

## Comments on “Comparison of immediate withdrawal and stepwise reduction in duration of non-invasive ventilation in chronic obstructive pulmonary disease patients presenting with acute hypercapnic respiratory failure”

Vidushi Rathi

Department of Pulmonary and Sleep Medicine, All India Institute of Medical Sciences, New Delhi, India

Dear Editor,

The recent study published by Purohit *et al.* provides new evidence on the safety of immediate withdrawal of non-invasive ventilation (NIV) in chronic obstructive pulmonary disease (COPD) patients admitted with acute hypercapnic respiratory failure (AHRF) after recovery [1]. The article suggests that stepwise reduction of NIV may prolong hospital stay and increase the risk of hospital-acquired infections along with the cost. This is a clinically important study with multiple practical implications.

The American Thoracic Society/European Respiratory Society

2017 guidelines strongly recommend NIV for AHRF in COPD exacerbation but do not provide for the duration [2]. The Indian Society of Critical Care Medicine 2020 guidelines recommend a protocolized rather than physician-directed withdrawal of NIV even though they suggest using either of the three strategies of reduction in pressures of NIV, duration of NIV, or immediate cessation [3]. Even though it may not seem immaterial which of the 3 options is chosen, it has great implications on the duration of intensive care and the cost of therapy. Though it can be easily predicted that immediate withdrawal will have minimum intensive care unit (ICU) duration, the cost analysis is lacking. Even Purohit *et al.* found a reduced hospital and ICU stay in the immediate withdrawal group without any adverse outcomes in the patients [1]. The authors could have also done a cost-benefit analysis of the immediate against stepwise NIV withdrawal in acute COPD.

Another important aspect is the predictors of successful NIV cessation, which the authors have evaluated. The partial pressure of carbon dioxide (pCO<sub>2</sub>) is an important criterion for home NIV in COPD [4]. In the study by Purohit *et al.* [1], the pCO<sub>2</sub> is a predictor of successful weaning. This can be explained by the underlying pathophysiology of COPD exacerbation wherein the main mechanism of hypercapnia is hypoventilation which can be easily corrected by NIV. The expiratory positive airway pressure requirement is low (unless there is obstructive sleep apnea concomitantly) and the inspiratory positive airway pressure is generally kept high to provide adequate pressure support. Once the hypoventilation is reversed, the bronchodilators, steroids, and antibiotics can easily help in recovery [5]. Thus, similar to phenotyping COPD based on etiology and severity, a phenotypic approach to COPD exacerbation based on underlying disease, superimposed infection, hypercapnia, and the correction of the same can help these patients get the appropriate and timely therapy.

However, one factor which also remains ignored in all such evidence-providing studies is the detailed evaluation of the indication for which NIV was acutely used in COPD. The Global Initiative against Lung Diseases guidelines recommend using NIV in acute exacerbation for hypercapnia, refractory hypoxia, and even in signs of muscle fatigue [6]. Most patients in ICU with COPD exacerbation often have hypoxia, hypercapnia, or both. However, those patients who have a near normal blood gas analysis and require NIV for muscle fatigue or high work breathing are weaned off from NIV based on clinical symptoms and vitals like respiratory rate only, which are often a subjective decision of the treating physician. It is imperative to have institutional guidelines for such patients also as to when NIV can be weaned. Stepwise reduction in NIV seems physiologically better in such patients so

Correspondence: Vidushi Rathi, Department of Pulmonary and Sleep Medicine, All India Institute of Medical Sciences, New Delhi 110029, India.

Tel.: 9971891536.

E-mail: vidushirathi@gmail.com

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that respiratory muscles get time to recover. However, there is no evidence for the same due to studies majorly taking acute hypercapnic COPD patients in NIV trials.

Thus, the major conclusions at present which can be drawn are that NIV can be weaning immediately or in a stepwise manner in COPD exacerbation. However, pCO<sub>2</sub> monitoring and cost analysis must be considered while determining the choice. Larger studies focusing on indications of NIV in COPD exacerbation comparison with the weaning strategy can help formulate guidelines.

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