International Platform of Registered Systematic Review and Meta-analysis Protocols

INPLASY

Meta-analysis of High-flow Nasal Cannula Versus Non-invasive Ventilation for Acute Exacerbations of Chronic Obstructive Pulmonary Disease

INPLASY202470032

doi: 10.37766/inplasy2024.7.0032

Received: 10 July 2024

Published: 10 July 2024

Corresponding author:
Fusen Zhang

icuzhangfusen@126.com

Author Affiliation:
The Affiliated Taian City Central Hospital of Qingdao University.

Gao, T; Qi, F; Zhu, T ; Zhang, L; Li, HR; Zhu, YY; Zhang, FS.

ADMINISTRATIVE INFORMATION

Support - Shandong Province Clinical Key Specialty Construction Project (2020-29); Shandong Province Tai'an City Science and Technology Development Plan Project (2019NS166); Shandong Province Tai'an City Special Science and Technology Plan Project (2020FYZX01).

Review Stage at time of this submission - Preliminary searches.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202470032

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 10 July 2024 and was last updated on 10 July 2024.

INTRODUCTION

Review question / Objective The aim of this study was to systematically evaluate the clinical efficacy of transnasal high-flow oxygen therapy (HFNC) versus non-invasive positive pressure ventilation (NIV) for the treatment of acute exacerbations of chronic obstructive pulmonary disease (COPD), and the study method chosen was an RCT trial.

Condition being studied Chronic Obstructive Pulmonary Disease (COPD) is the third most common cause of death globally, and the latest large-scale epidemiological survey study in China shows that the number of COPD patients in China is close to 100 million. Non-invasive ventilation (NIV) has been shown to improve gas exchange, increase alveolar ventilation, reduce dyspnoea and tracheal intubation, and shorten hospital stay and mortality.HFNC delivers a heated and humidified air-oxygen mixture to the patient, reduces anatomical dead space in the nasopharyngeal airway, improves mucosal ciliary clearance of the large bronchial tubes and small airways, and increases end-expiratory pressure.HFNC has the same characteristics as that used for hypercapnic COPD. sexual exacerbations (i.e., oxygenation, positive pressure, and dead space reduction), which, combined with its ease of use and comfort, prevention of pulmonary function deterioration and tracheal intubation, make it an alternative to NIV. Previous case reports or case series studies have found HFNC to be a successful alternative to NIV for acute hypercapnic respiratory failure in terms of gas exchange and tolerability.

METHODS

Participant or population Adults ≥18 years of age, meeting diagnostic criteria for COPD, acute exacerbation, or combined respiratory failure.

Intervention HFNC and NIV for AECOPD separately.

Comparator NIV alone for AECOPD.

Study designs to be included RCT test.

Eligibility criteria
1. Time point selection: HFNC and NIV at 2-4 hours, 12 hours, 24 hours, 48 hours, 72 hours, 5-7 days of treatment and post treatment.
2. In clinical practice, a diagnosis of COPD requires that the patient meets all of the following conditions:
(1) Presence of pulmonary symptoms (dyspnoea, cough or sputum)
(2) Corresponding clinical background (e.g. tobacco exposure)
(3) Evidence of airflow limitation.

Information sources A search was conducted for all literature describing the use of HFNC in patients with COPD up to 30 October 2022 in PubMed, Web of science, Embase, Cochrane Library database, China Knowledge Network, and Wanfang Data database. The search formula combined medical subject headings (MeSH) and free words for the search: high-flow or high-flow oxygen therapy, non-invasive or non-invasive ventilation, COPD or chronic obstructive pulmonary disease.

Main outcome(s)
1. clinical regression: intubation rate, mortality, length of stay, duration of respiratory support
2. blood gas analysis: partial pressure of carbon dioxide (PaCO2), partial pressure of oxygen (PaO2), oxygenation index, pH, arterial oxygen saturation (SaO2)
3. vital signs: respiratory rate, heart rate, mean arterial pressure
4. adverse reactions.

Quality assessment / Risk of bias analysis The quality of the RCTs was assessed using the Cochrane Risk of Bias Tool, which includes the generation of randomised sequences, allocation concealment, blinding of investigators and subjects, blinding of study endpoints, completeness of endpoint data, selective reporting of study results and other assessments of potential bias. Each item was rated as "low risk", "high risk" or "unclear".

Strategy of data synthesis For each included study, comparisons of risk of intubation, risk of mortality, and adverse events were dichotomous outcomes, calculated using the odds ratio (OR) and 95% confidence interval (CI); length of hospital stay, duration of respiratory support, PaCO2, PaO2, oxygenation index, pH, SaO2, respiratory rate, heart rate, and mean arterial pressure were continuous variables, calculated using the mean difference (MD) and 95% confidence interval (CI) to calculate it. Statistical heterogeneity analysis was performed in this study using I2, with I2 ≤ 50% defined as no statistical heterogeneity. When heterogeneity was tested for P ≥ 0.05 and I2 ≤ 50%, the study used a fixed-effects model to estimate the pooled effect size; if P 50%, a random-effects model was used. If the included study reported measurements at multiple time points, the common time point included in most experiments was selected. If the findings included more than 10 studies, potential publication bias was assessed using funnel plots.

Subgroup analysis None.

Sensitivity analysis Sensitivity analyses were performed by stata software, and sensitivity analyses were used to assess the impact of individual studies on the overall meta-results, with a statistically significant P<0.05.

Country(ies) involved China.

Keywords High-flow nasal cannula; Non-invasive ventilation; Chronic obstructive pulmonary disease; Meta-analysis.

Contributions of each author
Author 1 - Tong Gao.
Author 2 - Feng Qi.
Author 3 - Tong Zhu.
Author 4 - Li Zhang.
Author 5 - Li Zhang.
Author 6 - Yingying Zhu.
Author 7 - Fusen Zhang.