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Ambulatory management of pneumothorax

BTS Interventional Course, 31st May 2024

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No conflicts of interest

Aims

- Ambulatory management of pneumothorax
  - Device
  - Initial management
  - Management of persistent air leak
  - Guidelines

Why ambulatory management?

In UK

- 8000 admissions for pneumothorax each year
- 50 000 bed days given an average length of stay of just under
- one week
- These admissions alone have estimated costs of £13.65m for the National Health Service.

(Bintcliffe and Maskell 2014)

Benefits

- Reduction in bed days
- Increased ambulation

- PSP- well population
- SSP- long hospital stay >10 days

Not a new idea

Thorax (1973), **28**, 386.

Management of spontaneous pneumothorax using a Heimlich flutter valve

A. BERNSTEIN, M. WAQARUDDIN, and M. SHAH

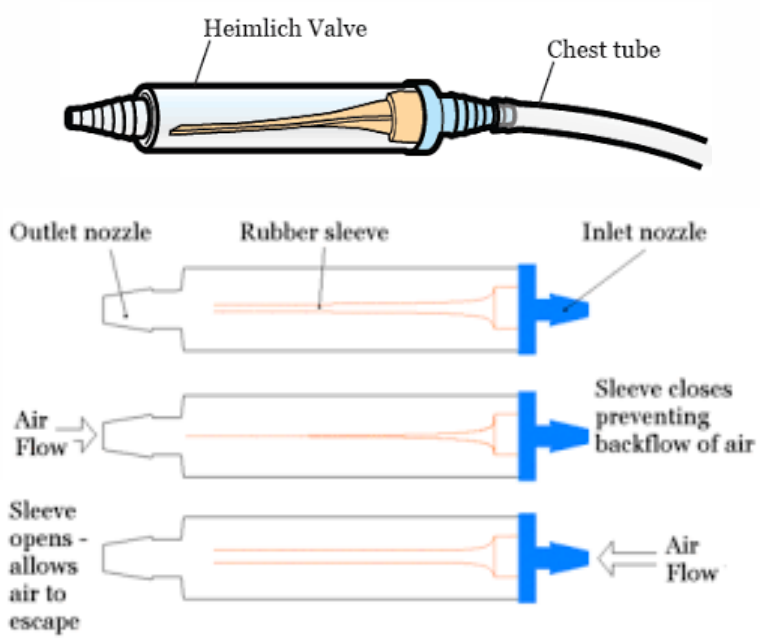
Department of Thoracic Medicine, Hope Hospital, Salford, M6 8HD

Intrapleural evacuation of air was achieved with a Heimlich flutter (non-return) valve in 16 patients with a total of 18 pneumothoraces, 17 of which were spontaneous. Complete lung expansion occurred in 17 (94·4%) of these episodes by five days, and 12 (66%) showed full expansion within one hour. Valve blockage occurred in one patient whose pneumothorax was associated with exudation through the intrapleural catheter and standard under water drainage is recommended in this situation or where there is effusion.

The flutter valve precludes the need for the cumbersome apparatus of under water seal drainage and therefore avoids the well-known possible dangers of connecting an intrapleural catheter to a water trap. Another advantage is the immediate mobility of the patient.

FIG. 3. *Patient immediately after completion of procedure.*

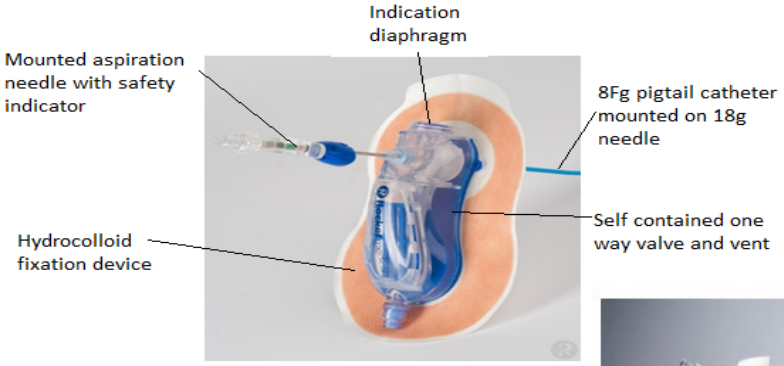
Heimlich Valve

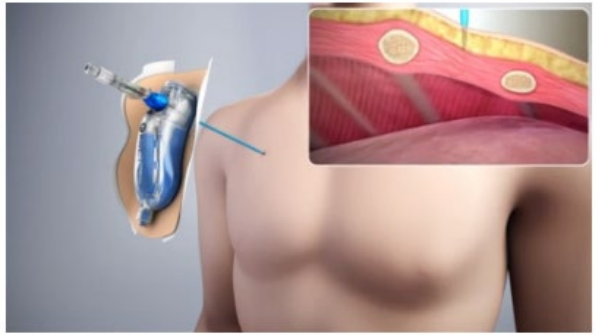


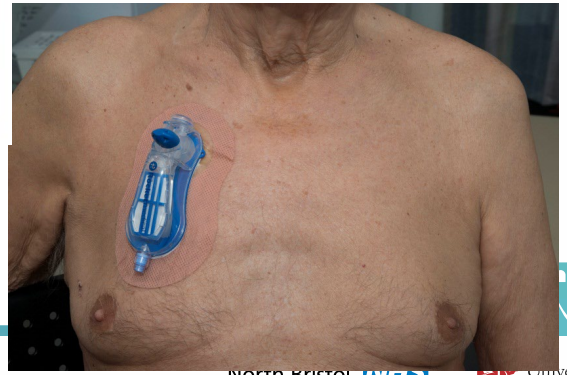
Pneumostat


One-Way Seal Valve
Air Leak Well
Stepped Connector
Collection Chamber
Luer-Lock Connector

Pleural vent







Initial management

RAMPP

Hallifax et al, Lancet 2020 396:39

Ambulatory management of primary spontaneous pneumothorax: an open-label, randomised controlled trial

Rob J Hallifax, Edward McKeown, Parthipan Sivakumar, Ian Fairbairn, Christy Peter, Andrew Leitch, Matthew Knight, Andrew Stanton, Asim Ijaz, Stefan Marciniak, James Cameron, Amrithraj Bhatta, Kevin G Blyth, Raja Reddy, Marie-Clare Harris, Nadeem Maddekar, Steven Walker, Alex West, Magda Laskawiec-Szkonter, John P Corcoran, Stephen Gerry, Corran Roberts, John E Harvey, Nick Maskell, Robert F Miller, Najib M Rahman

Summary

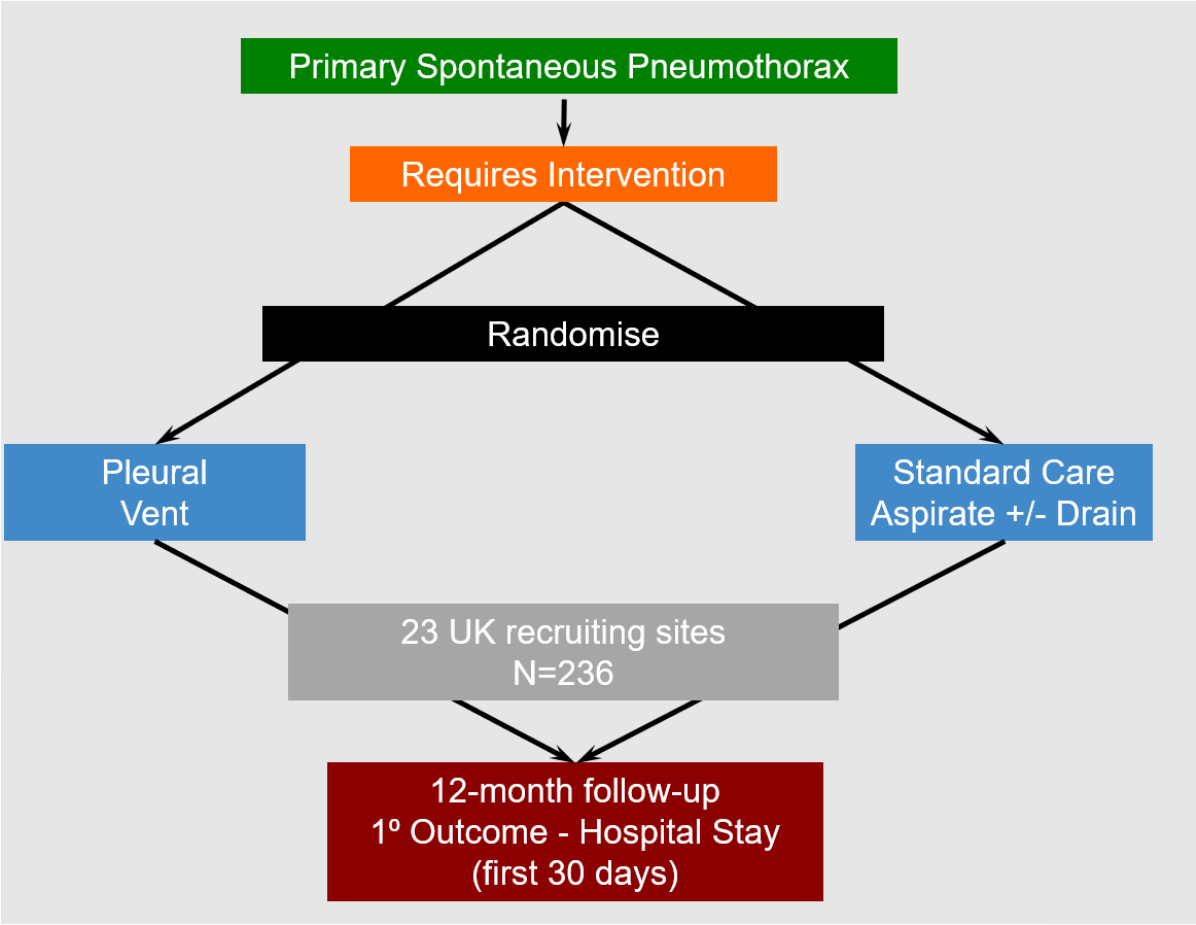
Background Primary spontaneous pneumothorax occurs in otherwise healthy young patients. Optimal management is not defined and often results in prolonged hospitalisation. Data on efficacy of ambulatory options are poor. We aimed to describe the duration of hospitalisation and safety of ambulatory management compared with standard care.

Lancet 2020; 396: 39–49

See Comment page 4

Oxford Centre for Respiratory Medicine (R J Hallifax PhD) and

RAMMP: Randomised Ambulatory Management of Primary Pneumothorax


Primary Spontaneous Pneumothorax
Requires Intervention
Randomise
Pleural
Vent
Standard Care
Aspirate +/- Drain
23 UK recruiting sites
N=236
12-month follow-up
1º Outcome - Hospital Stay
(first 30 days)

Primary outcome:

Median LOS

Ambulatory treatment 0 days [IQR 0–3]

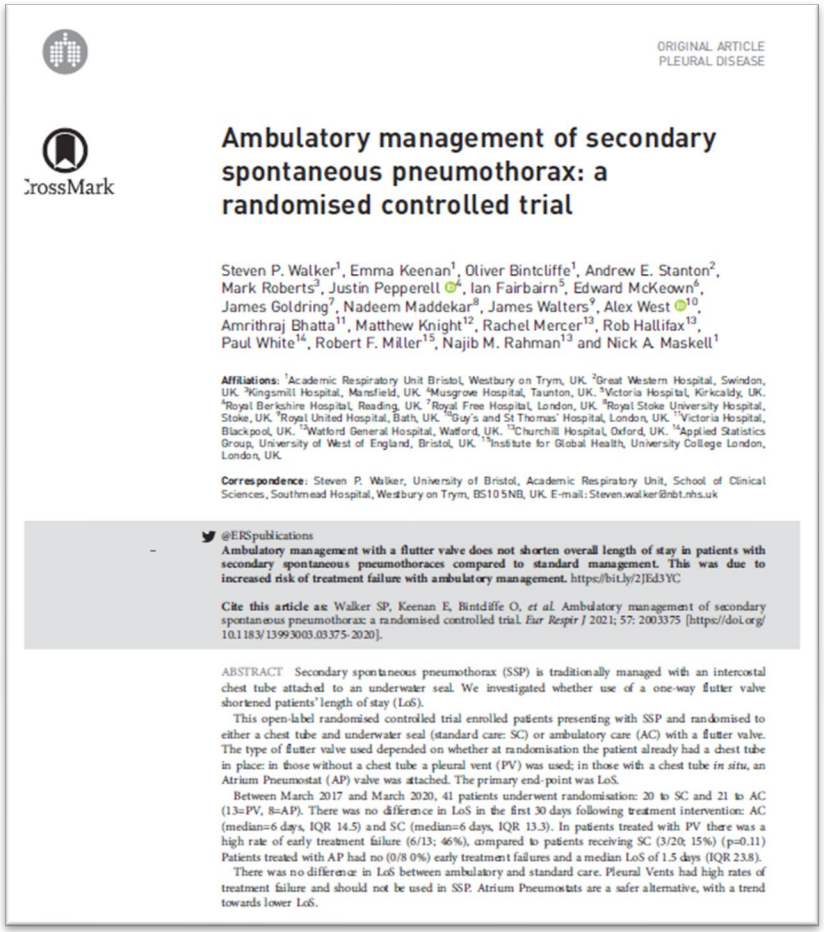
Standard care 4 days [IQR 0–8]; p<0·0001

- Similar pain scores after the first intervention was similar

Hallifax et al, Lancet 2020 396:39
IQR: Interquartile Range
LOS: Length of Stay

Pleural vents – primary PTx

	Patients receiving ambulatory care (n=117)	Patients receiving standard care (n=119)	p value
Any serious adverse event or adverse event	64 (55%)	46 (39%)	0·0135
Serious adverse events	14 (12%)	0	<0·0001
Serious adverse events related to treatment*			
Enlarging pneumothorax†	4 (3%)	0	..
Device blocked or kinked†	2 (2%)	0	..
Device dislodgement†	1 (1%)	0	..
Re-expansion pulmonary oedema (asymptomatic)	1 (1%)	0	..
Device leakage†	1 (1%)	0	..
Admitted for suction	1 (1%)	0	..
Serious adverse events unrelated to treatment*			
Unrecognised haemopneumothorax†	3 (3%)	0	..
Pleurisy	1 (1%)	0	..



ORIGINAL ARTICLE
PLEURAL DISEASE

Ambulatory management of secondary spontaneous pneumothorax: a randomised controlled trial

Steven P. Walker[1], Emma Keenan[1], Oliver Bintcliffe[1], Andrew E. Stanton[2], Mark Roberts[3], Justin Pepperell[4], Ian Fairbairn[5], Edward McKeown[6], James Goldring[7], Nadeem Maddekar[8], James Walters[9], Alex West[10], Amrithraj Bhatta[11], Matthew Knight[12], Rachel Mercer[13], Rob Hallifax[13], Paul White[14], Robert F. Miller[15], Najib M. Rahman[13] and Nick A. Maskell[1]

Affiliations: [1]Academic Respiratory Unit Bristol, Westbury on Trym, UK. [2]Great Western Hospital, Swindon, UK. [3]Kingsmill Hospital, Mansfield, UK. [4]Musgrove Hospital, Taunton, UK. [5]Victoria Hospital, Kirkcaldy, UK. [6]Royal Berkshire Hospital, Reading, UK. [7]Royal Free Hospital, London, UK. [8]Royal Stoke University Hospital, Stoke, UK. [9]Royal United Hospital, Bath, UK. [10]Guy's and St Thomas' Hospital, London, UK. [11]Victoria Hospital, Blackpool, UK. [12]Watford General Hospital, Watford, UK. [13]Churchill Hospital, Oxford, UK. [14]Applied Statistics Group, University of West of England, Bristol, UK. [15]Institute for Global Health, University College London, London, UK.

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@ERSpublications
Ambulatory management with a flutter valve does not shorten overall length of stay in patients with secondary spontaneous pneumothoraces compared to standard management. This was due to increased risk of treatment failure with ambulatory management. https://bit.ly/2JEd3YC

Cite this article as: Walker SP, Keenan E, Bintcliffe O, *et al*. Ambulatory management of secondary spontaneous pneumothorax: a randomised controlled trial. *Eur Respir J* 2021; 57: 2003375 [https://doi.org/10.1183/13993003.03375-2020].

ABSTRACT Secondary spontaneous pneumothorax (SSP) is traditionally managed with an intercostal chest tube attached to an underwater seal. We investigated whether use of a one-way flutter valve shortened patients' length of stay (LoS).

This open-label randomised controlled trial enrolled patients presenting with SSP and randomised to either a chest tube and underwater seal (standard care: SC) or ambulatory care (AC) with a flutter valve. The type of flutter valve used depended on whether at randomisation the patient already had a chest tube in place: in those without a chest tube a pleural vent (PV) was used; in those with a chest tube *in situ*, an Atrium Pneumostat (AP) valve was attached. The primary end-point was LoS.

Between March 2017 and March 2020, 41 patients underwent randomisation: 20 to SC and 21 to AC (13=PV, 8=AP). There was no difference in LoS in the first 30 days following treatment intervention: AC (median=6 days, IQR 14.5) and SC (median=6 days, IQR 13.3). In patients treated with PV there was a high rate of early treatment failure (6/13; 46%), compared to patients receiving SC (3/20; 15%) (p=0.11) Patients treated with AP had no (0/8 0%) early treatment failures and a median LoS of 1.5 days (IQR 23.8).

There was no difference in LoS between ambulatory and standard care. Pleural Vents had high rates of treatment failure and should not be used in SSP. Atrium Pneumostats are a safer alternative, with a trend towards lower LoS.

41 patients with secondary spontaneous pneumothorax

Intervention: Ambulatory care

Standard care: 12Fr Seldinger chest drain with under water seal

Walker SP, Keenan E, Bintcliffe O, et al. Ambulatory management of secondary spontaneous pneumothorax: a randomised controlled trial. Eur Respir J 2021; 57: 2003375

Rocket Pleural Vent

Atrium Pneumostat

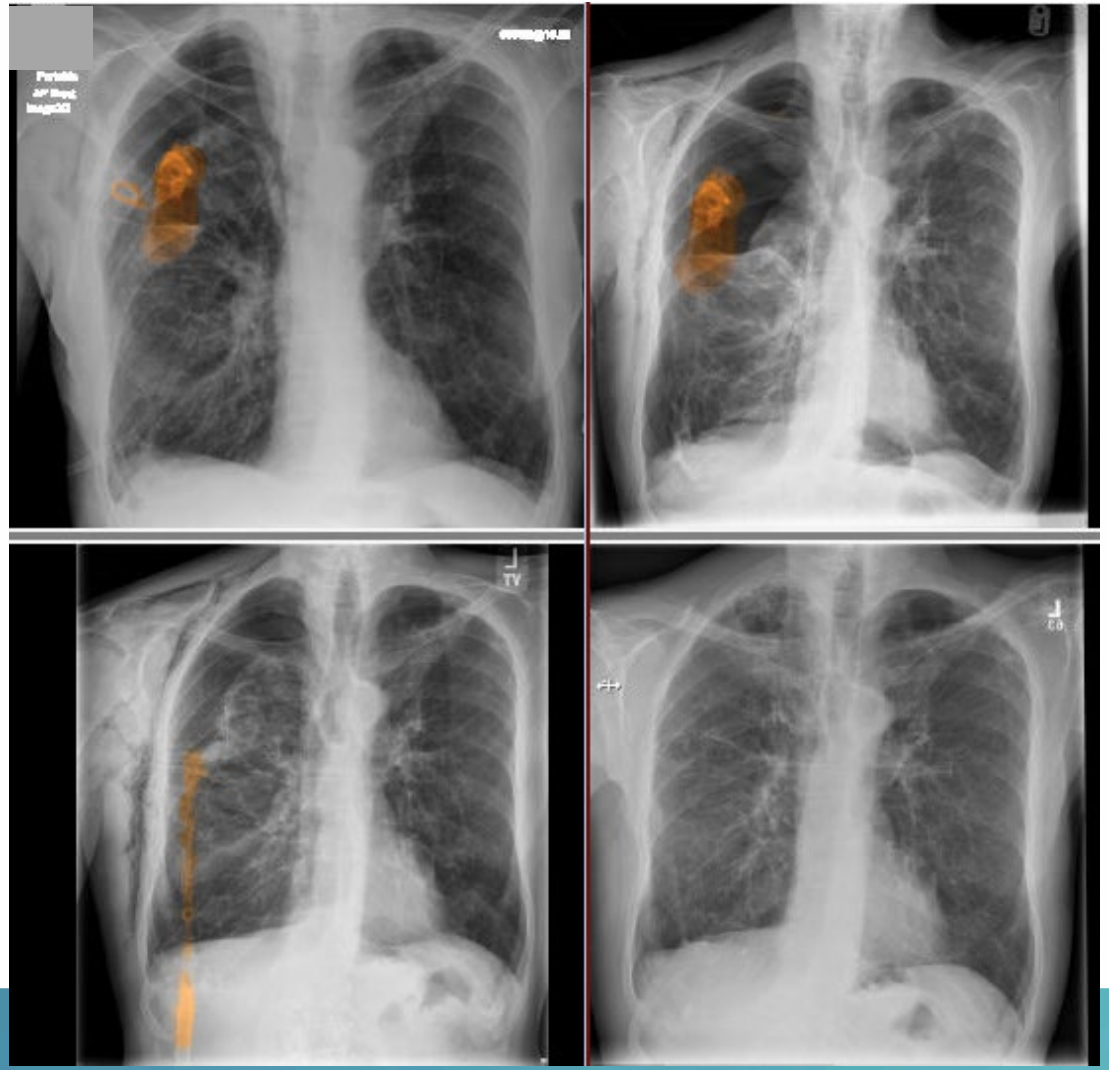
12Fr Seldinger with underwater seal

Urgent Safety Review January 2019

Treatment failure in Rocket pleural vents

Trial Number	Event	Days	Outcome
B08	Vent became dislodged	1	Chest drain inserted
N13	Pneumothorax increased in size + subcut. emphysema	1	Chest drain inserted
S15	'Vent blocked' ⇨subcut. emphysema	2	Chest drain inserted
N18	'Vent blocked' ⇨subcut. emphysema	2	Chest drain inserted
N27	Pneumothorax increased in size + subcut. emphysema	2	Chest drain inserted
F28	Pneumothorax increased in size + subcut. emphysema	2	Chest drain inserted

Serious adverse event data (provided by author) from Walker SP , Keenan E, Bintcliffe O, et al. Ambulatory management of secondary spontaneous pneumothorax: a randomised controlled trial. Eur Respir J 2021; 57: 2003375



Images on file Dr S Walker

RESULTS: PRIMARY OUTCOME. Follow-up: 30 days

LOS for standard care

LOS for ambulatory care

P=0.77

LOS for Pneumostat

LOS for Pleural Vent

Walker SP, Keenan E, Bintcliffe O, et al. Ambulatory management of secondary spontaneous pneumothorax: a randomised controlled trial. Eur Respir J 2021; 57: 2003375

Intervention subgroup analysis

	Atrium Pneumostat			Pleural Vent			
	N	Median	IQR	N	Median	IQR	P value
Length of stay, days (1st 30 days)	8	1.5	23.8	13	9	13.5	0.374

	N	Yes	%	N	Yes	%	P value
Failure of treatment within the 1st week	8	0	0%	13	6	47%	0.046
Requiring additional procedure in 3 months	8	2	25%	13	6	47%	0.4

BMJ Open Respiratory Research

Safety and efficacy of ambulatory management of secondary spontaneous pneumothorax: a case series

Fasih Khan, Yusuf Vali, Muhammad Naeem, Raja Reddy

- SSP n=99
- Prospective

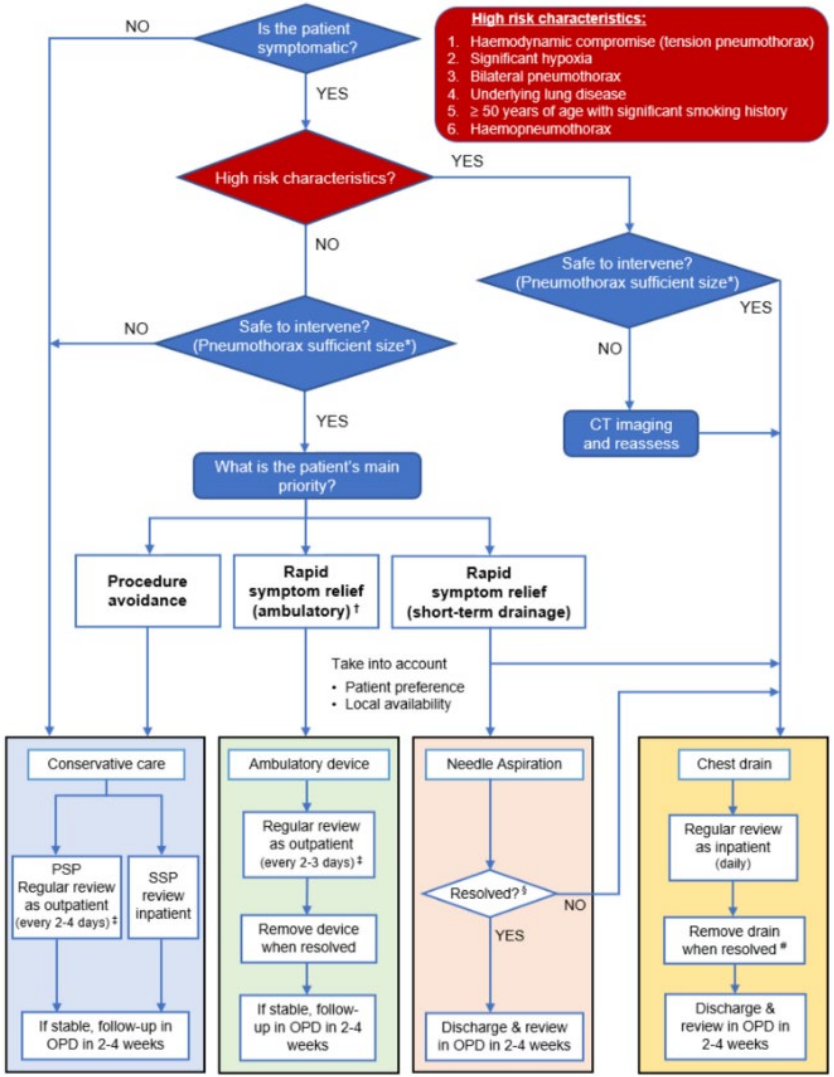
Inclusion

1. Cognitively intact.
2. WHO performance status of 0–1
3. Able to attend the ambulatory care unit for follow-up.
4. No coexisting condition requiring hospital admission.
5. Aged between 16 and 80 years.

- Suitable for ambulatory pathway n=55
- Not suitable for ambulatory pathway N=44

- Total duration of drainage: 5.84+/-0.77
- Inpatient stay 0.74 +/-0.17

- Complictions: Drain displacement (1); Empyema (2)


Is the patient symptomatic?
NO
YES
High risk characteristics:
1. Haemodynamic compromise (tension pneumothorax)
2. Significant hypoxia
3. Bilateral pneumothorax
4. Underlying lung disease
5. ≥ 50 years of age with significant smoking history
6. Haemopneumothorax
High risk characteristics?
YES
NO
Safe to intervene? (Pneumothorax sufficient size*)
NO
YES
Safe to intervene? (Pneumothorax sufficient size*)
YES
NO
CT imaging and reassess
What is the patient's main priority?
Procedure avoidance
Rapid symptom relief (ambulatory)†
Rapid symptom relief (short-term drainage)
Take into account
• Patient preference
• Local availability
Conservative care
PSP Regular review as outpatient (every 2-4 days)‡
SSP review inpatient
If stable, follow-up in OPD in 2-4 weeks
Ambulatory device
Regular review as outpatient (every 2-3 days)‡
Remove device when resolved
If stable, follow-up in OPD in 2-4 weeks
Needle Aspiration
Resolved?§
NO
YES
Discharge & review in OPD in 2-4 weeks
Chest drain
Regular review as inpatient (daily)
Remove drain when resolved #
Discharge & review in OPD in 2-4 weeks

BTS guidelines

"Ambulatory management should be considered for the initial treatment of primary spontaneous pneumothorax in adults with good support and in centres with available expertise and follow-up facilities"

(Conditional)

ERS 2024.

Decision aid for initial management pathways for primary spontaneous pneumothorax
Note: this figure is to aid discussions with patients and should be done in conjunction with guidance within the text. The studies referenced used different designs and may not be directly comparable.

The treatment options: from least invasive (left) to most (right)	Observational care (conservative)	Needle aspiration	Ambulatory care	Chest drain	Surgery
How long is the average (mean) initial hospital stay?	1.0 days[#]	2.6 days	0 days	4.8 days	4 days[¶]
What is the chance of a pneumothorax recurrence within a year?	9 patients in 100	25 patients in 100	24 patients in 100	21 patients in 100	6 patients in 100[+]
How often is a further pleural procedure required?	15 patients in 100 Note: no initial procedure with observational care	22 patients in 100	21 patients in 100	25 patients in 100	3 patients in 100 (Further video-assisted thoracic surgery)
What are the complication rates (%)					
Skin infection	1	0	1	3	0
Local bleeding	0	0	7	3	0
Surgical emphysema	0	1	6	6	0
Haemothorax	3[§]	1	3	6	3
Tube blockage or displacement	0	0	5	11	0
Number of studies	1	6	1	6	1[f]
Study reference(s)	[13]	[20–25]	[27]	[20–25]	[33]

[#]: initial length of stay obtained from supplementary appendix [13].
[¶]: does not include readmission for elective surgery, which increases hospital stay to 7.1 days [33].
[+]: 1-year recurrence rates obtained from communication from authors [33].
[§]: the three instances of haemothorax in the conservative management group were noted as a pleural effusion on the chest radiograph, before insertion of any chest tube [13].
[f]: the Al-Mourgi and Alshehri [31] study was not included in the decision aid as listed outcomes were non-comparable.

Management for persistent air leak

Bristol Academic Respiratory Unit

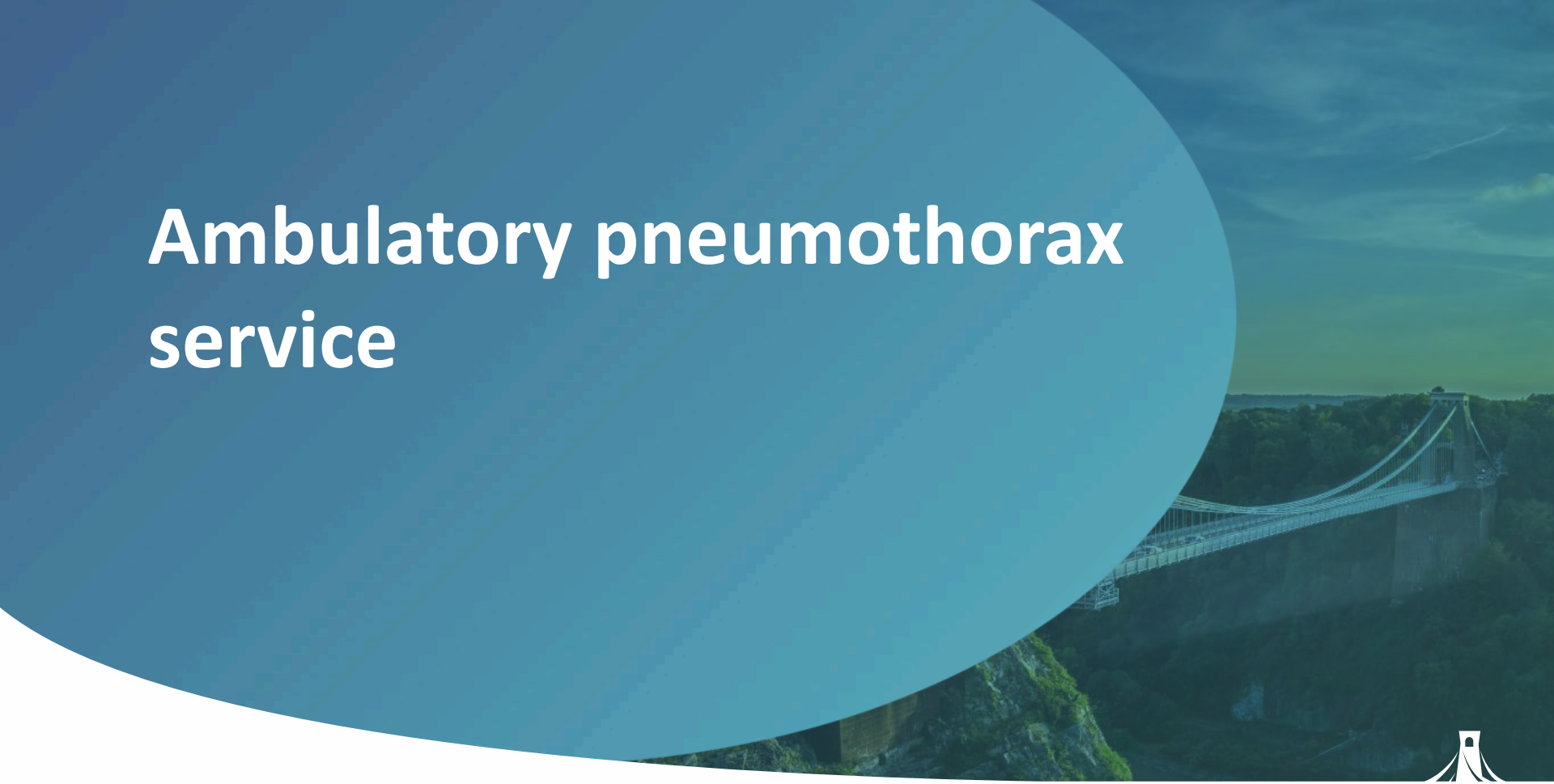
North Bristol NHS Trust

University of BRISTOL

Management for persistent air leak

- Very little data
- Promising technique (presenters' own opinion)
- Need to:
  - Ensure stability on device prior to discharge,
  - Care plan
  - Careful safety netting
  - Robust ambulatory outpatient service

Ambulatory pneumothorax service



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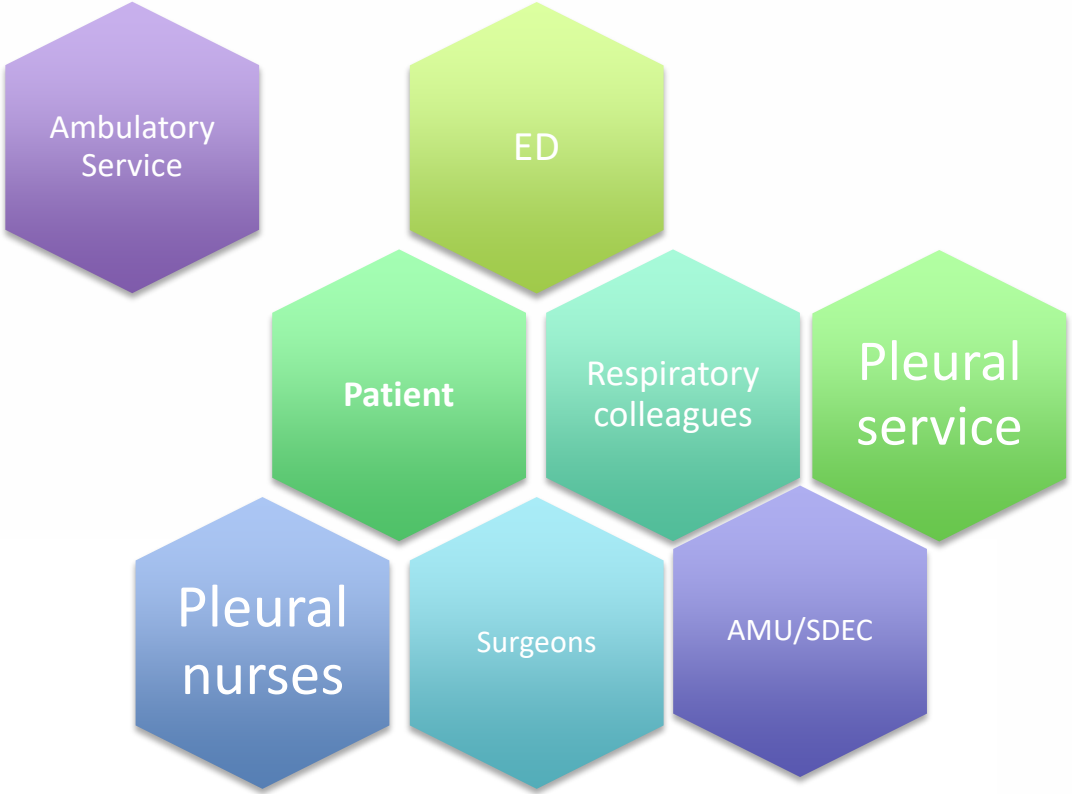
Ambulatory pneumothorax service



Thank you

… questions?