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Pneumothorax Incidence in Patients With Chronic Lung Comorbidities Receiving Continuous Positive Airway Pressure and Noninvasive Ventilation: A Retrospective Observational Study in a District General Hospital

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Abstract

Introduction

Continuous positive airway pressure (CPAP) and non-invasive ventilation (NIV) are widely used in acute and chronic respiratory failure. CPAP is commonly used for obstructive sleep apnea-hypopnea syndrome, while NIV has an established role in acute hypercapnic respiratory failure and selected patients with chronic ventilatory failure. Many patients have underlying chronic lung disease, potentially increasing the risk of barotrauma and pneumothorax. Real-world data on pneumothorax incidence among these patients remain poorly described. We aimed to describe the occurrence of documented pneumothorax and explore its association with chronic respiratory comorbidities.

Materials and methods

We conducted a retrospective observational study of 306 adults manually selected at random from patients receiving CPAP or NIV between May 2023 and May 2025 across outpatient, inpatient, and emergency settings at Blackpool Victoria Hospital, Blackpool, United Kingdom. Clinical records and available chest imaging were reviewed for documented pneumothorax and respiratory comorbidities (chronic obstructive pulmonary disease (COPD), bronchiectasis, and interstitial lung disease (ILD)). Follow-up imaging was not systematic. Smoking history was recorded separately. Descriptive statistics, exact 95% confidence intervals (CIs), and two-sided Fisher's exact tests were used. The study received institutional clinical audit approval, and all analysed data were de-identified.

Results

A total of 306 patients were included. Pneumothorax was documented in two patients following CPAP/NIV initiation, representing 0.7% (2/306; 95% exact binomial CI: 0.1%-2.3%). Overall, 203 patients (66.3%) had at least one respiratory comorbidity, including COPD in 60 (19.6%), bronchiectasis in 17 (5.6%), ILD in 16 (5.2%), and other comorbidities in 118 (38.6%). Smoking history was recorded separately in 67 patients (21.9%). Both patients with pneumothorax had underlying chronic respiratory disease: one had COPD, and the other had ILD. No statistically significant association was observed for the presence of any respiratory comorbidity ($p = 0.552$), COPD ($p = 0.354$), or ILD ($p = 0.102$).

Discussion

Documented pneumothorax was uncommon in this heterogeneous CPAP/NIV cohort despite the high prevalence of respiratory comorbidities. However, non-systematic follow-up imaging may have led to underestimation of its occurrence. With only two events, associations with individual comorbidities could not be reliably assessed. These findings provide descriptive real-world evidence but do not establish the safety of CPAP/NIV or exclude increased pneumothorax risk in patients with chronic lung disease.

Conclusions

Documented pneumothorax was uncommon among patients receiving CPAP/NIV, despite a high prevalence of respiratory comorbidities. However, the small number of events and non-systematic follow-up imaging limit conclusions regarding its true occurrence and associated risk factors. Further studies with systematic monitoring and larger populations are needed to better assess pneumothorax risk in these patients.

Categories: Pulmonology, Internal Medicine

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Introduction

Continuous positive airway pressure (CPAP) and non-invasive ventilation (NIV) are established forms of non-invasive respiratory support that are widely used in acute and chronic respiratory failure, particularly among patients with chronic lung disease who may be at increased risk of barotrauma and pneumothorax [1]. NIV has an important role in acute hypercapnic respiratory failure, particularly during acute exacerbations of chronic obstructive pulmonary disease (COPD). Randomized trials and systematic evidence support its use in appropriately selected patients [2-6]. NIV is also used as long-term ventilatory support in selected patients with chronic stable hypercapnic COPD [7,8]. CPAP is an established treatment for obstructive sleep apnea-hypopnea syndrome, including symptomatic moderate or severe disease and selected patients with mild disease [9].

Positive airway pressure can improve ventilation and gas exchange without the need for endotracheal intubation. However, it may contribute to pulmonary barotrauma in susceptible patients. Pneumothorax is clinically important because its development in a patient requiring respiratory support may cause deterioration and complicate ongoing ventilatory management. Patients with pre-existing structural lung abnormalities, particularly emphysema or other chronic pulmonary diseases, may have an increased susceptibility to pneumothorax. Sloots and Duiverman described pneumothorax in patients with COPD and emphysema receiving chronic home NIV and highlighted the uncertainty regarding the relative contributions of ventilator pressure and the underlying emphysema phenotype [1].

Patients receiving CPAP or NIV in routine clinical practice represent a heterogeneous population. Some receive CPAP electively and chronically for sleep-disordered breathing, whereas others receive NIV for chronic ventilatory failure. In acute hospital practice, NIV may be initiated in the emergency department or inpatient areas for acute type 2 respiratory failure. UK and international guidelines emphasize appropriate patient selection, monitoring, and structured delivery of NIV in acute hypercapnic respiratory failure [5,6].

Despite their widespread use, real-world data on pneumothorax occurrence among patients receiving CPAP or NIV remain limited. This study aimed to describe the observed proportion of documented pneumothorax and explore its association with chronic respiratory comorbidities in a hospital-based cohort.

Materials And Methods

Study design and setting

This retrospective observational study was conducted at Blackpool Victoria Hospital, Blackpool, United Kingdom, between May 2023 and May 2025. The study used records from respiratory and sleep services and included patients receiving CPAP or NIV across outpatient, inpatient, and emergency care settings. The cohort, therefore, represented both acute and chronic positive airway pressure use.

Study population, patient identification, and selection

Potential participants were identified from the hospital CPAP and NIV records. A sample was manually selected at random from a larger population of patients receiving CPAP or NIV, without predefined stratification, including individuals with and without chronic respiratory comorbidities. Adult patients receiving CPAP or NIV during the study period were eligible for inclusion. Each patient was included only once. The cohort included patients receiving long-term CPAP for OSAHS, patients receiving NIV as part of chronic respiratory management, and patients receiving acute NIV in hospital or the emergency department for type 2 respiratory failure associated with COPD, asthma, or other clinically appropriate causes.

Available clinical records and chest imaging were reviewed to identify whether pneumothorax was present before initiation of CPAP/NIV. One patient identified during the selection process was excluded because chest radiography before NIV demonstrated a pre-existing pneumothorax. The final study population comprised 306 patients.

CPAP and NIV exposure

The cohort included both acute and chronic exposure to CPAP/NIV, and treatment duration varied according to indication. Some patients received acute NIV for less than one day or for several days during emergency or inpatient treatment, whereas patients receiving chronic CPAP or NIV could remain on therapy for a year or longer. Positive airway pressure was initiated at a low pressure and titrated according to the local clinical protocol, clinical requirements, and patient response. Exact device models, individual pressure settings, and treatment durations were not consistently available in the study dataset and were, therefore, not included in the statistical analysis. Exact settings immediately preceding the two documented pneumothorax events were also unavailable. Consequently, treatment-specific pneumothorax risks could not be reliably assessed.

Data collection and comorbidity ascertainment

Clinical information was obtained retrospectively from available hospital and primary-care records. Recorded variables included CPAP/NIV exposure, smoking history, COPD, bronchiectasis, ILD, other comorbidities, and documented pneumothorax occurrence. Respiratory comorbidities were identified from existing documented diagnoses in medical and general-practice records rather than independently reassessed using additional diagnostic testing. Smoking history included current and former smoking and was recorded separately as a potential risk factor, without being classified as a respiratory comorbidity on its own. For acute presentations, available clinical investigations, including arterial blood gas analysis, imaging, and spirometry where documented, were reviewed alongside the clinical record.

Patients could have more than one respiratory comorbidity. Consequently, individual comorbidity categories were not mutually exclusive, and their sum was not expected to equal the number of patients with at least one respiratory comorbidity.

Pneumothorax ascertainment and clinical review

Pneumothorax was identified through review of available chest radiography and corresponding clinical records. Available imaging before CPAP/NIV initiation was reviewed to exclude known pre-existing pneumothorax. Follow-up chest imaging was not performed systematically in all patients and was generally obtained when clinically indicated. Consequently, pneumothorax events without documented imaging or clinical assessment may not have been captured, particularly among outpatients. Clinical records were also reviewed for documented alternative precipitating factors, including recent thoracic trauma or invasive procedures.

Two pneumothorax events were documented following initiation of noninvasive respiratory support. Both occurred in hospitalized patients receiving NIV for type 2 respiratory failure. One patient had underlying COPD and the other had ILD. Detailed individual ventilator settings, treatment records, and clinical outcomes could not be reliably verified from the available dataset. The temporal association between NIV initiation and pneumothorax does not establish causality.

Statistical analysis

Data were analyzed using IBM SPSS Statistics for Windows, Version 28.0 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized using frequencies and percentages. The observed proportion of documented pneumothorax was calculated as the number of patients with documented pneumothorax divided by the total study population. The 95% confidence interval (CI) was calculated using the Clopper-Pearson exact binomial method.

Because only two pneumothorax events occurred and expected cell counts were small, two-sided Fisher's exact tests were used to explore associations between documented pneumothorax and the presence of any respiratory comorbidity, COPD, and ILD. Statistical significance was defined as $p < 0.05$.

Missing data

The hospital electronic and CPAP/NIV records contained the variables required for the principal analysis, including treatment status, relevant medical history, and available imaging. No patient was excluded from the final cohort because of missing data for the principal study outcome. However, exact device models, individual pressure settings, treatment durations, and follow-up imaging were not consistently available. Consequently, treatment-specific event proportions and standardized outcome surveillance could not be assessed reliably.

Ethical and governance considerations

This project was approved as Clinical Audit No. 721 by the Clinical Audit Panel at Blackpool Teaching Hospitals NHS Foundation Trust on 16 April 2025. The intention to publish the findings was disclosed during the clinical audit approval process. Institutional permission was obtained to access the relevant CPAP/NIV clinical records for retrospective review. All data used for analysis were de-identified, and no patient-identifiable information was included in the analytical dataset or manuscript. No intervention was performed for research purposes. A separate NHS Research Ethics Committee approval or formal consent waiver was not documented; therefore, the study is reported according to the institutional clinical audit approval rather than claiming a formal research ethics exemption.

Results

Study population and clinical characteristics

A total of 306 patients were included in the final analysis. The population represented a heterogeneous group receiving positive airway pressure therapy across outpatient, inpatient, and emergency care. Clinical characteristics are summarized in Table *1*.

Variable	n (%)
≥1 respiratory comorbidity	203 (66.3)
Smoking history (current or former)	67 (21.9)
Chronic obstructive pulmonary disease	60 (19.6)
Bronchiectasis	17 (5.6)
Interstitial lung disease	16 (5.2)
Other comorbidities	118 (38.6)
Documented pneumothorax	2 (0.7)
No documented pneumothorax	304 (99.3)

TABLE 1: Patient characteristics and documented pneumothorax (n = 306)

Respiratory comorbidity categories are not mutually exclusive. Smoking history was recorded separately and was not classified as a respiratory comorbidity on its own. All percentages use the complete cohort (n = 306) as the denominator.

Pneumothorax incidence

Pneumothorax was documented in two of 306 patients following initiation of CPAP/NIV, corresponding to an observed proportion of 0.7% (2/306; 95% Clopper-Pearson exact CI: 0.1%-2.3%). The remaining 304 patients (99.3%) had no documented pneumothorax during the reviewed treatment period.

Both pneumothorax events occurred in hospitalized patients receiving NIV for type 2 respiratory failure. Available clinical records and chest imaging confirmed that pneumothorax was identified following initiation of positive airway pressure therapy. Both patients had underlying chronic respiratory disease: one had COPD and the other had ILD. Exact pressure settings immediately preceding the events were unavailable.

Association between comorbidities and pneumothorax

Both documented pneumothorax events occurred among the 203 patients with at least one respiratory comorbidity, compared with no events among the 103 patients without a recorded respiratory comorbidity. The two-sided Fisher's exact test did not demonstrate a statistically significant association (p = 0.552; Table *2*).

	Pneumothorax present	Pneumothorax absent
≥1 respiratory comorbidity (n = 203)	2	201
No respiratory comorbidity (n = 103)	0	103

TABLE 2: Overall respiratory comorbidity versus pneumothorax

Two-sided Fisher's exact p = 0.552.

Among 60 patients with COPD, one had documented pneumothorax and 59 did not. Among 246 patients without COPD, one had documented pneumothorax and 245 did not. The two-sided Fisher's exact test did not demonstrate a statistically significant association (p = 0.354; Table *3*).

	Pneumothorax present	Pneumothorax absent
COPD (n = 60)	1	59
No COPD (n = 246)	1	245

TABLE 3: Chronic obstructive pulmonary disease (COPD) versus pneumothorax

Two-sided Fisher's exact p = 0.354.

Among 16 patients with ILD, one had documented pneumothorax, and 15 did not. Among 290 patients without ILD, one had documented pneumothorax and 289 did not. The two-sided Fisher's exact test did not demonstrate a statistically significant association (p = 0.102; Table 4).

	Pneumothorax present	Pneumothorax absent
ILD (n = 16)	1	15
No ILD (n = 290)	1	289

TABLE 4: Interstitial lung disease (ILD) versus pneumothorax

Two-sided Fisher's exact p = 0.102.

Although no statistically significant associations were identified, these findings should be interpreted in the context of the small number of documented pneumothorax events (n = 2), which limits the ability to detect potential associations between underlying respiratory comorbidities and pneumothorax.

Discussion

Principal findings

This retrospective observational study evaluated pneumothorax occurrence among 306 patients receiving CPAP or NIV in routine clinical practice. The cohort included patients receiving chronic treatment through outpatient and sleep services as well as patients receiving acute NIV in inpatient and emergency settings. Two pneumothorax events were documented, corresponding to an observed proportion of 0.7%.

Pneumothorax was, therefore, infrequently documented in this cohort despite respiratory comorbidity being recorded in approximately two-thirds of patients. However, the small number of pneumothorax events is central to interpretation of the results. With only two events, the study has limited statistical power to determine whether individual respiratory conditions modify pneumothorax risk.

NIV is an established treatment for acute hypercapnic respiratory failure, particularly in acute exacerbations of COPD. Randomized and systematic evidence has demonstrated reductions in treatment failure and the need for intubation, with mortality benefit in appropriately selected populations [2,3]. UK and international guidelines support NIV for appropriate patients with acute hypercapnic respiratory failure [5,6]. Large observational data also support the effectiveness of NIV in routine COPD hospital care [10].

Noninvasive respiratory support is also used beyond the acute hospital episode. Long-term NIV is suggested for selected patients with chronic stable hypercapnic COPD [7], and randomized evidence has shown benefit from home NIV plus oxygen in selected patients with persistent hypercapnia following a severe COPD exacerbation [8]. CPAP is an established therapy for obstructive sleep apnea-hypopnea syndrome [9]. A contemporary review also describes the role of NIV in acute and chronic hypercapnic COPD and highlights continuing uncertainty regarding optimal modes, settings, and treatment goals [11].

Pneumothorax and underlying lung disease

Pneumothorax is a recognized potential complication in patients exposed to positive-pressure respiratory support, although its absolute frequency during noninvasive ventilation is difficult to quantify across heterogeneous populations. Particular concern exists in patients with abnormal lung architecture, including emphysema and other structural pulmonary disease, because the underlying lung pathology may itself predispose to pneumothorax.

Sloots and Duiverman described patients with COPD and emphysema who developed pneumothorax while receiving chronic home NIV [1]. Their report noted that the ventilator pressures were not extremely high and highlighted emphysema as an important potential risk factor, raising the possibility that pulmonary phenotype may be more important than ventilator settings alone [1]. This is relevant to the present cohort because many patients receiving CPAP/NIV have pre-existing lung pathology that may independently influence pneumothorax risk.

Both documented pneumothorax events in our cohort occurred in patients with underlying chronic respiratory disease. One affected patient had COPD, and one had ILD. These observations do not establish that either condition caused pneumothorax or independently increased its risk. Similarly, the non-significant Fisher's exact tests should not be interpreted as evidence that respiratory comorbidities are unrelated to pneumothorax. With only two documented events, potential associations between underlying respiratory disease and pneumothorax may remain undetected.

Clinical implications

The low observed proportion of documented pneumothorax is encouraging in the context of widespread CPAP and NIV use, while highlighting the importance of continued clinical vigilance. Structured assessment and monitoring remain important, particularly in patients with structural lung disease or unexpected deterioration. The British Thoracic Society (BTS) and Intensive Care Society (ICS) guideline recommends arterial blood gas assessment before and after NIV initiation in acute hypercapnic respiratory failure and recommends chest radiography as part of assessment, while emphasizing that imaging should not delay urgently required ventilatory support in severe acidosis [5].

In the present study, review of available pre-treatment imaging was important because it helped distinguish pneumothorax already present before positive airway pressure therapy from pneumothorax identified subsequently. One potential participant was excluded because chest radiography before NIV demonstrated an existing pneumothorax.

Both documented pneumothorax events occurred in hospitalized patients receiving NIV for type 2 respiratory failure. Available records indicated that pneumothorax was identified following initiation of noninvasive respiratory support, without a documented preceding traumatic or procedural explanation. Nevertheless, temporal sequence alone cannot establish causality. Underlying pulmonary pathology, severity of the acute respiratory illness, positive airway pressure exposure, or a combination of these factors may have contributed.

Comparison with existing evidence

The present findings should be considered alongside the substantially larger evidence base demonstrating the clinical benefits of NIV in appropriately selected patients. Plant et al. demonstrated benefit from early NIV during acute COPD exacerbations on general respiratory wards [2], while the systematic review by Lightowler et al. supported noninvasive positive-pressure ventilation for respiratory failure due to COPD exacerbations [3]. Brochard et al. reviewed the evidence supporting NIV in acute respiratory failure [4], and subsequent BTS/ICS and European Respiratory Society (ERS)/ American Thoracic Society (ATS) guidelines formalized evidence-based recommendations for acute NIV [5,6].

For chronic hypercapnic COPD, the ATS clinical practice guideline supports nocturnal NIV in selected patients [7]. Murphy et al. reported that home NIV plus oxygen prolonged the time to readmission or death compared with oxygen alone in selected patients with persistent hypercapnia after an acute COPD exacerbation [8]. These benefits provide important context: pneumothorax is clinically important, but assessment of this uncommon complication must be balanced against the established benefits of appropriately indicated NIV.

Our study contributes real-world observational evidence regarding documented pneumothorax occurrence in a heterogeneous population receiving acute and chronic CPAP/NIV. The inclusion of patients across outpatient, inpatient, and emergency settings provides a broader clinical perspective on this complication. However, the study was not designed to compare specific ventilator devices, pressure settings, or radiological lung phenotypes, and it cannot determine which treatment-related or patient-related factors contribute most strongly to pneumothorax risk.

Limitations

This study has several important limitations. First, it was a retrospective, single-center observational study. Data quality depended on the accuracy and completeness of existing clinical, CPAP/NIV, primary-care, and imaging records. Findings from one hospital may not be directly generalizable to institutions with different patient populations, ventilation protocols, monitoring practices, or service structures.

Second, only two pneumothorax events occurred among 306 patients. Although the low number of documented events is itself an important descriptive finding, it substantially limits statistical power. The

study cannot reliably establish or exclude associations between pneumothorax and individual respiratory comorbidities. In particular, non-significant Fisher's exact test results should not be interpreted as demonstrating equivalence or absence of clinical risk.

Third, the population was heterogeneous. It included patients receiving CPAP and NIV for different indications and across outpatient, inpatient, and emergency settings. Treatment duration ranged from short-term acute exposure to long-term chronic therapy. This reflects routine clinical practice but limits direct comparison between specific treatment groups. Separate denominators for acute and chronic treatment groups were not available for subgroup analysis.

Fourth, exact device models, detailed patient-level ventilator settings, and treatment durations were not consistently available. Consequently, the study could not examine pressure-response relationships or determine whether particular inspiratory or expiratory pressures were associated with pneumothorax. Exact pressure settings immediately preceding the two pneumothorax events were also unavailable.

Fifth, follow-up chest imaging was not performed systematically in all patients and was generally obtained when clinically indicated. Therefore, asymptomatic or clinically unrecognized pneumothorax events may not have been captured, particularly among outpatients. The observed proportion of documented pneumothorax may consequently underestimate its true occurrence.

Sixth, although available imaging and records were reviewed to confirm that pneumothorax was identified after treatment initiation and to identify documented alternative causes such as trauma or invasive procedures, the retrospective design cannot establish that CPAP or NIV caused the pneumothorax. Residual confounding from the severity of the underlying respiratory illness and structural lung abnormalities remains possible.

Finally, the small number of patients within some individual comorbidity groups, together with only two outcome events, prevented meaningful multivariable analysis or reliable adjustment for overlapping comorbidities. Larger multicenter studies with standardized documentation of treatment indication, device type, pressure settings, treatment duration, radiological phenotype, systematic follow-up imaging, and clinical outcomes would be required to define patient-specific risk more precisely.

Conclusions

Documented pneumothorax was uncommon in this retrospective cohort of patients receiving CPAP or NIV, occurring in two of 306 patients (0.7%) during the study period. Both events occurred in patients with underlying chronic respiratory disease and were identified after initiation of noninvasive respiratory support. No statistically significant association was detected between documented pneumothorax and the evaluated respiratory comorbidity groups. The low observed proportion of pneumothorax is an important descriptive finding in a population with a high prevalence of underlying respiratory comorbidities. These findings support the importance of continued clinical vigilance and appropriate monitoring during CPAP/NIV treatment, particularly in patients with structural lung disease. However, the small number of events and non-systematic follow-up imaging limit conclusions regarding the true occurrence of pneumothorax and its association with individual respiratory conditions.

This study contributes real-world observational evidence from a heterogeneous population receiving acute and chronic CPAP/NIV across different clinical settings. The findings highlight the value of further investigation into pneumothorax occurrence and associated risk factors in patients receiving noninvasive respiratory support. Larger multicenter studies incorporating detailed ventilator settings, duration of exposure, radiological phenotype, systematic follow-up imaging, and patient-level risk factors are needed to characterize pneumothorax risk more precisely.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Clinical Audit Panel, Blackpool Teaching Hospitals NHS Foundation Trust issued approval (Audit reference 721). **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

References

1. Sloots JM, Duiverman ML: Pneumothorax in patients with COPD and emphysema receiving home chronic non-invasive ventilation: is it the emphysema phenotype or ventilator setting?. BMJ Case Rep. 2023, 16:253186. 10.1136/bcr-2022-253186
2. Plant PK, Owen JL, Elliott MW: Early use of non-invasive ventilation for acute exacerbations of chronic obstructive pulmonary disease on general respiratory wards: a multicentre randomised controlled trial. Lancet. 2000, 355:1931-5. 10.1016/s0140-6736(00)02323-0
3. Lightowler JV, Wedzicha JA, Elliott MW, Ram FS: Non-invasive positive pressure ventilation to treat respiratory failure resulting from exacerbations of chronic obstructive pulmonary disease: Cochrane systematic review and meta-analysis. BMJ. 2003, 326:185. 10.1136/bmj.326.7382.185
4. Brochard L, Mancebo J, Elliott MW: Noninvasive ventilation for acute respiratory failure . Eur Respir J. 2002, 19:712-21. 10.1183/09031936.02.00295502
5. Davidson AC, Banham S, Elliott M, et al.: BTS/ICS guideline for the ventilatory management of acute hypercapnic respiratory failure in adults. Thorax. 2016, 71 Suppl 2:ii1-35. 10.1136/thoraxjnl-2015-208209
6. Rochwerg B, Brochard L, Elliott MW, et al.: Official ERS/ATS clinical practice guidelines: noninvasive ventilation for acute respiratory failure. Eur Respir J. 2017, 50:1602426. 10.1183/13993003.02426-2016
7. Macrea M, Oczkowski S, Rochwerg B, et al.: Long-term noninvasive ventilation in chronic stable hypercapnic chronic obstructive pulmonary disease. An official American Thoracic Society clinical practice guideline. Am J Respir Crit Care Med. 2020, 202:e74-87. 10.1164/rccm.202006-2382ST
8. Murphy PB, Rehal S, Arbane G, et al.: Effect of home noninvasive ventilation with oxygen therapy vs oxygen therapy alone on hospital readmission or death after an acute COPD exacerbation: a randomized clinical trial. JAMA. 2017, 317:2177-86. 10.1001/jama.2017.4451
9. National Institute for Health and Care Excellence: obstructive sleep apnoea/hypopnoea syndrome and obesity hypoventilation syndrome in over 16s. (2021). Accessed: 2026: https://www.nice.org.uk/guidance/ng202.
10. Lindenauer PK, Stefan MS, Shieh MS, Pekow PS, Rothberg MB, Hill NS: Outcomes associated with invasive and noninvasive ventilation among patients hospitalized with exacerbations of chronic obstructive pulmonary disease. JAMA Intern Med. 2014, 174:1982-93. 10.1001/jamainternmed.2014.5430
11. Owens RL, Derom E, Ambrosino N: Supplemental oxygen and noninvasive ventilation. Eur Respir Rev. 2023, 32:220159. 10.1183/16000617.0159-2022