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# High flow nasal cannula versus non-invasive ventilation in the treatment of acute exacerbations of COPD with acute-moderate hypercapnic respiratory failure

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Dear Editor,

Recently, we read with great interest the article by Tan et al. [1], in which the authors demonstrated that compared to high-flow nasal cannula oxygen (HFNC), non-invasive ventilation (NIV) is a better choice for initial respiratory support in patients with acute exacerbations of chronic obstructive pulmonary disease (AECOPD) complicated by acute-moderate hypercapnic respiratory failure. Although this result highlights the efficacy of NIV in the treatment of AECOPD patients, we believe that there are still certain issues that need to be clarified in the study conducted by Tan et al.

First, the gas flow rate of HFNC during treatment needs to be noticed. Mechanically, the high gas flow rate of HFNC can wash out the dead space of chronic obstructive pulmonary disease (COPD) patients, and effectively decreases pressure of arterial carbon dioxide (PaCO<sub>2</sub>). Studies have shown that HFNC as initial respiratory support is non-inferior to NIV in decreasing PaCO<sub>2</sub> after 2 h of treatment in patients with mild-to-moderate

AECOPD [2]. However, carbon dioxide retention was the most common reason for treatment failure in the HFNC group in this study. Therefore, whether raising the initial gas flow rate from 40 L/min to 60 L/min could improve the treatment success rate of HFNC. It is worth noting that study has shown that higher gas flow rate than 30 L/min not only fails to lower PaCO<sub>2</sub> but also increases inspiratory effort [3]. In short, the initial gas flow rate of 40 L/min does not seem to be an optimal setting. In addition, HFNC has the advantage of comfort and is usually used continuously after obtaining the optimal gas flow rate required by the patient. In this study, intermittent downregulation of gas flow rate or even discontinuation of HFNC was adopted in the HFNC group, which may be a key factor leading to the failure of HFNC treatment.

Additionally, the baseline data lacks of information on the frequency of acute exacerbations in patients. The 2017 Global Strategy for the Diagnosis, Management and Prevention of COPD report noted that that the frequency of previous hospitalizations for acute exacerbations of COPD and concurrent cardiovascular disease comorbidities are associated with poor outcomes in patients [4]. Therefore, it is necessary to list the frequency of acute exacerbations and to describe the cardiovascular comorbidities such as heart failure, hypertension, and arrhythmia in the baseline data, which may significantly affect the success of respiratory therapy in each group of patients.

Furthermore, Oxygen therapy and ventilatory support are only one part of AECOPD treatment [4]. It is

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well known that the use of bronchodilators is critical in the treatment of AECOPD. Through dilating the bronchi and bronchioles, bronchodilators not only improve the exchange of oxygen and carbon dioxide, but also facilitate the expulsion of sputum, which is closely related to the success of oxygen therapy. In addition, respiratory infection is the main cause of acute exacerbation of COPD, and reasonable antibiotic use can reduce the risk of treatment failure and the length of hospital stay. Poor respiratory infections can significantly increase airway secretions, lead to sputum blockage, carbon dioxide retention, and result in failure of ventilation support, with treatment outcomes that appear to be independent of the choice of HFNC or NIV for ventilation support. Therefore, the authors should provide information on bronchodilator use and infection status during AECOPD treatment in order to rule out differences in oxygen therapy outcomes.

Finally, HFNC followed by NIV is common in the clinic. Studies have shown that AECOPD patients who switched to NIV after HFNC treatment failure showed similar clinical outcomes compared to patients with direct NIV [5]. Meanwhile, HFNC after NIV interruption can increase patient comfort and reduce NIV use [6]. Therefore, compared with NIV or HFNC alone, alternating use of both may be a viable ventilation support strategy for AECOPD patients. Unfortunately, most of the existing studies have focused on the non-inferiority of NIV versus HFNC and have produced some conflicting results.

In conclusion, the non-inferiority of HFNC and NIV in the treatment of AECOPD with acute-moderate hypercapnic respiratory failure remains to be discussed. In addition, future well-designed studies should focus on the role of alternating HFNC and NIV in the treatment of AECOPD patients to avoid intubation.

#### Abbreviations

HFNC	High-flow nasal cannula oxygen
NIV	Non-invasive ventilation
AECOPD	Acute exacerbations of chronic obstructive pulmonary disease
COPD	Chronic obstructive pulmonary disease
PaCO <sub>2</sub>	Pressure of arterial carbon dioxide

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RPX and ZQS participated in the discussion and wrote the manuscript. All authors read and approved the final version of the manuscript.

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#### Declarations

##### Ethics approval and consent to participate

Not applicable.

##### Consent for publication

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##### Competing interests

The authors declare that they have no competing interests.

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