

CORRESPONDENCE

Acidosis, non-invasive ventilation and mortality in hospitalised COPD exacerbations

The national chronic obstructive pulmonary disease (COPD) audit confirms the high mortality associated with acute hypercapnic respiratory failure (AHRF) in COPD, particularly in severely acidotic patients.¹ The authors highlight the observations that significant numbers of patients eligible for non-invasive ventilation (NIV) do not receive it and that NIV is almost universally the ceiling of care with only 5% of acidotic patients receiving invasive mechanical ventilation (IMV). Comparisons are made with the outcomes of clinical trials of NIV, and there is an implication that in clinical practice NIV is not being used optimally with patients being denied potentially life-saving treatment. However, patient selection is the likely explanation for the higher mortality rates in the 'real world'. The greater mortality rates in those receiving NIV at all levels of acidosis, even after allowing for early iatrogenic acidosis due to high flow oxygen, suggests NIV is often used in patients with no chance of survival. The high mortality rate reflects the fact that for many COPD patients AHRF represents the end stage of inexorable decline.

While pH identifies patients in need of ventilatory support, other factors should be considered to determine the appropriate level of intervention. Clinicians use 'clinical judgement' and objective evidence to support this may be obtained on routine clinical assessment. Previous national audits identified performance status as an important predictor of survival in patients admitted to hospital with an acute exacerbation of COPD (AECOPD).^{2,3} We have recently shown that in patients dying from AECOPD a WHO performance score (WHO-PS) ≥ 3 is a powerful marker of end-stage disease and a better predictor of death than pH.⁴ In 2009 we prospectively studied COPD patients admitted to hospital with AHRF treated with NIV (n=65). Inpatient mortality was

33.8% and on univariate analysis, factors associated with mortality included poor performance status, long-term oxygen therapy, early warning score, severe acidosis (pH<7.20) and anaemia (table 1). On multivariate analysis only performance status (WHO-PS ≥ 3 : OR (95% CI) 39.1 (6.8 to 223.6; p<0.0001) and anaemia (OR (95% CI) 5.87 (1.27 to 26.7; p=0.023) were significant.

We acknowledge that the authors may have highlighted possible deficiencies in delivery of NIV and perhaps more patients should be considered for IMV, but we contend that of equal importance is identification of those patients in whom neither NIV nor IMV is likely to be beneficial so that they may be offered more appropriate end-of-life care.

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Authors' response

We thank Mydin *et al*¹ for their interest in our article.² They contend that the main findings are explained by patient selection and that for many of these patients management with non-invasive ventilation (NIV) is inappropriate and end-of-life care pathways should be introduced instead.

We agree that patient selection is one of the important explanations for the difference in outcomes of observed clinical practice when compared with the randomised controlled trial (RCT) results and repeatedly emphasise this within the discussion. Patient selection alone however is unlikely to

explain the poor survival observed as we also demonstrate that patients subject to pre-hospital oxygen poisoning have poorer outcomes and patients treated with NIV often have significant delays in the initiation of treatment contrary to the RCT evidence and guideline recommendations.

We have also found that patients who fit the RCT and guideline criteria for NIV do not in some cases receive this treatment while escalation to invasive mechanical ventilation (IMV) is the exception. The study also describes inadequate documentation of both escalation plans and do not resuscitate orders. So it is quite possible that some of these patients are receiving NIV when instead end-of-life care may be more appropriate, but there are many other important issues that explain the observed outcomes. End of life in chronic obstructive pulmonary disease (COPD) exacerbations is a difficult area of care for which the guidelines are currently vague and where our own data have shown that in large-scale studies all predictors of outcome combined only explain a minority of the variance in outcome.³ Finally studies of patient choice when offered IMV for respiratory failure in COPD have shown patient preference for intervention beyond that considered appropriate by intensivists in many cases.⁴ In essence, this is an area where prospective research is required to better understand both the wishes of patients and the costs and benefits of interventionist or palliative choices.

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Table 1 Univariate analysis of variables associated with mortality

Variable	OR	95% CI	p-Value
WHO-PS	3.59	1.66 to 7.76	0.001
WHO-PS ≥ 3	37.7	7.4 to 192.5	0.000
EWS	1.45	1.05 to 1.99	0.021
Hb (g/dl)	0.58	0.41 to 0.83	0.002
Anaemia	5.53	1.81 to 16.92	0.002
LTOT	2.99	1.03 to 8.65	0.043
pH	0.003	0.00 to 1.94	0.079
pH<7.20	3.64	1.16 to 11.37	0.025

Anaemia: men Hb<13.0 g/dl; women<12.0 g/dl.
EWS, early warning score; Hb, haemoglobin; LTOT, long-term oxygen therapy; PS, performance score.