British Thoracic Society
Respiratory Support Pilot Audit Report 2021
Audit period 1 December 2021 – 31 January 2022
Audit lead: Dr Michael Davies

Summary

The principal purpose of the 2021 Respiratory Support pilot audit was to test a new audit dataset in preparation for a national audit in early 2023. The dataset derives from the BTS acute NIV (Non-Invasive Ventilation) audit, with additional questions to widen the patient cohort consistent with the joint BTS/Intensive Care Society's guidance document published in 2021.[1] A section for COVID-19 related admissions was included. Data were also collected to calculate the Non-Invasive Ventilation Outcomes (NIVO) score.[2] This is a validated clinical prediction tool designed to help with decision-making about acute NIV for patients with Chronic obstructive pulmonary disease (COPD) who develop acute hypercapnic respiratory failure.[2] Since it provides a risk adjustment, it may assist benchmarking.

Winter 2021-22 was a period of significant demand for acute respiratory services. Earlier waves of the COVID-19 pandemic placed a huge demand on respiratory support services and, at some stages, almost all patients requiring respiratory support were COVID-19 positive. By winter 2021, many hospitals were seeing a return of more 'usual' reasons for admission, such as acute NIV for hypercapnic exacerbations of COPD. This pilot audit therefore provides an insight into the changing demands on respiratory support services and a hitherto unseen case-mix of non-COVID and COVID-related admissions.

The pilot study found that the dataset and audit platform worked well, with positive feedback received from participating centres. Data entry completion rates were impressively high and robust. Work is ongoing to design the full national audit planned for 2023.

Key findings

- There were 749 patient episodes, of whom at least 79% of patients were treated with respiratory support.
- Acute NIV for acute hypercapnic respiratory failure (COVID-19 negative) was provided for 316 (42%) patients admitted to respiratory support services, and 278 (37%) were admitted for respiratory support in the context of acute hypoxaemic respiratory failure due to COVID-19.
- 'Other' groups of patients represented 21% (n=155) of respiratory support activity, though the largest population in this category were patients who were already on home NIV. Acute pneumonia (n=38, 5% of all patients) was the most common reason for admission that was not related to a form of non-invasive respiratory support.

Acute NIV cohort (n=316)

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- Demographics were similar to the 2019 acute NIV audit.
- NIV success was 86% (76% in 2019) and hospital survival was 80% (76% in 2019).
- The pilot study data are therefore encouraging, and perhaps continue the positive outcome trends seen in 2019, though firm conclusions should not be made ahead of the planned national audit.

NIVO score

- The NIVO score was captured for patients with COPD who were treated with acute NIV. Data completion was 100%, indicating that the indices required to create the score are readily available in routine clinical practice.
- Outcome analysis showed that the participating centres achieved outcomes that were better than expected for their high-risk patients. Other audit data were consistent with good delivery of NIV care.
- As such, the pilot audit showed good agreement with the published validation cohort. Embedding the NIVO score will improve benchmarking and outlier analysis for the upcoming national audit.

COVID-19 pneumonitis cohort (n=278)

- Median oxygen requirements were 60% on admission to respiratory support services.
- At least 59% of patients were documented as 'for escalation to critical care.'
- CPAP was the primary mode of respiratory support for 68% of patients. HFNO was the primary mode for 19%, though they were most often used together.
- Transfer to critical care was required for 49 patients (18% of whole cohort, 24% of those who were for escalation).
- Of the 278 patients, 167 (60%) survived to hospital discharge.
- Escalation status at 24 hours was a strong marker of outcome; survival was 78% if 'for escalation to critical care' and was 29% for patients who were 'not for further escalation.'

Aims and objectives

The Respiratory Support Pilot Audit was the first stage of a project to capture data on adult patients requiring enhanced ward-level monitoring and treatment, with a view to better understanding variations in clinical practice and outcome. The audit also aimed to gather service-level data through an organisational questionnaire.

The project will be delivered in three parts:
1: A pilot study **(December 2021 to January 2022)**
2: Local audit programme
3: A national audit **(February 2023 – March 2023)**

This report outlines the findings of the pilot study.

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Methods

The pilot study had two parts:
Part 1: Patient Questionnaire – one record per patient
Part 2: Organisational Questionnaire – one record to be submitted by each participating site to provide information on available resources for each institution

Part 1: Patient Questionnaire

Inclusion Criteria

Any patient requiring monitoring above and beyond what is given on the ward/advanced monitoring for an acute respiratory problem. Such patients can include:

- Patients receiving acute non-invasive ventilation (NIV) for acute acidaemic hypercapnic respiratory failure
- Patients receiving acute non-invasive continuous positive airway pressure (CPAP) for hypoxaemia of respiratory cause
- Patients receiving acute high flow nasal oxygen (HFNO) for hypoxaemia
- Patients receiving Long Term Ventilation who are admitted acutely
- ICU step down patients with ongoing single organ respiratory failure including continued requirement for tracheostomy/laryngectomy management and patients receiving Mechanical Insufflation-Exsufflation (MI-E) therapy
- Acute pulmonary embolism (PE)
- Acute Asthma
- Other Respiratory conditions characterised by an acute need for continuous oxygen saturation monitoring

PART 2: Organisational Audit

In line with standard BTS audit practice, a series of organisational questions were asked, with one response requested from each hospital. Responses reflect the services available at the time of the audit period.

Whilst focused on Respiratory Support Units (RSUs), it is recognized that some hospitals continue to lack the necessary infrastructure for designated RSU area(s). As such, there was no requirement for participating hospitals to have a designated RSU.

Pilot Period

Pilot sites were asked to collect data for cases from 1 December 2021 to 31 January 2022. The data collection period ran from 1 Dec 2021 to 31st March 2022.

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Pilot Sites selection

The aim was to include 10 to 20 sites, comprising of a variety of organisations (teaching hospital / district general hospital, large / small) and different geographies (urban, rural and from across the UK). Essentially though, a willingness to participate was a strong driver for approval.

Findings

Demographics and Participating sites

The following 19 hospitals participated in the pilot study:

Institution	Trust
Calderdale Royal Hospital	Calderdale and Huddersfield NHS Foundation Trust
Darent Valley Hospital	Dartford and Gravesham NHS Trust
Wexham Park Hospital	Frimley Health NHS Foundation Trust
Frimley Park Hospital	Frimley Health NHS Foundation Trust
The Great Western Hospital	Great Western Hospitals NHS Foundation Trust
St Mary's Hospital - Imperial	Imperial College Healthcare NHS Trust
Ealing Hospital	London North West University Healthcare NHS Trust
Antrim Hospital	Northern Health & Social Care Trust
Northumbria Specialist Emergency Care Hospital	Northumbria Healthcare NHS Foundation Trust
Queen Alexandra Hospital	Portsmouth Hospitals NHS Trust
Royal Free Hospital	Royal Free London NHS Foundation Trust
City Hospital	Sandwell and West Birmingham Hospitals NHS Trust
Kings Mill Hospital	Sherwood Forest Hospitals NHS Foundation Trust
The James Cook University Hospital	South Tees Hospitals NHS Foundation Trust
St James University Hospital	The Leeds Teaching Hospitals NHS Trust
Royal Victoria Infirmary	The Newcastle upon Tyne Hospitals NHS Foundation Trust
Bristol Royal Infirmary	University Hospitals Bristol NHS Foundation Trust
Glenfield Hospital	University Hospitals of Leicester NHS Trust
Royal Stoke University Hospital	University Hospitals of North Midlands NHS Trust

Table 1: Participating sites

Organisational data

A limited review of organisational data is provided due to the small nature of the pilot study.

All 19 participating units responded that they have a designated NIV area, though 5 of these (21%) felt that they do not provide a full RSU environment. Average unit size was 16 beds (range 6 - 36).

Routine nurse to patient ratio was 1:2 for 4 (21%), 1:2-1:4 for 10 (53%), and 1:4 - 1:8 for 5 (26%). Respiratory consultant cover 24/7 was provided in 5 (26%) units, with the remainder requiring on-call cover from acute medical specialties.

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95% of units had provision for continuous pulse oximetry monitoring during the first 24 hours of acute NIV and 95% of units had provision for point of care blood gas analysis within or adjacent to all designated NIV areas.

Leadership roles for the Respiratory Support/NIV services were as follows, with 2019 data provided for comparison.

Role	2019 NIV audit	2022 pilot respiratory support audit (%)
Medical Lead	89	95
Medical lead AND time in job plan	39	47
Nursing lead	52	68
Physiotherapy lead	34	47

Table 2: Respiratory support leadership roles

Subjects

There were 749 patient episodes submitted (median 32 responses per institution) for the whole respiratory support dataset. Median age was 69 years (44% female gender). Table 3 shows the primary reason for admission.

Primary reason for admission to Respiratory Support Service	Number
Acute hypercapnic respiratory failure (COVID-19 negative)	316
Acute hypoxaemic respiratory failure (known or suspected COVID-19)	278
Acute pneumonia	38
Acute exacerbation of Interstitial lung disease	17
Acute exacerbation of COPD (not requiring NIV)	13
Neuromuscular / secretion clearance (not requiring NIV)	10
Acute pulmonary embolism	8
Acute asthma	7
Complex pleural management (fluid or pneumothorax)	6
Other	56
Total	**749**

Table 3: Primary reason for admission to respiratory support services (all patients)

As shown in Table 3, the most common reason for admission to a respiratory support service was to provide acute NIV for patients with acute hypercapnic respiratory failure (n= 316, 42%), though use of respiratory support for COVID-19 positive patients with acute hypoxaemic respiratory failure remained a common indication for admission (n=278, 37%). There were a minority of COVID-19 positive patients in other categories (e.g. admitted *with* COVID-19 rather than *because* of COVID-19).

Outcomes for the whole cohort are summarised below. Audit, however, ideally measures current practice against a defined standard. This Respiratory Support pilot does not have defined standards for the whole cohort because of its new nature and the variety of patient cohorts included. There are, however, clear quality standards for acute NIV,[3] plus emerging high-quality research evidence for patients treated with COVID-19. As such, this report will also analyse outcomes according to the diagnostic group.

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Escalation decisions

Participating sites were asked if an escalation status decision was documented within 24 hours of respiratory support service admission. Here, escalation status referred to whether the patient was considered for transfer to critical care in the event of clinical deterioration. The study found that an escalation decision was documented within 24 hours of admission for 720 (96%) of patients. Of these, 314 were for escalation and 406 were not for escalation to critical care. For comparison, escalation status was documented for 83% of patients in the 2019 NIV audit. For the acute hypercapnic respiratory failure (AHRF) cohort treated with NIV (n=316), an escalation decision was recorded for 309 (98%); 27% were for escalation, and 71% were documented as not for endotracheal intubation. For the acute COVID-19 cohort (278), escalation status as documented for 264 (95%); 59% were for escalation and 36% were not. In subsequent analysis in this report, a patient will be considered for escalation in the absence of a documented decision against.

Frailty assessment

A Rockwood frailty score was entered for 597/749 patients (80%). Figure 1 shows the relative distribution of frailty where data are available. As shown later, this varied according to diagnostic group.

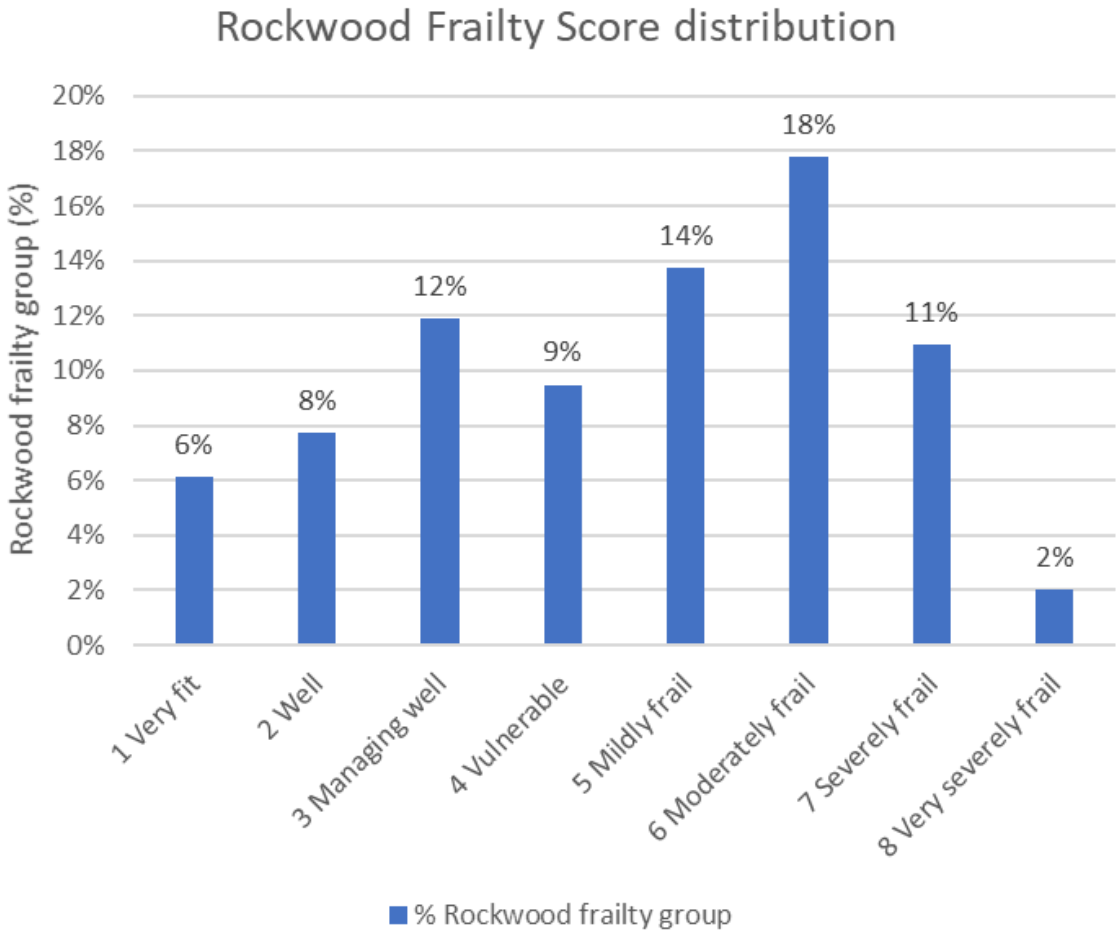

Figure 1: Rockwood Frailty Score distribution for the respiratory support cohort (n=597)

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Outcomes for the whole cohort (n=749)

Median length of respiratory support service stay was 6 days (IQR 4-10). Status at discharge from service was as follows.

Respiratory Support discharge status	Number (%)
Discharge direct to home/community setting	300 (40)
Step-down to ward	194 (26)
Died	164 (22)
Transfer to ICU/HDU	62 (8)
Transfer to another hospital	13 (2)
Unknown/other	16 (2)
Total	**749**

Table 4: Status at discharge from respiratory support service

Of the 62 patients who transferred to HDU/ICU, 35 (56%) survived to hospital discharge. For the whole cohort, hospital survival was 70%. No differences in outcome were seen according to gender or ethnicity. A lower survival rate was seen with advancing age (Figure 2), though as shown patient numbers were lower at each extreme of age.

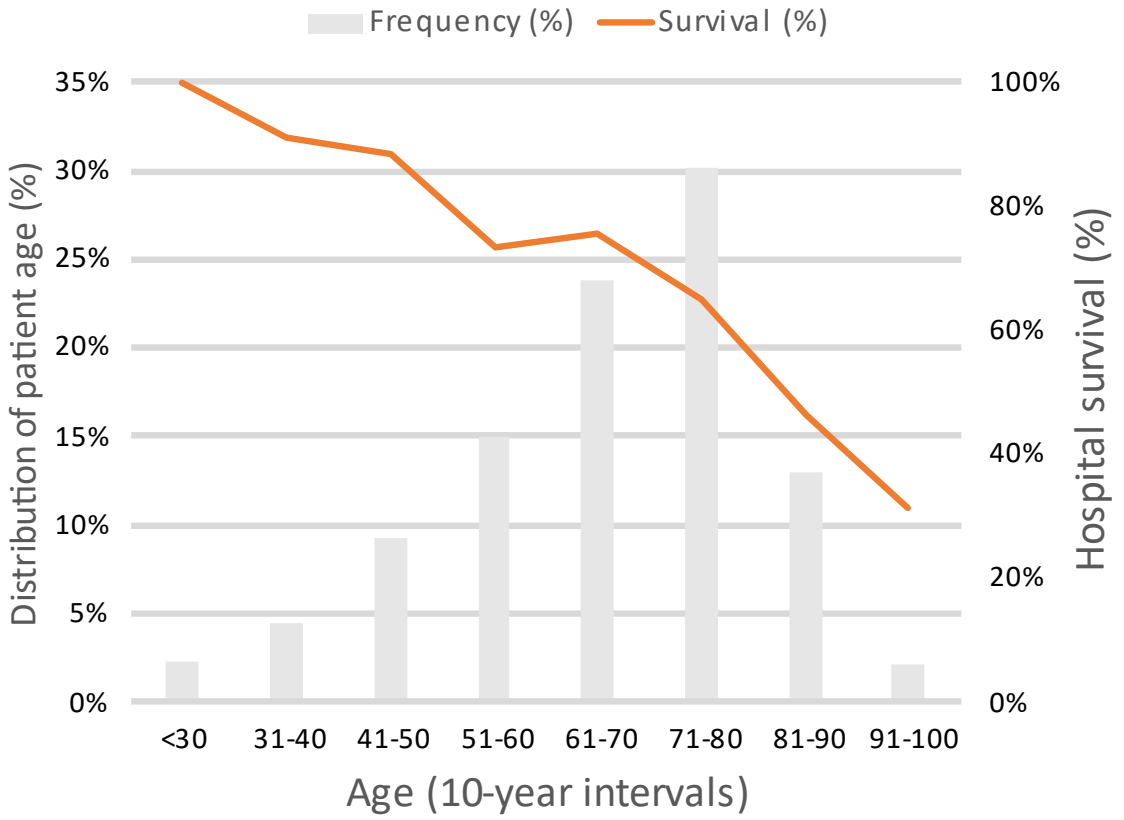

Figure 2: Age distribution in deciles and its relationship with hospital survival (n=749)

Where frailty data were available (n=597), a lower survival rate was also seen as frailty increased to 'mildly frail' though did not reduce further as frailty increased. Figure 3 shows the relationship between frailty score category (x-axis), hospital survival and escalation decisions.

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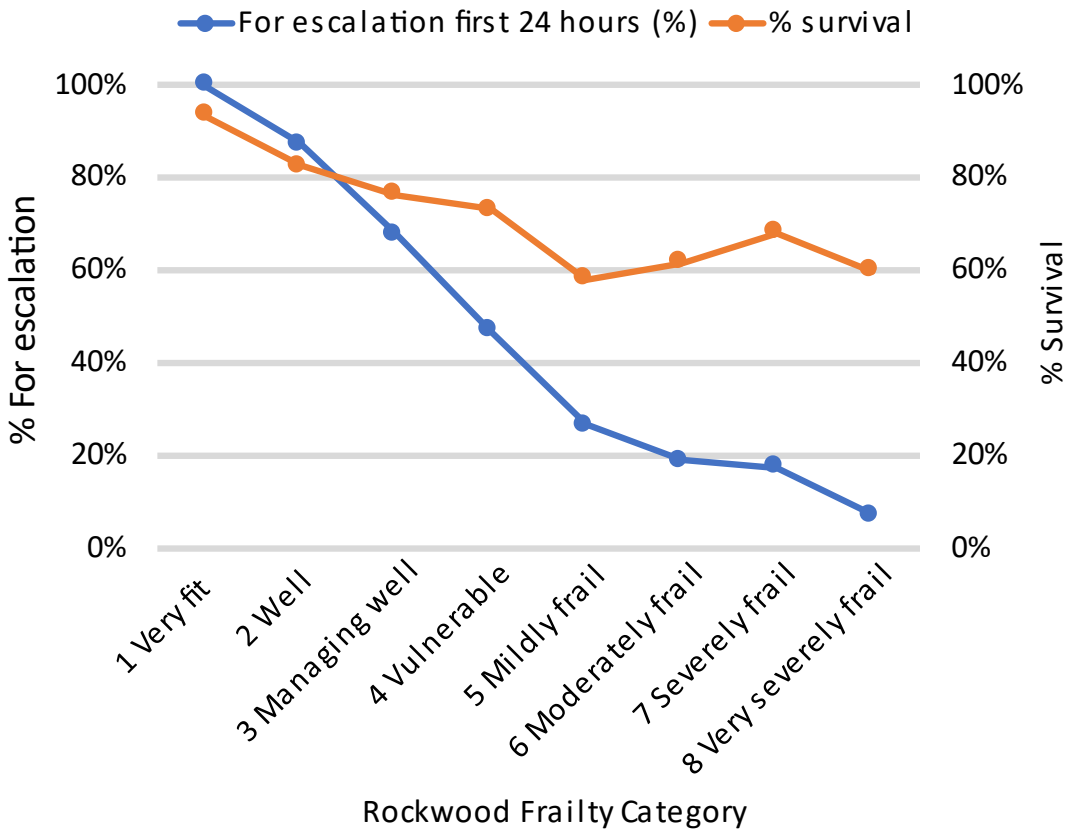

Figure 3: Distribution of escalation status and hospital survival with respect to frailty score (n=597)

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The COVID-19 negative acute NIV cohort (n=316)

Outcome data are shown against the 2019 acute NIV national audit[4] for comparison. The 19 participating hospitals represented a reasonable cross-section of acute hospitals though, of course, are only a small proportion compared to the national audit. Table 5 shows demographic data.

Patient demographics

	2019 NIV audit	2022 respiratory support pilot (NIV subgroup)
Patient submissions (n)	3502	316
Participating hospitals (n)	159	19
Age (median, years)	72	70
Gender (% female)	56	49
Diagnosis (%)		
COPD	67	67
Obesity-related respiratory failure	8	15
Acute Cardiogenic Pulmonary Oedema	7	3
Neuromuscular / Chest-wall disorders	3	4
Other	13	10
No data	2	1
Completed escalation plan (%)	83	98
Consolidation present on CXR (%) *(where data available)*		
Yes	37	40
No	63	60
Pre-NIV blood gas results (median, kPa)		
pH	7.26	7.26
$PaCO_2$	9.3	9.9
PaO_2	8.1	8.4

Table 5: Demographics for the 2019 national audit and the NIV cohort of the 2022 pilot audit

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As for prior NIV audits, these were a relatively frail group of patients. The Rockwood Frailty Score was available for 258 patients (82% of the total NIV cohort) with distribution as follows.

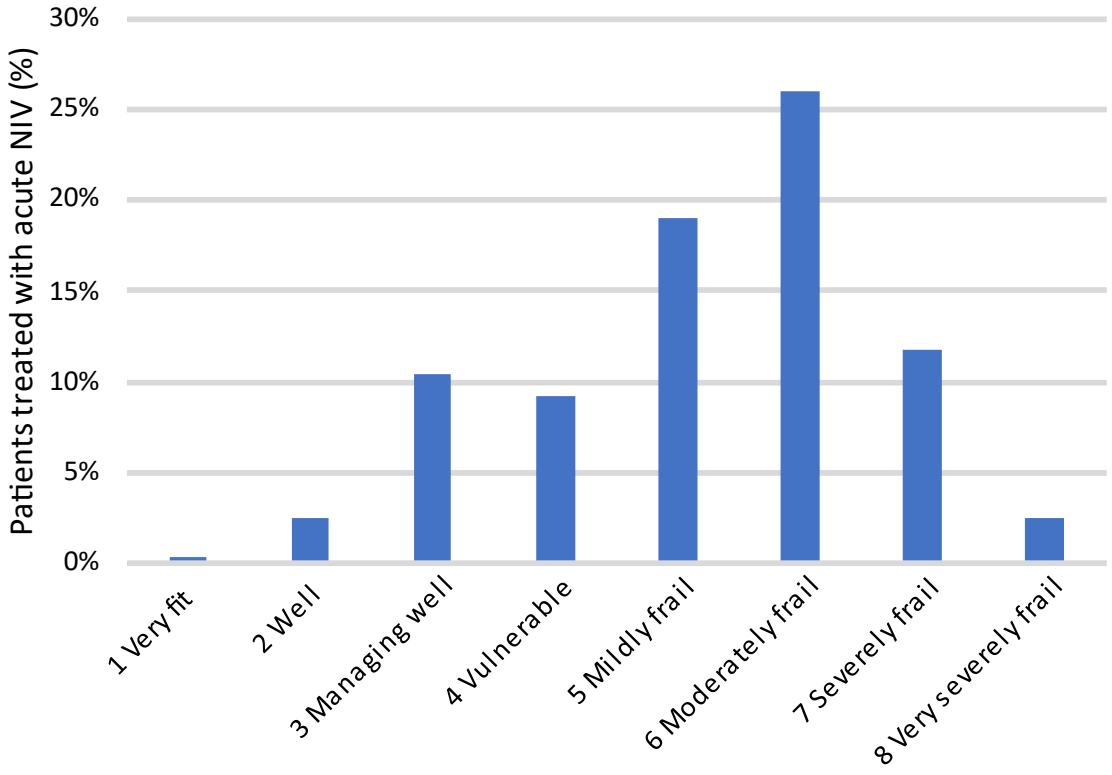

Figure 4: Rockwood Frailty Score distribution for patients treated with acute NIV (n=258)

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Outcomes

Of the 316 patients with AHRF, acute NIV was started within 60 minutes of the last pre-NIV blood gas for 110 (35%). Outcome data are provided in Table 6.

	2019	2022
Average NIV settings after 2 hours	18/5	20/5
NIV outcome (%)		
Success (resolution of acidaemia)	76	86
Failure	21	13
Failure but proceeded to intubation	3	0.5
No data	0	0.5
Length of stay (median days)	9	6
Outcome of admission (%)		
Death	26	20
Alive at hospital discharge	70	80
Other / No data	4	0

Table 6: Outcome data for the 2019 national audit and the NIV cohort of the 2022 pilot audit

As shown, the outcomes of the 2022 pilot study appear favourable against the 2019 audit, notably a 6% absolute improvement in patient survival and a 10% absolute improvement in NIV success as defined by achieving resolution of respiratory acidaemia. The proportion of patients with COPD was similar between audit periods, though obesity-related respiratory failure increased from 8 to 15%.

Again, caution is urged here due to the significant differences between audit population sizes, and the possibility that outcomes may be affected by case-mix.

The NIVO score (n=213)

Introduction

The 2021 pilot audit provided the opportunity to trial use of the Non-Invasive Ventilation Outcomes (NIVO) score. The NIVO score is a validated clinical prediction tool designed to aid decision-making around the role of acute NIV for patients with acute hypercapnic respiratory failure as a consequence of COPD.[2] Whilst developed to aid prognostication, it may equally be used to assist benchmarking via risk-adjusted outcomes.

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Methods

The NIVO score was compiled from measures available at the time of presentation with acute hypercapnic respiratory failure (Table 7). The score can provide an expected outcome for in-hospital mortality plus 90-day mortality, if treated with acute NIV. Higher scores indicate a lower likelihood of survival.

NIVO Score	Points
Consolidation	1
GCS <15	1
Atrial Fibrillation	1
pH <7.25	1
Time to Acidaemia >12 hours	2
eMRCD 5a	2
eMRCD 5b	3 /9

Table 7: NIVO score

NIVO Score	Hospital Mortality
0	0%
1	8.9%
2	5.3%
3	15.1%
4	19.0%
5	35.1%
6	53.7%
7	65.4%
8	87.5%
9	100%

Table 8: NIVO score and expected hospital mortality

In line with its validation for patients with COPD, collection of the NIVO score was restricted on the audit data entry platform to patients with acute exacerbations of COPD who were treated with acute NIV (n= 213).

Outcomes

Data collection was complete for all 213 patients (1278 individual data points, 100%). The distribution of NIVO scores were similar to those seen in the published validation data[2] is shown below.

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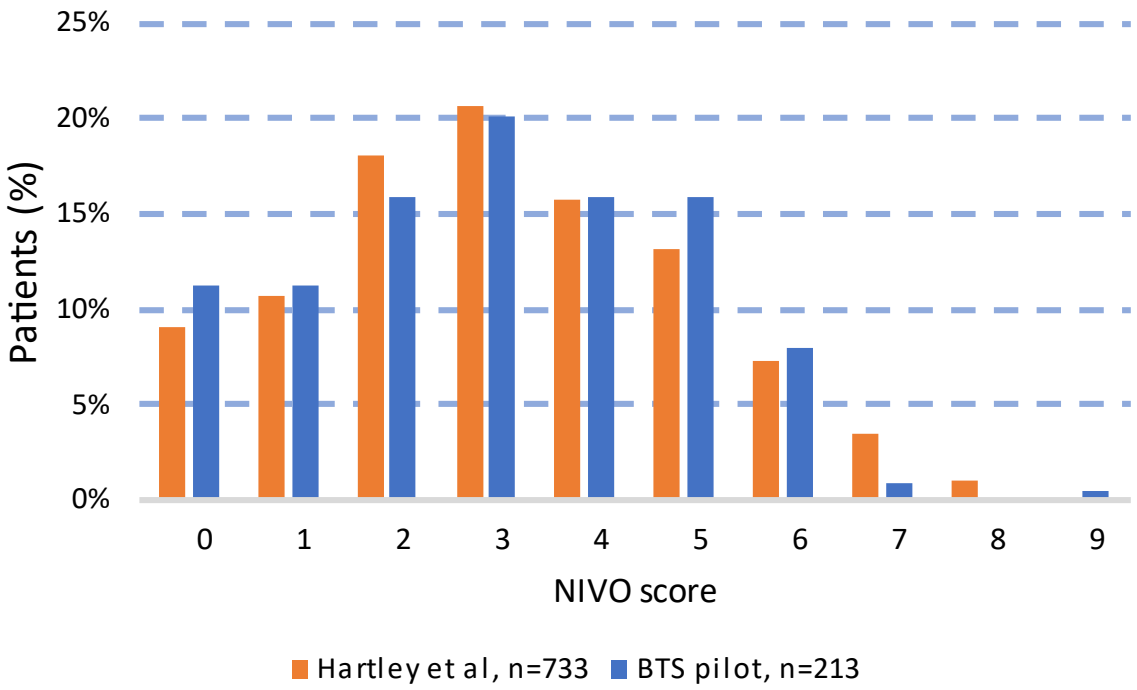

Figure 5: Distribution of the NIVO scores for patients with COPD and treated with NIV

Due to the smaller sample size for the pilot audit, NIVO score data were pooled into four risk categories and compared to the expected hospital mortality[2] and shown in Table 9.

NIVO risk category	Number	Expected hospital mortality (%)	Observed hospital mortality (%)
Low (0-2)	82	5.0	7.3
Medium (3-4)	77	16.8	18.2
High (5-6)	51	41.2	29.4
V. High (7-9)	3	71.4	100

Table 9: Observed vs. expected mortality

These data show that the NIVO score performed well against the pilot audit cohort. Low and medium risk patients experienced the lowest observed hospital mortality and matched the expected mortality of the original study. Little inference can be drawn from the 3 patients in the very high-risk category. A lower than expected hospital mortality was seen, however, for high-risk patients. This may be explained by relatively low patient numbers in this group (n=51), though could also represent high-quality delivery of treatment.

Summary

With complete data entry plus outcome data that conforms to the stratified nature of the tool, the NIVO score will be a useful addition to the future national audit tool. It appears robust and helpful in practice, particularly to assist future benchmarking and outlier data assessment.

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The acute COVID-19 pneumonitis cohort (n=278)

Extending the patient cohort beyond acute NIV alone enabled the inclusion of COVID-19 related admissions to respiratory support services. Use of respiratory support outside of a critical care became a necessity during the COVID-19 pandemic.

Whilst there are no existing clear standards to audit against, the RECOVERY-RS trial showed that treating hospitalised COVID-19 patients who have acute respiratory failure with CPAP reduces the need for invasive mechanical ventilation.[5] In the CPAP group, 137 of 377 participants (36%) either needed mechanical ventilation or died within 30 days, compared with 158 of 356 participants (44%) in the conventional oxygen therapy group, and with 184 of 414 participants (44%) in the High Flow Nasal Oxygen group. Its pragmatic nature allowed for crossover, though with a highest crossover seen towards CPAP the effect was most likely to underestimate the effect of CPAP rather than confound the findings.

Importantly, the RECOVERY-RS trial excluded patients not deemed suitable for tracheal intubation, so it represents only some of the patients treated in a respiratory support setting. Further, the study did not capture the location of therapy (ward-based vs. critical care), though it is likely that a significant proportion of patients were treated in a respiratory support service. It is therefore important to assess real-life outcomes against the research findings arising from a selected population. The pilot audit data are uncontrolled, so represent a good insight into clinical practice.

Patient demographics

In total, 303 patients had a positive COVID-19 status during their respiratory support admission, 278 of whom were admitted with acute hypoxaemic respiratory failure due to COVID-19 (Table 10).

Reason for Respiratory Support admission	Number
Acute hypoxaemic respiratory failure due to known or suspected COVID-19 pneumonitis	278
Acute hypercapnic respiratory failure treated with acute NIV	12
Home NIV requirement	6
Acute pulmonary embolism	2
Acute asthma	1
Acute exacerbation of COPD, not treated with NIV	1
Acute pneumonia	1
Other	2

Table 10: Reason for Respiratory Support admission (COVID-19 positive cohort)

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Data were analysed for the acute hypoxaemic respiratory failure group as follows.

Demographics (n=278)	
Age (Median, IQR)	63 (51-76)
Gender (% female)	38
Comorbidity (%)	
Respiratory	35
Hypertension	32
Cardiac	25
Type II Diabetes Mellitus	23
Obesity	14
No prior comorbid condition	30
Escalation status (%)	
For escalation to critical care	59
Not for further escalation	36
Not documented	5
Symptom duration before respiratory support admission (median days, IQR)	8 (4-12)
Covid-19 positive test duration pre-respiratory support (median days, IQR)	2 (0-8)
Oxygen requirement on admission to respiratory support service (median FiO_2 %, IQR)	60 (60-87.5)
SaO_2 on admission to respiratory support service (median %, IQR)	92 (89-94)
Respiratory rate on admission to respiratory support service (median, IQR)	25 (20-30)

Table 11: Demographics for patients with acute COVID-19

The median age was 63 years and 62% were male. Only 30% of patients had no prior comorbid condition. Ethnicity was recorded for 273 (98%) patients as follows; White 71%, Asian 14%, Black 6%, and other 9%. Patients usually transferred to the respiratory support service soon after hospital admission (median 1 day, 0-2) and had experienced symptoms consistent with COVID-19 for one week prior to hospital arrival.

The Rockwood frailty score was documented for 228 (82%) patients. Of these, 53% of patients had frailty scores 1-3 (low scores indicating lower levels of premorbid frailty), compared to more than 90% for the RECOVERY-RS study cohort.[5] The Respiratory Support pilot study frailty distribution was as follows.

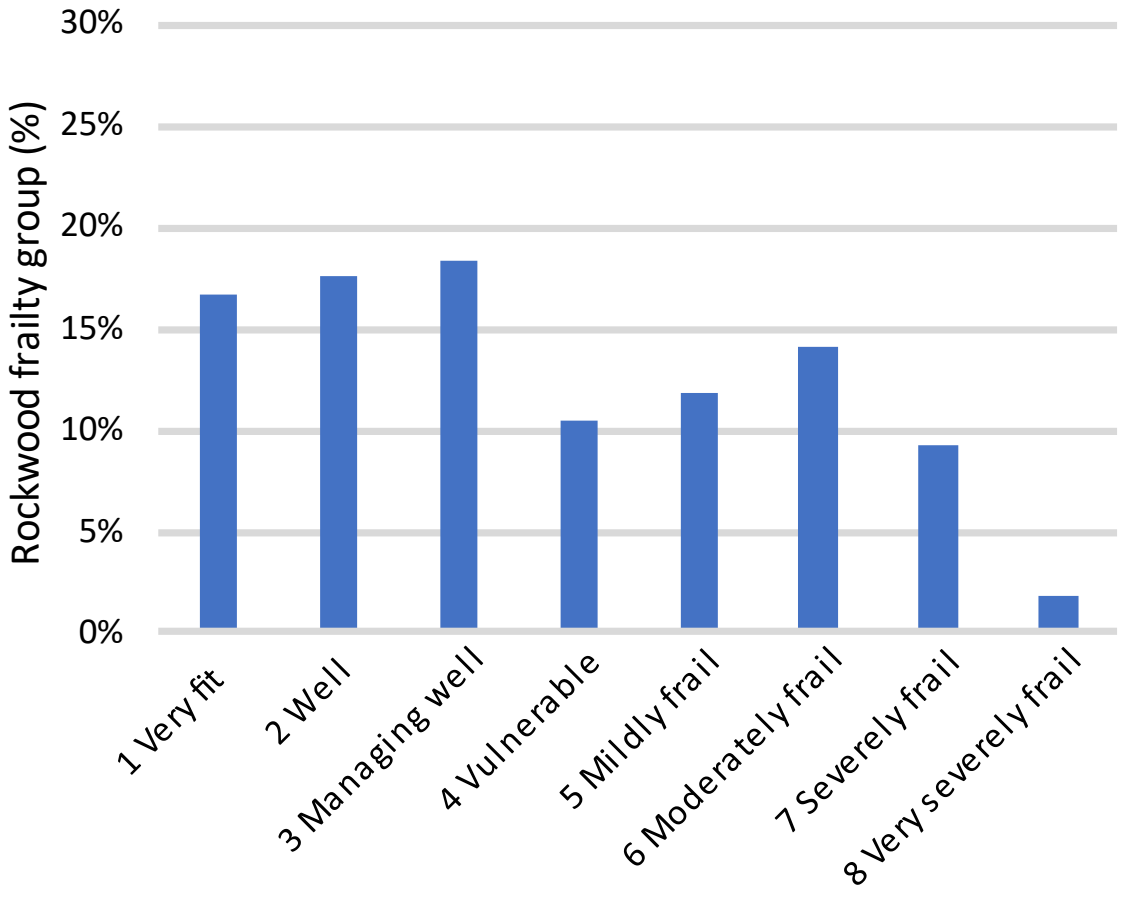

Figure 6: Rockwood Frailty Score distribution for patients with acute COVID-19

Outcomes

CPAP was the most common form of respiratory support, though HFNO was often used during breaks from CPAP (Table 12). HFNO was rarely used in isolation.

Use of respiratory support (n=278)	n (%)
CPAP and HFNO	112 (40%)
CPAP alone	107 (38%)
HFNO alone	35 (13%)
NIV	20 (7%)
Low-flow oxygen alone	4 (1%)

Table 12: Respiratory support use for patients with acute COVID-19

Recognising that some patients would use more than one form of respiratory support, sites were asked for the primary mode of support. This was CPAP for 190 patients, and HFNO for 64. Escalation to critical care was required for 49 patients, none of whom had a prior decision of 'not for escalation.' As such, transfer to critical care took place for 18% of the total group and 28% of the 'for escalation' group.

Median length of stay was 6 days (IQR 3-10 days). Hospital survival for the whole cohort was 60% (167/278). Hospital survival was only 29% for patients who were documented as not for escalation

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to critical care, whereas it was 78% for patients who were for escalation (Figure 7). As shown, there was little difference between CPAP and HFNO though we stress the uncontrolled nature of the data and small numbers, particularly for the cohort supported with HFNO alone.

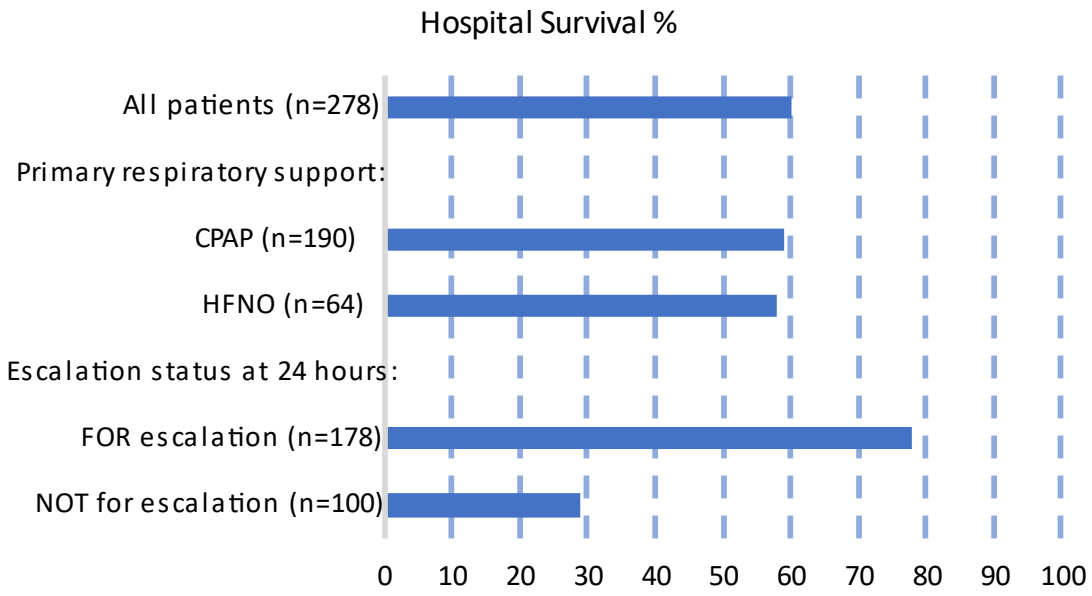

Figure 7: Hospital survival for patients with acute COVID-19, and according to mode of respiratory support and escalation status

The study reviewed escalation status and hospital survival with respect to premorbid frailty as assessed by the Rockwood score (Figure 8). Data are not shown for the most frail group (category 8: very severely frail) due to small cohort size. There were 4 patients in this category; 1 was for escalation and 3 survived.

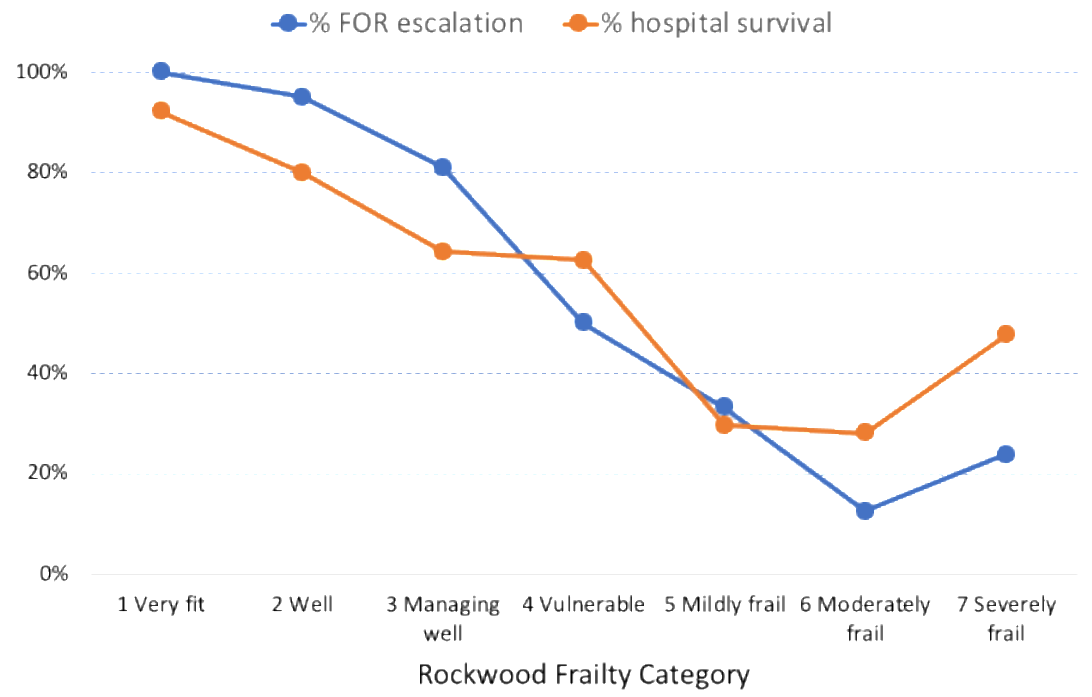

Figure 8: Relationship between frailty and hospital survival for patients with acute COVID-19

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Of the 49 patients with acute COVID-19 who were transferred to critical care, 39 had been treated with CPAP and 10 with HFNO. Endotracheal intubation was undertaken for 42/49. Overall, 31/49 (63%) of patients transferred to critical care survived to hospital discharge.

Other cohorts of patients treated within respiratory support services (n=155)

Basic demographic and outcome data were collected for all patients included in the pilot Respiratory Support audit. Sites were not, however, asked detailed information about patients who did not receive non-invasive respiratory support. For this category, the pilot audit aimed to understand the nature of patients who require respiratory support admission for reasons other than non-invasive respiratory support.

The primary reasons for respiratory support admission for patients not included in the acute NIV or acute COVID (respiratory support) cohorts were as follows:

Primary reason for admission to respiratory support service (n=155)	**Number**	**Hospital survival (n)**	**LOS (Median days)**
Acute pneumonia	38	16	3
Acute exacerbation of ILD	17	6	7
AECOPD (not requiring NIV)	13	11	5
Neuromuscular / secretion clearance	10	9	3.5
Acute pulmonary embolism	8	6	5
Acute asthma	7	7	4
Complex pleural management	6	4	3.5
Other	56	44	5
Total	**155**	**103**	

Table 13: Reasons for respiratory support admission if not treated with acute NIV for AHRF or for acute COVID-19 (*33/56 in the 'other' category were admitted to the respiratory support service because of their pre-existing requirement for home NIV)

A more detailed review is planned for the upcoming national audit, including wider organisational factors. For example, the 'appropriateness' of respiratory support bed use was not reviewed in this pilot audit. In the national audit, questions will be asked on whether overflow from other departments impacted respiratory support capacity and whether respiratory support admission or discharge was delayed for non-clinical reasons.

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Conclusions

Review of the pilot audit process

The 2021 BTS Respiratory Support pilot audit arose from the earlier BTS NIV audit. There is a wider group of patients who require complex enhanced ward-level care who had not been included in earlier audits. There are now clear infrastructure guidelines for the function of respiratory support services[1]. Inclusion of this additional activity is especially important considering the rapid change in respiratory support function achieved to support patients during the COVID-19 pandemic. New treatment pathways rapidly emerged out of necessity. The research response has been extremely impressive, with an evidence-base gained to support these new treatment and support pathways.

The pilot study revised the prior NIV audit tool to reflect the evolved role of respiratory support services. The primary aim of this study was to assess the feasibility of the new dataset. Was it sufficiently easy to complete? Would it provide meaningful and helpful data if conducted as a national audit?

The NIVO score, a tool developed to aid prognostication though may also be used to assess risk-adjusted outcomes. If adopted within the audit platform, it could provide trusts with a useful tool to benchmark their outcomes.

The resultant dataset was slightly larger than the earlier NIV audit tool, though early filtering of questions according to diagnostic category streamlined the required responses. Data collection rates for each section were excellent, and notably for the newer sections relating to the NIVO score and acute COVID-19. BTS is very grateful to all those centres and individuals who agreed to participate in this audit.

The Respiratory Support audit format worked well and could be used for a national audit with only minor adjustment. The national audit is planned to take place in early 2023. At this stage, it is unlikely that wider questions will be introduced relating to the ‘other’ respiratory support diagnostic categories, mindful that most are already covered by other audit processes and recognising that numbers in individual centres will be relatively small. Nevertheless, the plan is to continue to assess patient throughput such that any future changes in service trends can be quantified.

Conclusions on audit findings

There were 749 patient submissions, providing the opportunity for detailed analysis. This was of particular interest because of the changing demand on respiratory support services. The pilot audit period was characterised by significant service demand because of ‘normal’ winter pressures and the continuing impact of the COVID-19 pandemic. Whilst the most common reason for admission to respiratory support services was to receive acute NIV in the context of acute hypercapnic respiratory failure, almost 40% of all patients required admission with acute COVID-19 pneumonitis.

The most recent BTS national acute NIV audit in 2019 had shown a significant improvement in patient outcomes in comparison to earlier audits. This encouraging trend has continued, at least for the 19 centres who participated in the pilot audit. Overall mortality was lower (20% vs. 26%) despite similar pre-NIV blood gases (median pH 7.26). More generalisable conclusions cannot be drawn, though it is reassuring that there was no evidence to suggest any decline in acute NIV pathways for the participating centres as a consequence of the additional demand of COVID-19.

The NIVO score was measured in the audit process for the first time. The study found that it performed well. The participating centres achieved better than expected results for high-risk patients treated with NIV. This is consistent with their wider audit findings if benchmarked against the 2019 data. Whilst currently limited to the management of patients with COPD, the NIVO score should nevertheless provide a helpful risk adjustment for future audits.

The pilot audit also included a series of questions relating to the management of COVID-19 pneumonitis. Comparisons to existing published data are challenging because of differences in patient population. Escalation status appears to be an especially important marker of outcome. More than 1/3 of patients in the pilot audit were deemed not suitable for endotracheal intubation. Whilst 30% of all patients had no prior significant comorbid condition, many others did. With increasing underlying frailty came a lower proportion of patients suitable for escalation, with the largest downward pivot in escalation decisions noted between category 3 (managing well, 81% for escalation) and 4 (vulnerable, 50% for escalation).

Delivery of CPAP and HFNO appeared safe, with results in the 'for escalation' cohort appearing similar to other comparable series (e.g. Recovery-RS). With a median FiO_2 at 60% on respiratory support admission, enhanced care was clearly essential and management in an respiratory support environment had a positive impact on critical care services. Of those considered for escalation, 76% of respiratory support admissions did not require critical care. Based on the average duration of stay, this represents approximately 700 critical care bed days saved during the two-month audit period (37 bed days per organisation). If transferred to critical care, then outcomes also appeared favourable though the numbers transferred were relatively small. Use of CPAP and HFNO was much less favourable for patients deemed not suitable for escalation. A possible caveat is the relatively high proportion of patients who were not for escalation at perhaps less severe levels of frailty (only 50% of patients considered for escalation at frailty category 4: Vulnerable, yet 63% survived). Underlying frailty is, however, only one of numerous factors considered when reaching escalation decisions.

The COVID-19 pandemic placed an unprecedented strain on NHS acute healthcare services and also led to significant change. Closer working between respiratory support services and critical care has been of mutual benefit. The data show the significant positive impact of effective respiratory support services. In addition, continuous outcome monitoring is commonplace within critical care (e.g. ICNARC). The Respiratory Support audit dataset could provide the same function, enabling centres to benchmark their data more regularly.

In summary, the 2021 pilot audit confirms that the dataset and platform are robust and participating centres should be thanked again for their willingness to trial it. The findings show the extent to which respiratory support services have evolved successfully in response to COVID-19 whilst maintaining high-quality patient care for other more 'typical' patient groups. The planned national audit will no doubt reveal much more about the evolution of these services.

References

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