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The NIVO score: can it help to improve noninvasive ventilation in daily clinical practice?

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Shareable abstract (@ERSpublications)
The study of Hartley designed an easy-to-use score to predict mortality in noninvasively ventilated COPD patients. More information about NIV is gained, but the exact measures on how to improve NIV in clinical practice remains uncertain. https://bit.ly/3tFfg8F

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Noninvasive ventilation (NIV) is an evidence-based treatment for patients developing acute respiratory failure due to an exacerbation of COPD [1]. NIV has proven to reduce work of breathing, enhance gas exchange, reduce the length of hospital stay and to reduce the risk of endotracheal intubation and mortality, regardless of whether NIV is applied within the intensive care unit (ICU) or on the pulmonary ward [1–3]. NIV is therefore recommended to serve as a first-line intervention in patients with acute hypercapnic respiratory failure due to an exacerbation of their COPD.

Unfortunately, implementing NIV in standard care seems rather difficult. Roberts *et al*. [4] performed a study including 9716 patients and found that both initiation of NIV in patients with a metabolic acidosis and non-initiation in patients with a respiratory acidosis were not unusual. This is in agreement with another study of Roberts *et al*. [5], which shows that adherence to guidelines concerning COPD exacerbations in general but also specific to NIV treatment during a COPD exacerbation is lacking; they reported that only 51% of the patients who fulfilled the inclusion criteria for NIV actually received NIV. Major variations in NIV in clinical practice across different countries have been observed [6, 7], but it is clear that the application of NIV in clinical practice is far from optimal. This may be the reason that several observational studies show no survival benefit of NIV compared to standard of care [4, 8].

An important aspect in deciding whether NIV should be started is the likelihood of the treatment's success. However, a patient's prognosis is difficult for healthcare workers to predict. Wildman *et al*. [9] asked the admitting doctors of 832 patients with severe exacerbations of obstructive lung diseases to predict the probability of survival at 180 days after admission. While 62% of the patients survived to 180 days, the mean predicted survival of the clinicians was only 49%. This prognostic pessimism may lead to mistakenly high risk of NIV failure and can contribute to NIV underuse. A prediction score could help clinicians to better estimate the prognosis and make a more deliberate choice regarding the application of NIV. Several prediction tools have been studied, but are often limited due to complexity, unavailability of data at the bedside or the fact that it has not been validated in ventilated patients during a COPD exacerbation [10–12]. Confalonieri *et al*. [13] specifically designed two prediction charts for patient with a COPD exacerbation on NIV: one that could predict failure of NIV treatment at admission and one that could predict failure after 2 h of NIV. However, their risk chart makes use of the APACHE II, which itself is a rather complex score and requires information that may not be easily available at the bedside. Furthermore, while the risk charts were derived from a large group of patients, their validation cohort was quite limited. These facts probably contribute to the fact that, for all we know, no prediction tool is in widespread use in daily clinical practice.

As presented in this issue of the *European Respiratory Journal*, HARTLEY *et al*. [14] have developed a simple clinical prediction tool for in-hospital mortality that relies on information available at the bedside. The tool was derived from a population of 489 patients with acute hypercapnic respiratory failure due to an exacerbation of COPD treated with assisted ventilation (94.5% on NIV). Using multivariate regression analysis, the Noninvasive Ventilation Outcomes (NIVO) score was derived, consisting of six categorised variables: extended Medical Research Council Dyspnoea score (eMRCD) 1–4/5a/5b, time from admission to acidaemia >12 h, pH <7.25, presence of atrial fibrillation, Glasgow coma scale ⩽14 and the presence of chest radiograph consolidation. Subsequently, the NIVO score was extensively validated in a cohort of 733 patients from 10 different hospitals. In comparison with other available prediction tools, the NIVO score showed better results with an area under the receiver operating characteristic curve of 0.79. The study seems well-constructed and the score's simplicity and its validity in a generalisable cohort of exacerbated COPD patients create potential for using the score in daily clinical practice. However, some limitations should also be taken into account. First, only patients on ventilatory treatment were included, thereby excluding patients that qualified for NIV but did not get the treatment. Hence, the NIVO score predicts the in-hospital mortality of patients if NIV gets started, but does not necessarily apply to patients who are having an indication for NIV but in whom NIV is not provided. Second, the derivation cohort consisted of patients admitted between 2008 and 2013 and it would have been interesting to know whether experiences regarding NIV changed during the past 10 years. Third, it seems that a large group of the validation cohort was not naïve with NIV; 36% has had previous NIV and 9% had home mechanical ventilation. This could influence the results of NIV treatment. Finally, the study was only performed in the UK and no information about the settings of the NIV was given.

We agree with the authors that the NIVO score could challenge pessimism by objectively predicting the in-hospital mortality of patients with an exacerbation of COPD on assisted ventilation. However, the question arises whether this score could really help to improve the clinical practice of NIV. Whether the treatment will be successful, and thus the prognosis of the patient, is one aspect that plays a role in the decision to start NIV. However, it is obviously a multifactorial decision depending on other aspects, such as the centre's facilities and the physician's expertise. In the event that the bad prognosis estimated by the patient's physician is the main reason that NIV is not started, the NIVO score could support or counteract this decision. However, to our knowledge, little is known about the exact barriers for starting NIV in clinical practice. Since the study of HARTLEY *et al*. [14] was performed in medical centres in which all facilities for NIV use were present and did not analyse the barriers to NIV use, it remains uncertain whether the NIVO score could really improve NIV underuse by making more objective predictions of mortality.

Further questions arise due to this study regarding the clinical practice of NIV. The study shows that the most important predictor of in-hospital mortality is the degree of dyspnoea assessed by the eMRCD. What can we learn from this aspect to improve NIV treatment in daily clinical practice? When a patient presents at the emergency department, the main focus is mostly on the patient's symptoms at that moment. In the study of HARTLEY *et al*. [14], the eMRCD was used, which describes the patient's level of breathlessness on a good day over the preceding 3 months. Should we therefore more focus on patient's symptoms in their daily life? Another important predictor is an increased time from admission to acidaemia (>12 h). Does this mean that acidaemia is detected too late? Do we need to monitor patients more closely at the pulmonary ward to detect acidaemia sooner, for example by performing more arterial blood gas analyses or transcutaneous measurements? Or do we need to preventively admit high-risk patients, for example with a high eMRCD score, to the intensive care unit for better monitoring options?

In conclusion, HARTLEY *et al*. [14] designed an easy-to-use and well-validated score to predict the in-hospital mortality in noninvasively ventilated COPD patients during acute respiratory failure. The NIVO score can have various utilities in daily clinical practice. Additionally, the study gives us more information about the use of NIV in clinical practice. However, the exact measures on how to improve NIV use in clinical practice remain uncertain.

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