

COPD exacerbations: 2 much NEWS?

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Exacerbations of chronic obstructive pulmonary disease (ECOPD) remain a common cause of hospital admission in the UK, despite the huge amount of effort and resources that have been invested in COPD services in recent years, and in-hospital mortality has been unchanged at around 4%.¹ Clinical teams looking after patients with ECOPD need well-validated tools to assess mortality risk at admission and detect clinical deterioration in a timely manner. Several such tools have been developed to predict in-hospital mortality, of which the Dyspnoea, Eosinopenia, Consolidation, Acidaemia and atrial Fibrillation (DECAF) score has received the greatest attention^{2,3} indeed, the 2014 UK National COPD Audit report recommended the DECAF score for all patients hospitalised for ECOPD, in part to enable adjustment for mortality risk in a mixed cohort. Yet despite being robustly derived and validated, the DECAF score has not been widely adopted into clinical practice; in the 2019 National COPD Audit report, DECAF was recorded in only 17.5% of admissions¹ and it is therefore worthwhile to consider alternatives.

Introduced in 2012, the National Early Warning Score (NEWS) was designed to standardise the clinical response to the deteriorating patient. Derived from routinely measured physiological parameters, it was validated as an indicator of clinical deterioration and mortality in several acute medical conditions. Despite its widespread use, questions were raised over its safety in the management of patients at risk of hypercapnic respiratory failure, for whom the addition of supplemental oxygen might lower their NEWS, but inadvertently place them at risk of worsening hyperoxic hypercapnia.⁴ Furthermore, patients with chronic hypoxaemia and on long-term oxygen therapy may have inappropriately elevated scores by virtue of their being on supplementary oxygen even when their acute illness has

stabilised, resulting in inappropriate escalation for medical review. In response, the Royal College of Physicians introduced NEWS2 in 2017, which incorporates a second oxygen saturation (SpO₂) scale for use with patients at risk of hyperoxic hypercapnia, as well as 'new confusion' as an adverse factor.⁵ NEWS2 is recorded on multiple occasions during hospital admission and, like NEWS, triggers a clinical response at a threshold score of ≥ 5 . The instructions for completion of NEWS2 stipulate the presence of hypercapnia on a current arterial blood gas or during previous assessments, before using the second oxygen saturation scale. However, up to 25% of patients hospitalised with ECOPD do not have an arterial blood gas taken, and among those that do, the prevalence of hypercapnia is high. Is there an argument, therefore, to employ the second SpO₂ scale on NEWS2 (NEWS2_{ALL COPD}) for all patients admitted to hospital with ECOPD to avoid missing those patients at risk of, but not yet diagnosed with, hypercapnia? And if so, is NEWS2_{ALL COPD} a useful clinical tool to predict in-hospital mortality as an alternative to DECAF?

These are the questions that Echevarria and colleagues endeavour to address in the current issue of *Thorax*.⁶ They retrospectively applied the second SpO₂ scale of NEWS2 to all patients with ECOPD and compared its performance against NEWS and NEWS2 in terms of clinical alert frequency and in-hospital mortality prediction. The authors also compared the performance of admission NEWS2 with the DECAF score in patients admitted with ECOPD. The application of NEWS2_{ALL COPD} at admission reduced the numerical score overall, thus decreasing the frequency of clinical alerts by 9.5% in absolute terms. This was achieved without detriment to safety, as mortality was zero on the day of admission for those patients in the lowest risk category (NEWS2_{ALL COPD} 0–4). As a predictor of in-hospital mortality, however, the DECAF score performed better than NEWS2_{ALL COPD}, NEWS2 and NEWS (area under the receiver-operator curve (AUROC) 0.83 vs NEWS2_{ALL COPD} 0.72, NEWS2 0.70 and NEWS 0.65).

This study makes a significant contribution to the literature on the use of NEWS2 in COPD exacerbations and is relevant to current clinical practice, as early

warning scores will continue to be ubiquitous in acute medical care.^{7,8} It has been conducted in a large, multi-centre cohort of unselected patients with proven COPD with a complete data set for the primary outcome of in-hospital mortality. Although NEWS2 and NEWS2_{ALL COPD} were derived retrospectively, the individual parameters were recorded prospectively. The study incorporated the presence of new confusion, unlike recent studies that have evaluated NEWS2,^{7,8} and demonstrated that this addition improved its ability to detect in-hospital mortality.

The initial concern about NEWS was that patients with COPD and other conditions associated with chronic respiratory failure would be given inappropriately high levels of supplementary oxygen to avoid triggering an alert.⁴ However, members of acute medical and critical care teams might argue that unnecessary alerts for urgent (NEWS2 ≥ 5) or emergency (NEWS2 ≥ 7) responses based on relatively low oxygen saturations in patients with COPD impose a more onerous burden on already stretched emergency response teams. The evidence presented by Echevarria *et al* for a safe reduction in such alerts using NEWS2_{ALL COPD} is therefore reassuring.

Furthermore, the authors make a convincing case for the superiority of the DECAF score in assessing in-hospital mortality risk and have included their comparison with NEWS2 on the basis that the latter is used to adjust for case mix in the National COPD Audit. It should be noted, however, that the derivation cohort analysed in this study was likely to favour DECAF, as its original aim was to identify independent predictors of in-hospital mortality at admission. Nonetheless, it is helpful to highlight once again the utility of the DECAF score in clinical practice to risk-stratify patients at admission, particularly now that there is randomised controlled trial evidence of its role in facilitating safe, cost-effective early discharge for low-risk patients.⁹

Some caution should be exercised in interpreting the findings. First, the performance of NEWS2 and NEWS2_{ALL COPD} was assessed in a cohort of patients with proven COPD, whereas it is common in clinical practice for patients to receive an empirical diagnosis of ECOPD based on clinical features and a relevant smoking history¹; spirometry may in fact only be recorded in 40% of admissions. This does limit the generalisability of the study, although the authors rightly cite the study of Austin *et al*,¹⁰ where application of controlled oxygen therapy in patients

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at risk of hypercapnic respiratory failure was effective in reducing mortality, even though a high proportion of patients did not have proven diagnosis of COPD.

Second, the authors consider only the physiological data at the beginning of the hospital admission for their evaluation of NEWS, NEWS2 and NEWS2_{ALL COPD}, whereas in practice these scores would be recorded several times a day throughout the inpatient stay and may reach a maximum value later on in the hospital stay. For example, late acidosis (with onset greater than 24 hours after hospital admission) occurs in a small but significant proportion of patients with COPD and is associated with higher mortality,¹¹ but the current study does not assess the performance of NEWS2_{ALL COPD} in this important subset of patients. Recently, Pimentel *et al* demonstrated in a retrospective analysis that NEWS2 was not superior to NEWS at detecting deterioration leading to death in patients with, or at risk of, hypercapnic respiratory failure at any point during the hospital stay and not just at admission.⁷ This study was however limited by the omission of new confusion in the calculation of NEWS2. There is undoubtedly an opportunity for a prospective study to assess the utility of repeated recordings of NEWS2 in detecting clinical decline throughout the course of an inpatient episode.

NEWS2 addresses fundamentally different questions from the DECAF score, which is aimed primarily at risk assessment at admission; namely, can a composite early warning score, calculated on multiple occasions from routine physiological observations, detect clinical deterioration? And do the alerts based on NEWS2 give rise to changes in management that improve clinical outcomes? Unfortunately, NEWS2 was not validated prior to its introduction, and the retrospective nature of the studies conducted to date precludes any analysis of the treatment modifications that might normally have been made in response to alerts. There

is clearly a need for a prospective study to address this evidence gap in all patients who are prone to hypercapnic respiratory failure, and not just in those with COPD. While early warning scores have the advantage of being widely available and relatively easy to use, they do not necessarily reflect changes in the physiological loads on the respiratory system during an exacerbation of COPD,^{12 13} underlining the vital importance of a comprehensive clinical assessment when patients report a worsening of their symptoms. Healthcare professionals must avoid the temptation to seek an improvement in the NEWS2 score as an aim of treatment following a clinical alert, and focus instead on addressing the specific physiological derangements underlying any deterioration. Echevarria and colleagues have carried out an interesting analysis which supports the suggestion that target saturations of 88%–92% in all patients admitted with ECOPD is both safe and time saving. It provides important evidence that can be used to inform future guidelines and clinical practice, but the goal of a single tool to predict both in-hospital mortality and deterioration remains elusive.

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