colonisation. Forced expiratory volume in one second (FEV1) measurements were collected longitudinally from the first ever encounter through to July 2018.

Linear regression was performed to look at Year 1 and Year 3 FEV1 measurements. Covariates included first ever FEV1 recorded (as the baseline measure of lung function), Non-tuberculous mycobacterium (NTM) disease, BMI, previous admission status, age, and PSA colonisation. In addition, a second analysis was performed for PSA colonisation and FEV1 alone to specifically look at this effect, given gaps in the data for some of the other covariates. All analyses were performed using the glm function in R 3.6.0.

Results 231 patient records were reviewed. A number of models were generated to analyse the data (table 1). Initial FEV1 was strongly associated with subsequent FEV 1. PSA colonisation was linked with Year 1 FEV1 in univariate analysis, but once covariates were added, this relationship disappeared. No other variable was significantly associated with FEV1 at either outcome time (Year 1 or Year 3).

Abstract M23 Table 1 PSA colonisation in regression models

Outcome variable and model	N	Beta coefficient for PSA	P value
FEV1 at Year 1 (univariate analysis)	146	0.178	0.023
FEV1 at Year 1 (multivariate analysis)	67	0.61	0.82
FEV1 at Year 3 (univariate analysis)	147	0.42	0.94
FEV1 At Year 3 (multivariate analysis)	49	0.5498	0.72

Conclusion To our knowledge this study assesses the largest cohort of PSA colonised patients against lung function decline. Patients colonised with PSA appeared to have poorer initial lung function than patients never infected or patients intermittently isolated with PSA. We have found no evidence of an association with ongoing decline in lung function with PSA colonisation. This suggests PSA as a marker of disease severity rather than a cause.

M24 VALIDATION OF THE COPD ASSESSMENT TEST (CAT) AS AN OUTCOME MEASURE IN BRONCHIECTASIS

[1]S Finch, [1]IF Laska, [2]TC Fardon, [2]JD Chalmers. *[1]University of Dundee, Dundee, UK; [2]NHS Tayside, Dundee, UK*

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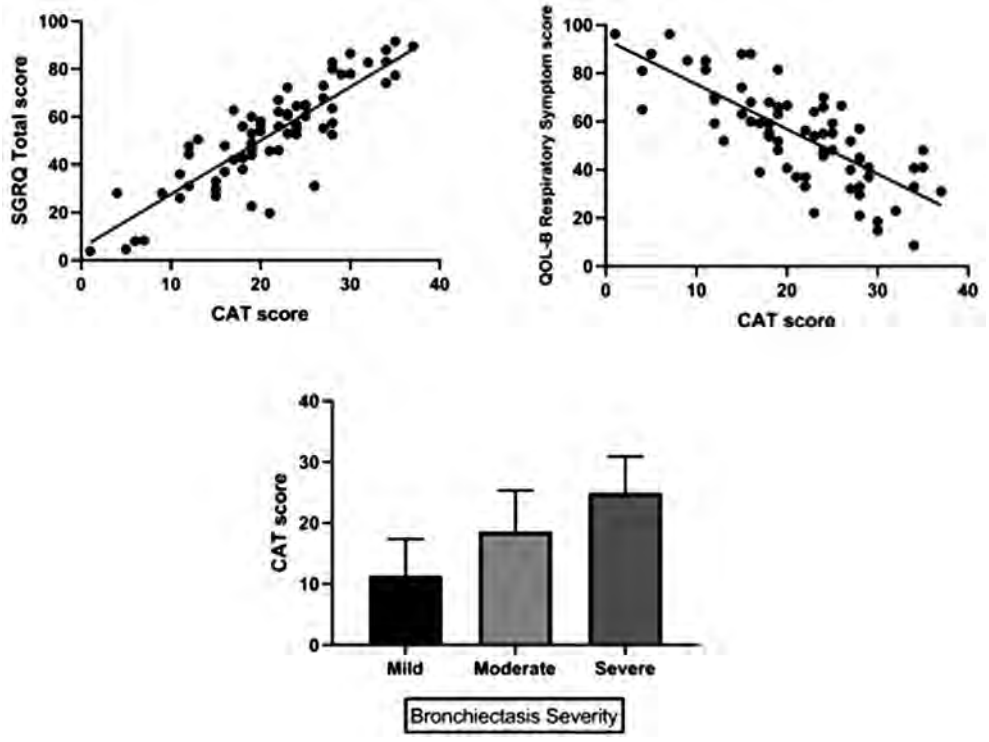
Introduction Objective assessment of symptoms in bronchiectasis is important for both research and in clinical practice. While disease specific questionnaires exist they are not widely validated or have not been shown to be responsive to



Abstract M24 Figure 1

interventions. The COPD assessment tool (CAT) is a short, simple, symptoms assessment tool widely used in COPD. The items included in the CAT are not specific to COPD and also reflect the dominant symptoms of bronchiectasis. We therefore performed a study to validate the CAT as an outcome measure in bronchiectasis.

Methods The CAT questionnaire was administered to two cohorts of bronchiectasis patients along with other QOL questionnaires. Patients underwent comprehensive clinical assessment. One cohort had repeated questionnaires collected before and after treatment of acute exacerbations. We analysed convergent validity, repeatability and responsiveness of the score and calculated the minimum clinically important difference using a combination of distribution based and anchor based methods.

Results In both cohorts there were positive correlations between the CAT and the St. George's Respiratory Questionnaire (SGRQ) in both cohorts ($r=0.90$, $p<0.0001$ and $r=0.87$, $p<0.0001$). There was a clear inverse relationship between CAT and QOL-B RSS ($r=0.75$, $p<0.0001$) and LCQ total score ($r=0.77$, $p<0.0001$), (noting that lower scores on both scales indicate worse symptoms). Patients with more severe disease based on the bronchiectasis severity index (BSI) had significantly higher CAT scores, and CAT also correlated with FEV1 (% predicted) and 6 Minute Walk Distance (6MWD). CAT increased significantly at exacerbation and fell at recovery. The intraclass correlation coefficient for two measurements 4 weeks apart while clinically stable was 0.88 95% CI 0.73–0.95, $p<0.0001$. Estimates of the MCID varied from 3–4 for distribution based methods and 3–5 for anchor based methods. An MCID of 3 was most consistent.

Discussion This study demonstrates that the CAT is a valid, responsive symptom assessment tool in bronchiectasis. The MCID is estimated as 3 points.

M25 OUTCOMES OF PULMONARY REHABILITATION IN PATIENTS WITH BRONCHIECTASIS

J Chapman, J Duckers, T Lines, D Proud, E Hilsden. *University Hospital Llandough, Cardiff, UK*

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Aims Current data on the outcomes of pulmonary rehabilitation in bronchiectasis patients is limited. This 12-year retrospective review aims to expand on current research into changes in exercise capacity, symptom severity, patient heath status and psychological wellbeing following a 19 session rehabilitation programme.

Method 115 patients with a primary diagnosis of bronchiectasis were included into this study. 94 patients (82.6%) completed outpatient pulmonary rehabilitation, a 3 session per week interdisciplinary programme of care involving patient education, exercise training and relaxation practice. Primary outcome measures were assessed via changes in the incremental shuttle walk test (ISWT) or 6-minute walk test (6MWT), self-reporting questionnaires including the St Georges Respiratory Questionnaire (SGRQ) and the Hospital Anxiety and Depression Scale (HADS), as well as health status predictors such as handgrip strength and Fat Free Mass Index (FFMI), a bioelectric impedance measurement of body fat composition.

Results There was an average increase of 47 m in the 6MWT ($P<0.001$) and 71 m ($P<0.0001$) in the ISWT. Other significant findings included a decrease in self-reported dyspnoea ($P<0.001$), as well as significant improvements in symptom related quality of life ($P<0.0001$) and psychosocial wellbeing ($p<0.0001$). It found no significant changes in fat free mass index, but significant increases in hand grip strength ($p=0.049$).

Conclusions Exercise capacity, symptom control, quality of life and psychological wellbeing significantly improved immediately following pulmonary rehabilitation. Hand grip strength, a marker of exacerbation frequency and mortality, also significantly improved, an area with limited previous research. Further research is needed to explore pulmonary rehabilitation's long term benefits and its cost effectiveness for bronchiectasis patients.

Abstract M25 Table 1 Raw data and statistics for exercise capacity, SGRQ, HADS and health status

	Exercise capacity		St George's Questionnaire				HADS score		Health status	
	6MWT (m)	ISWT (m)	Symptom difference	Activity difference	Impact difference	Total difference	Anxiety difference	Depression difference	FFMI change	Handgrip change
Number	20	61	76	76	76	76	88	88	57	73
Mean difference (± standard deviation)	47.0 ± 50.17	71.0 ± 61.0	-6.69 ±15.33	-6.76 ± 11.50	-10.14 ± 13.73	-8.52 ± 9.39	-1.82 ± 3.03	-3.10 ± 3.05	0.047 ±0.510	0.886 ± 3.03
95% confidence intervals	23.52 to 70.48	55.39 to 86.64	-3.19 to -10.19	-4.13 to -9.39)	-7.01 to -13.28	-6.38 to -10.67	-1.18 to -2.46	NA	-0.088 to 0.183	NA
P value	<0.001	<0.0001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.486	0.049

M26 CONVERGENT VALIDITY OF BRONCHIECTASIS QUALITY OF LIFE TOOLS IN THE BRONCH-UK REGISTRY

[1]J Brown, [2]J Bradley, [3]F Copeland, [4]M Carroll, [5]M Crichton, [6]J Duckers, [7]C Haworth, [7]RA Floto, [8]AT Hill, [9]M Loebinger, [9]R Wilson, [1]J Hurst, [9]W Cookson, [10]C Winstanley, [11]A McGuire, [12]R McNally, [12]P Mawson, [9]P Kelleher, [13]D Denning, [14]V Navaratnam, [14]R Hubbard, [15]M Kelly, [16]J Steer, [17]A Sullivan, [18]T Gatheral, [19]P Walker, [2]JS Elborn, [5]JD Chalmers, [12]A De Soyza. *[1]University College London, London, UK; [2]Queens University, Belfast, UK; [3]PCD Family support, London, UK; [4]Southampton University Hospitals, Southampton, UK; [5]Dundee University, Dundee, UK; [6]Cardiff and Vale University Hospitals, Cardiff, UK; [7]Cambridge Centre for Lung Infection, Cambridge, UK; [8]Edinburgh Royal Infirmary, Edinburgh, UK; [9]Imperial College, London, UK; [10]Liverpool University, Liverpool, UK; [11]London School of Economics, London, UK; [12]Newcastle University, Newcastle, UK; [13]Manchester University, Manchester, UK; [14]Nottingham University, Nottingham, UK; [15]Altnegalvin Hospitals, Belfast, UK; [16]Northumbria Healthcare, Northumbria, UK; [17]University Hospitals Birmingham, Birmingham, UK; [18]Morecombe Bay Hospitals, Morecombe Bay, UK; [19]Aintree University Hospitals, Liverpool, UK*

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Introduction Two quality of life instruments are widely used in bronchiectasis clinical trials, the Quality of Life

bronchiectasis questionnaire and the St Georges Respiratory Questionnaire with few large scale multi-centre direct comparisons. Convergent validity represents an assessment of the instrument against other measures that are considered to represent severity of disease, since a valid instrument should agree with clinical assessments of severity of disease and disease burden. We evaluated the convergent validity in the BRONCH-UK dataset.

Methods Prospective registry of adults with bronchiectasis from 13 secondary care centres across the UK, embedded within the EMBARC European platform. Patients completed baseline QOL-B and SGRQ and comprehensive clinical assessment. Linear regression and Spearman correlation evaluated the relationship between QOL scores and clinical variables.

Results 1403 patients were recruited. We report data on the first 813 with complete core datasets; 504 were female (62%), 309 male (38%). The mean age 65 years SD 12.6. The mean QOL-B RSS was 61 points (SD 22) and mean SGRQ was 42.2 (SD 22) indicating a population with moderate to severe impairment of quality of life

There was a strong inverse relationship between the QOL-B respiratory symptom score and the SGRQ ($r=-0.74$, $p<0.0001$). Similar relationships were observed across all domains.

The QOL-B RSS correlated with FEV1% predicted ($r=0.31$, $p<0.0001$), MRC dyspnoea score ($r=-0.47$, $p<0.0001$), daily sputum volume ($r=-0.46$, $p<0.0001$), exacerbation frequency ($r=-0.24$, $p<0.0001$) and the bronchiectasis severity index ($r=-0.35$, $p<0.0001$). The SGRQ was correlated with FEV1% predicted ($r=-0.32$, $p<0.0001$), MRC dyspnoea score ($r=0.55$, $p<0.0001$), daily sputum volume ($r=0.42$, $p<0.0001$), exacerbation frequency ($r=0.29$, $p<0.0001$) and the BSI ($r=0.39$, $p<0.0001$).

High risk populations e.g. chronic *P. aeruginosa* infection and frequent exacerbators (3 or more per year) had higher SGRQ and lower QOL-B RSS scores ($p<0.0001$ for all comparisons).

Conclusion Both the QOL-B RSS and the St Georges Respiratory Questionnaire show acceptable convergent validity in large representative population of patients with bronchiectasis in the UK.

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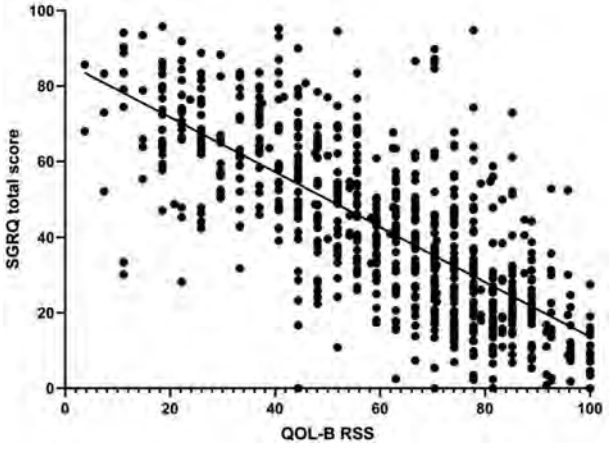

Abstract M26 Figure 1

M27 BRONCHIECTASIS MULTICENTRE COHORT; BASELINE DEMOGRAPHICS FROM BRONCHUK

[1]J Brown, [2]J Bradley, [3]F Copeland, [4]M Carroll, [5]M Crichton, [6]J Duckers, [7]C Haworth, [7]RA Floto, [8]AT Hill, [9]M Loebinger, [9]R Wilson, [1]J Hurst, [9]W Cookson, [10]C Winstanley, [11]A McGuire, [12]R McNally, [12]P Mawson, [9]P Kelleher, [13]D Denning, [14]V Navaratnam, [14]R Hubbard, [15]M Kelly, [16]J Steer, [17]A Sullivan, [18]T Gatheral, [19]P Walker, [2]JS Elborn, [5]JD Chalmers, [12]A De Soyza. *[1]University College London, London, UK; [2]Queens University, Belfast, UK; [3]Southampton University, Southampton, UK; [4]University of Dundee, Dundee, UK; [5]Cardiff and Vale University Health Board, Cardiff, UK; [6]Cambridge Centre for Lung Infection, Cambridge, UK; [7]Edinburgh Royal Infirmary, Edinburgh, UK; [8]Imperial College, London, UK; [9]Primary Ciliary Dyskinesia Family support, London, UK; [10]Liverpool University, Liverpool, UK; [11]London School of Economics, London, UK; [12]Newcastle University, Newcastle, UK; [13]Manchester University, Manchester, UK; [14]Nottingham University, Nottingham, UK; [15]Altnagelvin Area Hospital, Belfast, UK; [16]Northumbria Healthcare, Northumbria, UK; [17]University Hospitals Birmingham, Birmingham, UK; [18]Morecambe Bay Hospitals, Morecambe Bay, UK; [19]Aintree University Hospitals, Liverpool, UK*

10.1136/thorax-2019-BTSabstracts2019.435

Bronchiectasis is increasingly recognised but poorly described. There is variability in aetiology, management and outcomes. We have adapted the EMBARC platform and created a multisite UK based registry with affiliated biobank. The BronchUK partnership (www.bronch.ac.uk) aimed to recruit 1500 adult patients with annual follow up over 3–5 years. We report our demographic data.

Methods Multicentre recruitment (13 secondary care sites) with databasing of patient demographics. Data is quality assured on a routine basis. We followed the EMBARC protocol for data collection including Quality of Life Bronchiectasis (QOL-B) and SGRQ questionnaires.

Results 1403 patients have been recruited. We report data on the first 813 with complete core datasets; 504 were female (62%), 309 male (38%). The mean age 65 years SD 12.6 (median is 67 IQR 61–73). Patients were predominantly Caucasian (93%). The majority were never smokers 478 (58.8%) or ex-smokers 304 (37.4%) with only 31 (3.8%) self-reporting current smoking. Morbidity was high; Cardiovascular disease was present in 234 (28.8%). 147 (18.1%) were hospitalised in the last year due to respiratory disease, 666 (81.9%) were not. Exacerbations were common with one – 144 (17.7%), Two – 144 (17.7%) three or more- 319 (39.3%). Only 206 (25.3%) reported no exacerbations in prior 12 months. *Haemophilus influenzae* was the most frequent organism isolated (19.1% of all patients/29.3% of patients producing baseline sputum). *Pseudomonas* was cultured in most recent sputum in 98 (12.1%) rising to 223 (27.4%) isolating *Pseudomonas* in the last 2 years. The mean BMI was 26.5 (22.3–29.3) and median, FEV1% predicted median 76.9 (59.1–95.1). The Bronchiectasis severity index (BSI) was - mild= 233 (29%), moderate= 391 (48%), severe= 189 (23%). Common aetiologies were idiopathic (40%) and post infectious (34%). COPD and Asthma were either common comorbidities or suspected aetiologies (16–21% and 3–39%) respectively.

Conclusions The BronchUK registry has a broadly representative cohort of patients in terms of simple demographics (female predominant, *Haemophilus* infections, idiopathic/post infectious aetiologies) but the morbidity levels and hospitalisation rates are noteworthy. Long term follow up will help us ascertain which patients are at highest risk of poor outcomes.

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The Society's Specialist Advisory Groups also provided suggestions for symposia content.

Topic Leaders, who organised the symposia, were:

Dr Chris Barber
Professor James Chalmers
Dr Nazia Chaudhuri
Dr Robin Condliffe
Dr Sonya Craig
Professor Jane Davies
Professor Andres Floto
Dr Michael Gibbons
Dr Amanda Goodwin
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Dr Gareth Jones
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Dr Vidan Masani
Dr Philip Molyneaux
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Thorax, BMJ Journals, BMA House, Tavistock Square, London, WC1H 9JR, UK
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British Thoracic Society
17 Doughty Street, London WC1N 2PL, UK
T: **+44 (0)20 7831 8778**
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Please refer to the full Summary of Product Characteristics (SPC) before prescribing. **Presentation:** Each Fostair pressurised metered dose inhaler (pMDI) 100/6 dose contains 100 micrograms (mcg) of beclometasone dipropionate (BDP) and 6mcg of formoterol fumarate dihydrate (formoterol). Each Fostair pMDI 200/6 dose contains 200mcg of BDP and 6mcg of formoterol. Each Fostair NEXThaler 100/6 dry powder inhaler (DPI) dose contains 100mcg of BDP anhydrous and 6mcg of formoterol. Each Fostair NEXThaler 200/6 DPI dose contains 200mcg of BDP anhydrous and 6mcg of formoterol. **Indications:** ***Asthma***: Regular treatment of asthma where use of an inhaled corticosteroid/long-acting $beta_2$-agonist (ICS/LABA) combination is appropriate: patients not adequately controlled on ICS and as needed short-acting $beta_2$-agonist, or patients already adequately controlled on both ICS and LABA. ***COPD*** **(Fostair 100/6 only):** Symptomatic treatment of patients with severe COPD (FEV_1 <50% predicted normal) and a history of repeated exacerbations, who have significant symptoms despite regular therapy with long-acting bronchodilators. **Dosage and administration:** For inhalation in adult patients (≥18 years). ***Asthma***: **Maintenance And Reliever Therapy (Fostair 100/6 only)** can be taken as a regular maintenance treatment and as needed in response to asthma symptoms: 1 inhalation twice daily plus 1 additional inhalation as needed in response to symptoms. 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Formoterol itself may induce QTc prolongation. Potentially serious hypokalaemia may result from $beta_2$-agonist therapy and may also be potentiated by concomitant treatments (e.g. xanthine derivatives, steroids and diuretics). Formoterol may cause a rise in blood glucose levels. Fostair should not be administered for at least 12 hours before the start of anaesthesia, if halogenated anaesthetics are planned as there is risk of arrhythmias. Use with caution in patients with pulmonary tuberculosis or fungal/viral airway infections. Increase in pneumonia and pneumonia hospitalisation in COPD patients receiving ICS. Clinical features of pneumonia may overlap with symptoms of COPD exacerbations. Fostair treatment should not be stopped abruptly. Medical attention should be sought if treatment ineffective. Treatment should not be initiated during exacerbations or acutely deteriorating asthma. Fostair treatment should be discontinued immediately if the patient experiences a paradoxical bronchospasm. Fostair is not intended for initial management of asthma. Systemic effects of ICS may occur, particularly at high doses for long periods, but are less likely than with oral steroids. These include Cushing's syndrome, Cushingoid features, adrenal suppression, decrease in bone mineral density, cataract and glaucoma and more rarely, a range of psychological or behavioural effects including psychomotor hyperactivity, sleep disorders, anxiety, depression and aggression. Consider referral of patients reporting blurred vision or visual disturbances to an ophthalmologist as causes may include cataract, glaucoma or rare diseases such as central serous chorioretinopathy. Prolonged treatment with high doses of ICS may result in adrenal suppression and acute adrenal crisis. Lactose in Fostair NEXThaler contains small amounts of milk proteins, which may cause allergic reactions. **Interactions:** Possibility of systemic effects with concomitant use of strong CYP3A inhibitors (e.g. ritonavir, cobicistat) cannot be excluded and therefore caution and appropriate monitoring is advised. Beta-blockers should be avoided in asthma patients. Concomitant administration of other beta-adrenergic drugs may have potentially additive effects. Concomitant treatment with quinidine, disopyramide, procainamide, phenothiazines, antihistamines, monoamine oxidase inhibitors (MAOIs) and tricyclic antidepressants can prolong the QTc interval and increase the risk of ventricular arrhythmias. L-dopa, L-thyroxine, oxytocin and alcohol can impair cardiac tolerance towards $beta_2$-sympathomimetics. Hypertensive reactions may occur following co-administration with MAOIs including agents with similar properties (e.g. furazolidone, procarbazine). Concomitant treatment with xanthine derivatives, steroids or diuretics may potentiate a possible hypokalaemic effect of $beta_2$-agonists. Hypokalaemia may increase the likelihood of arrhythmias in patients receiving digitalis glycosides. Presence of ethanol in Fostair pMDI may cause potential interaction in sensitive patients taking metronidazole or disulfram. **Fertility, pregnancy and lactation:** Fostair should only be used during pregnancy or lactation if the expected benefits outweigh the potential risks. 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