Literature List
High Flow Oxygen Therapy

2022

High Flow Oxygen Therapy
Literature List 2022

INDEX

Coudroy R et al.	**High-flow nasal oxygen therapy alone or with non-invasive ventilation in immunocompromised patients admitted to ICU for acute hypoxemic respiratory failure: the randomised multicentre controlled FLORALI-IM protocol**	*BMJ Open 2019;9* ***2019 Aug***	8
Drake MG	**High-Flow Nasal Cannula Oxygen in Adults: An Evidence-based Assessment**	*Ann Am Thorac Soc* ***2018 Feb***	9
Mauri T et al.	**Optimum support by high-flow nasal cannula in acute hypoxemic respiratory failure: effects of increasing flow rates**	*Intensive Care Medicine volume 43* ***2017 Jul***	9
Zhao H et al.	**High-flow nasal cannula oxygen therapy is superior to conventional oxygen therapy but not to noninvasive mechanical ventilation on intubation rate: a systematic review and meta-analysis**	*Crit Care 21* ***2017 July***	10
Mauri T et al.	**Physiologic Effects of High-Flow Nasal Cannula in Acute Hypoxemic Respiratory Failure**	*Am J Respir Crit Care Med* ***2017 May***	10
Hernandez G et al.	**Effect of Postextubation High-Flow Nasal Cannula vs Noninvasive Ventilation on Reintubation and Postextubation Respiratory Failure in High-Risk Patients A Randomized Clinical Trial**	*JAMA. 2016; 316(15)* ***2016 Oct***	11
Coudroy R et al.	**High-flow nasal cannula oxygen therapy versus noninvasive ventilation in immunocompromised patients with acute respiratory failure: an observational cohort study**	*Ann. Intensive Care 6, 45* ***2016 May***	11

High Flow Oxygen Therapy
Literature List 2022

Menga LS et al.	**Noninvasive respiratory support for acute respiratory failure due to COVID-19**	*Current Opinion in Critical Care 28* ***2022 Feb***

Purpose of review: Noninvasive respiratory support has been widely applied during the COVID-19 pandemic. We provide a narrative review on the benefits and possible harms of noninvasive respiratory support for COVID-19 respiratory failure.

Recent findings: Maintenance of spontaneous breathing by means of noninvasive respiratory support in hypoxemic patients with vigorous spontaneous effort carries the risk of patient self-induced lung injury: the benefit of averting intubation in successful patients should be balanced with the harms of a worse outcome in patients who are intubated after failing a trial of noninvasive support.
The risk of noninvasive treatment failure is greater in patients with the most severe oxygenation impairment (PaO_2/FiO_2 < 200 mmHg).
High-flow nasal oxygen (HFNO) is the most widely applied intervention in COVID-19 patients with hypoxemic respiratory failure. Also, noninvasive ventilation (NIV) and continuous positive airway pressure delivered with different interfaces have been used with variable success rates. A single randomized trial showed lower need for intubation in patients receiving helmet NIV with specific settings, compared to HFNO alone.
Prone positioning is recommended for moderate-to-severe acute respiratory distress syndrome patients on invasive ventilation. Awake prone position has been frequently applied in COVID-19 patients: one randomized trial showed improved oxygenation and lower intubation rate in patients receiving 6-h sessions of awake prone positioning, as compared to conventional management.

Summary: Noninvasive respiratory support and awake prone position are tools possibly capable of averting endotracheal intubation in COVID-19 patients; carefully monitoring during any treatment is warranted to avoid delays in endotracheal intubation, especially in patients with PaO_2/FiO_2 < 200 mmHg.

Luján M et al.	**Non-invasive Respiratory Support in COVID-19: A Narrative Review**	*Front. Med.* ***2022 Jan***

Abstract: Acute respiratory failure secondary to COVID-19 pneumonia may require a variety of non-pharmacological strategies in addition to oxygen therapy to avoid endotracheal intubation. The response to all these strategies, which include high nasal flow, continuous positive pressure, non-invasive ventilation, or even prone positioning in awake patients, can be highly variable depending on the predominant phenotypic involvement. Deciding when to replace conventional oxygen therapy with non-invasive respiratory support, which to choose, the role of combined methods, definitions, and attitudes toward treatment failure, and improved case improvement procedures are directly relevant clinical questions for the daily care of critically ill COVID-19 patients. The experience accumulated after more than a year of the pandemic should lead to developing recommendations that give answers to all these questions.

Mehmood R et al.	**High-Flow Nasal Oxygenation and Its Applicability in COVID Patients**	*SN Compr. Clin. Med. 4, 49* ***2022 Jan***

Abstract: High-flow nasal oxygenation (HFNO) is a type of oxygen therapy that provides humidified and heated oxygen through a nasal cannula at much higher flow rates than standard oxygen therapy, while also allowing control over the fraction of inspired oxygen (FIO2). Compared to standard oxygen therapy, it is much more comfortable for the patient and seems to alleviate most of the problems associated with standard oxygen therapy, such as dry nose, dry throat and nasal pain. It also provides a variety of benefits that can reduce the incidence of escalating treatment and initiating mechanical ventilation in COVID patients with acute hypoxemic respiratory failure (AHRF). This article provides an overview of HFNO and its current applications in COVID patients during the pandemic.

Bonnesen B et al.	**Management of COVID-19-Associated Acute Respiratory Failure with Alternatives to Invasive Mechanical Ventilation: High-Flow Oxygen, Continuous Positive Airway Pressure, and Noninvasive Ventilation**	*Diagnostics 2021, 11(12)* ***2021 Dec***

Abstract: Patients admitted to hospital with coronavirus disease 2019 (COVID-19) may develop acute respiratory failure (ARF) with compromised gas exchange. These patients require oxygen and possibly ventilatory support, which can be delivered via different devices. Initially, oxygen therapy will often be administered through a conventional binasal oxygen catheter or air-entrainment mask. However, when higher rates of oxygen flow are needed, patients are often stepped up to high-flow nasal cannula oxygen therapy (HFNC), continuous positive airway pressure (CPAP), bilevel positive airway pressure (BiPAP), or invasive mechanical ventilation (IMV). BiPAP, CPAP, and HFNC may be beneficial alternatives to IMV for COVID-19-associated ARF. Current evidence suggests that when nasal catheter oxygen therapy is insufficient for adequate oxygenation of patients with COVID-19-associated ARF, CPAP should be provided for prolonged periods. Subsequent escalation to IMV may be implemented if necessary.

Mellado-Artigas R et al.	**High-flow nasal oxygen in patients with COVID-19-associated acute respiratory failure**	*Crit Care 25* ***2021 Feb***

Purpose: Whether the use of high-flow nasal oxygen in adult patients with COVID-19 associated acute respiratory failure improves clinically relevant outcomes remains unclear. We thus sought to assess the effect of high-flow nasal oxygen on ventilator-free days, compared to early initiation of invasive mechanical ventilation, on adult patients with COVID-19.

Methods: We conducted a multicentre cohort study using a prospectively collected database of patients with COVID-19 associated acute respiratory failure admitted to 36 Spanish and Andorran intensive care units (ICUs). Main exposure was the use of high-flow nasal oxygen (conservative group), while early invasive mechanical ventilation (within the first day of ICU admission; early intubation group) served as the comparator. The primary outcome was ventilator-free days at 28 days. ICU length of stay and all-cause in-hospital mortality served as secondary outcomes. We used propensity score matching to adjust for measured confounding.

Results: Out of 468 eligible patients, a total of 122 matched patients were included in the present analysis (61 for each group). When compared to early intubation, the use of high-flow nasal oxygen was associated with an increase in ventilator-free days (mean difference: 8.0 days; 95% confidence interval (CI): 4.4 to 11.7 days) and a reduction in ICU length of stay (mean difference: − 8.2 days; 95% CI − 12.7 to − 3.6 days). No difference was observed in all-cause in-hospital mortality between groups (odds ratio: 0.64; 95% CI: 0.25 to 1.64).

Conclusions: The use of high-flow nasal oxygen upon ICU admission in adult patients with COVID-19 related acute hypoxemic respiratory failure may lead to an increase in ventilator-free days and a reduction in ICU length of stay, when compared to early initiation of invasive mechanical ventilation. Future studies should confirm our findings.

Hu M et al.	**Application of high-flow nasal cannula in hypoxemic patients with COVID-19: a retrospective cohort study**	*BMC Pulm Med 20, 324* ***2020 Dec***

Background: It had been shown that High-flow nasal cannula (HFNC) is an effective initial support strategy for patients with acute respiratory failure. However, the efficacy of HFNC for patients with COVID-19 has not been established. This study was performed to assess the efficacy of HFNC for patients with COVID-19 and describe early predictors of HFNC treatment success in order to develop a prediction tool that accurately identifies the need for upgrade respiratory support therapy.

Methods: We retrospectively reviewed the medical records of patients with COVID-19 treated by HFNC in respiratory wards of 2 hospitals in Wuhan between 1 January and 1 March 2020. Overall clinical outcomes, the success rate of HFNC strategy and related respiratory variables were evaluated.

Results: A total of 105 patients were analyzed. Of these, 65 patients (61.9%) showed improved oxygenation and were successfully withdrawn from HFNC. The PaO2/FiO2 ratio, SpO2/FiO2 ratio and ROX index (SpO2/FiO2*RR) at 6h, 12h and 24h of HFNC initiation were closely related to the prognosis. The ROX index after 6h of HFNC initiation (AUROC, 0.798) had good predictive capacity for outcomes of HFNC. In the multivariate logistic regression analysis, young age, gender of female, and lower SOFA score all have predictive value, while a ROX index greater than 5.55 at 6 h after initiation was significantly associated with HFNC success (OR, 17.821; 95% CI, 3.741-84.903 p<0.001).

Conclusions: Our study indicated that HFNC was an effective way of respiratory support in the treatment of COVID-19 patients. The ROX index after 6h after initiating HFNC had good predictive capacity for HFNC outcomes.

Basile MC et al.	**Nasal high flow higher than 60 L/min in patients with acute hypoxemic respiratory failure: a physiological study**	*Crit Care 24, 654* ***2020 Nov***

Background: Nasal high flow delivered at flow rates higher than 60 L/min in patients with acute hypoxemic respiratory failure might be associated with improved physiological effects. However, poor comfort might limit feasibility of its clinical use.

Methods: We performed a prospective randomized cross-over physiological study on 12 ICU patients with acute hypoxemic respiratory failure. Patients underwent three steps at the following gas flow: 0.5 L/kg PBW/min, 1 L/kg PBW/min, and 1.5 L/kg PBW/min in random order for 20 min. Temperature and FiO2 remained unchanged. Toward the end of each phase, we collected arterial blood gases, lung volumes, and regional distribution of ventilation assessed by electrical impedance tomography (EIT), and comfort.

Results: In five patients, the etiology was pulmonary; infective disease characterized seven patients; median PaO2/FiO2 at enrollment was 213 [IQR 136–232]. The range of flow rate during NHF 1.5 was 75–120 L/min. PaO2/FiO2 increased with flow, albeit non significantly ($p = 0.064$), PaCO2 and arterial pH remained stable ($p = 0.108$ and $p = 0.105$). Respiratory rate decreased at higher flow rates ($p = 0.014$). Inhomogeneity of ventilation decreased significantly at higher flows ($p = 0.004$) and lung volume at end-expiration significantly increased ($p = 0.007$), but mostly in the non-dependent regions. Comfort was significantly poorer during the step performed at the highest flow ($p < 0.001$).

Conclusions: NHF delivered at rates higher than 60 L/min in critically ill patients with acute hypoxemic respiratory failure is associated with reduced respiratory rate, increased lung homogeneity, and additional positive pressure effect, but also with worse comfort.

Rochwerg B et al.	**The role for high flow nasal cannula as a respiratory support strategy in adults: a clinical practice guideline**	*Intensive Care Med 46* ***2020 Nov***

Purpose: High flow nasal cannula (HFNC) is a relatively recent respiratory support technique which delivers high flow, heated and humidified controlled concentration of oxygen via the nasal route. Recently, its use has increased for a variety of clinical indications. To guide clinical practice, we developed evidence-based recommendations regarding use of HFNC in various clinical settings.

Methods: We formed a guideline panel composed of clinicians, methodologists and experts in respiratory medicine. Using GRADE, the panel developed recommendations for four actionable questions.

Results: The guideline panel made a strong recommendation for HFNC in hypoxemic respiratory failure compared to conventional oxygen therapy (COT) (moderate certainty), a conditional recommendation for HFNC following extubation (moderate certainty), no recommendation regarding HFNC in the peri-intubation period (moderate certainty), and a conditional recommendation for postoperative HFNC in high risk and/or obese patients following cardiac or thoracic surgery (moderate certainty).

Conclusions: This clinical practice guideline synthesizes current best-evidence into four recommendations for HFNC use in patients with hypoxemic respiratory failure, following extubation, in the peri-intubation period, and postoperatively for bedside clinicians.

Perkins GD et al.	**RECOVERY- Respiratory Support: Respiratory Strategies for patients with suspected or proven COVID-19 respiratory failure; Continuous Positive Airway Pressure, High-flow Nasal Oxygen, and standard care: A structured summary of a study protocol for a randomised controlled trial**	*Trials 21, 687* ***2020 Jul***

Objective: The trial objective is to determine if Continuous Positive Airway Pressure (CPAP) or High-Flow Nasal Oxygen (HFNO) is clinically effective compared to standard oxygen therapy in patients with confirmed or suspected COVID-19.

Trial design: Adaptive (group-sequential), parallel group, pragmatic, superiority randomised controlled, open-label, multi-centre, effectiveness trial.

Participants: The trial is being conducted across approximately 60 hospitals across England, Wales, Scotland, and Northern Ireland. Inpatients at participating hospitals are eligible to participate if they have respiratory failure with suspected or proven COVID-19, and meet all of the inclusion criteria and none of the exclusion criteria. Inclusion criteria: 1) Adults ≥ 18 years; 2) Admitted to hospital with suspected or proven COVID-19; 3) Receiving oxygen with fraction of inspired oxygen (FiO2) ≥0.4 and peripheral oxygen saturation (SpO2) ≤94%; and 4) Plan for escalation to tracheal intubation if needed. Exclusion criteria: 1) Planned tracheal intubation and mechanical ventilation imminent within 1 hour; 2) Known or clinically apparent pregnancy; 3) Any absolute contraindication to CPAP or HFNO; 4) Decision not to intubate due to ceiling of treatment or withdrawal of treatment anticipated; and 5) Equipment for both CPAP and HFNO not available.

Intervention and comparator: Intervention one: Continuous positive airway pressure delivered by any device. Setup and therapy titration is not protocolised and is delivered in accordance with clinical discretion. Intervention two: High-flow nasal oxygen delivered by any device. Set-up and therapy titration is not protocolized and is delivered in accordance with clinical discretion. Comparator group: Standard care- oxygen delivered by face mask or nasal cannula (excluding the use of continuous positive airway pressure or high-flow nasal oxygen). Set-up and therapy titration is not protocolised and is delivered in accordance with clinical discretion. Intervention delivery continues up to the point of death, tracheal intubation, or clinical determination that there is no ongoing need (palliation or improvement).

Main outcomes: The primary outcome is a composite outcome comprising tracheal intubation or mortality within 30 days following randomisation. Secondary outcomes include tracheal intubation rate, time to tracheal intubation, duration of invasive ventilation, mortality rate, time to mortality, length of hospital stay, and length of critical care stay.

Zhang R et al.	**Effect of postextubation high-flow nasal cannula therapy on lung recruitment and overdistension in high-risk patient**	*Crit Care 24, 82* ***2020 Mar***

Background: Postextubation high-flow nasal cannula (HFNC) is used as a support therapy in high-risk patients in ICU. This study aimed to determine the effects of HFNC therapy on lung recruitment and overdistension assessed by electrical impedance tomography (EIT).

Methods: Twenty-four patients who received HFNC within 24 h after extubation were prospectively enrolled in this study. EIT was used to monitor regional lung ventilation distributions at baseline (conventional oxygen therapy) and three flow rate levels of HFNC therapy (20, 40, and 60 L/min). Change of end-expiratory lung impedance (ΔEELI), regional recruitment (recruited-pixels) and overdistension (overdistended-pixels), and lung strain change were determined by EIT. EIT images were equally divided into four ventral-to-dorsal horizontal regions of interest (ROIs 1, 2, 3, and 4). "Overdistension-by HFNC" due to HFNC is defined as an increase of overdistened-pixels > 10 than baseline. Patients were divided into two groups: (1) high potential of recruitment (HPR), recruited-pixels > 10 pixels at 60 L/min than baseline, and (2) low potential of recruitment (LPR), recruited-pixels < 10 pixels at 60 L/min than baseline.

Results: When the flow rate gradually increased from baseline to 60 L/min, a significant and consistent increasing trend of global ΔEELI (%) ($p < 0.0001$), recruited-pixels ($p < 0.001$), and overdistended-pixels ($p = 0.101$) was observed. Moreover, the increase of ΔEELI was mainly distributed in ROI2 ($p = 0.001$) and ROI3 ($p < 0.0001$). The HPR group (13/24 patients) had significantly higher recruited-pixels than the LPR group (11/24 patients) at 20, 40, and 60 L/min. There were no significant differences in PaO2/FiO2, ΔEELI (%), and overdistention pixels between the two groups. The HPR group had 13 patients in which no one had "overdistension-by HFNC", and the LPR group had 11 patients in which 4 patients had "overdistension-by HFNC" (0/13 vs. 4/11, $p = 0.017$).

Conclusions: Using EIT could identify diverse effects of HFNC on lung regional ventilation in postextubation situations. Further study is required to validate using "HFNC effect" based on lung recruitment and overdistension by EIT in clinical practice.

Coudroy R et al.	**High-flow nasal oxygen therapy alone or with non-invasive ventilation in immunocompromised patients admitted to ICU for acute hypoxemic respiratory failure: the randomised multicentre controlled FLORALI-IM protocol**	*BMJ Open 2019;9* ***2019 Aug***

Introduction: Non-invasive ventilation (NIV) is recommended as first-line therapy in respiratory failure of critically ill immunocompromised patients as it can decrease intubation and mortality rates as compared with standard oxygen. However, its recommendation is only conditional. Indeed, the use of NIV in this setting has been challenged recently based on results of trials finding similar outcomes with or without NIV or even deleterious effects of NIV. To date, NIV has been compared with standard oxygen but not to high-flow nasal oxygen therapy (HFOT) in immunocompromised patients. Several studies have found lower mortality rates using HFOT alone than when using HFOT with NIV sessions in patients with de novo respiratory failure, and even in immunocompromised patients. We are hypothesising that HFOT alone is more effective than HFOT with NIV sessions and reduces mortality of immunocompromised patients with acute hypoxemic respiratory failure.

Methods and analysis: This study is an investigator-initiated, multicentre randomised controlled trial comparing HFOT alone or with NIV in immunocompromised patients admitted to intensive care unit (ICU) for severe acute hypoxemic respiratory failure. Around 280 patients will be randomised with a 1:1 ratio in two groups. The primary outcome is the mortality rate at day 28 after inclusion. Secondary outcomes include the rate of intubation in each group, length of ICU and hospital stay and mortality up to day 180.

Drake MG	**High-Flow Nasal Cannula Oxygen in Adults: An Evidence-based Assessment**	*Ann Am Thorac Soc* ***2018 Feb***

Abstract: High-flow nasal cannula oxygenation has distinct advantages over other oxygen devices because of its unique effects on respiratory physiology. In particular, adjustable oxygen delivery and flow-dependent carbon dioxide clearance reduce work of breathing and better match inspiratory demand during respiratory distress. Historically, few studies had evaluated whether the physiologic effects of these devices translated into clinical benefit. However, recent publications have begun to address this knowledge gap. High-flow nasal cannula oxygenation has been shown to have similar, and in some cases superior clinical efficacy compared with conventional low-flow oxygen supplementation and noninvasive positive pressure ventilation in acute hypoxemic respiratory failure. High-flow nasal cannula oxygenation also prevents reintubations in medical and postoperative surgical populations, provides preoxygenation for laryngoscopy, and supports oxygenation during bronchoscopy. This review examines the evidence for high-flow nasal cannula oxygenation use in adults, including a focus on the unique effects of high flow on respiratory physiology and keys for tailoring flow for specific clinical scenarios.

Mauri T. et al.	**Optimum support by high-flow nasal cannula in acute hypoxemic respiratory failure: effects of increasing flow rates**	*Intensive Care Med 43* ***2017 Jul***

Purpose: Limited data exist on the correlation between higher flow rates of high-flow nasal cannula (HFNC) and its physiologic effects in patients with acute hypoxemic respiratory failure (AHRF). We assessed the effects of HFNC delivered at increasing flow rate on inspiratory effort, work of breathing, minute ventilation, lung volumes, dynamic compliance and oxygenation in AHRF patients.

Methods: A prospective randomized cross-over study was performed in non-intubated patients with patients AHRF and a PaO2/FiO2 (arterial partial pressure of oxygen/fraction of inspired oxygen) ratio of ≤300 mmHg. A standard non-occlusive facial mask and HFNC at different flow rates (30, 45 and 60 l/min) were randomly applied, while maintaining constant FiO2 (20 min/step). At the end of each phase, we measured arterial blood gases, inspiratory effort, based on swings in esophageal pressure (ΔPes) and on the esophageal pressure–time product (PTPPes), and lung volume, by electrical impedance tomography.

Results: Seventeen patients with AHRF were enrolled in the study. At increasing flow rate, HFNC reduced ΔPes ($p < 0.001$) and PTPPes ($p < 0.001$), while end-expiratory lung volume (ΔEELV), tidal volume to ΔPes ratio (V T/ΔPes, which corresponds to dynamic lung compliance) and oxygenation improved ($p < 0.01$ for all factors). Higher HFNC flow rate also progressively reduced minute ventilation ($p < 0.05$) without any change in arterial CO2 tension ($p = 0.909$). The decrease in ΔPes, PTPPes and minute ventilation at increasing flow rates was better described by exponential fitting, while ΔEELV, V T/ΔPes and oxygenation improved linearly.

Conclusions: In this cohort of patients with AHRF, an increasing HFNC flow rate progressively decreased inspiratory effort and improved lung aeration, dynamic compliance and oxygenation. Most of the effect on inspiratory workload and CO2 clearance was already obtained at the lowest flow rate.

Zhao H et al.	**High-flow nasal cannula oxygen therapy is superior to conventional oxygen therapy but not to noninvasive mechanical ventilation on intubation rate: a systematic review and meta-analysis**	*Crit Care 21* ***2017 Jul***

Background: High-flow nasal cannula oxygen (HFNC) is a relatively new therapy used in adults with respiratory failure. Whether it is superior to conventional oxygen therapy (COT) or to noninvasive mechanical ventilation (NIV) remains unclear. The aim of the present study was to investigate whether HFNC was superior to either COT or NIV in adult acute respiratory failure patients.

Methods: A review of the literature was conducted from the electronic databases from inception up to 20 October 2016. Only randomized clinical trials comparing HFNC with COT or HFNC with NIV were included. The intubation rate was the primary outcome; secondary outcomes included the mechanical ventilation rate, the rate of escalation of respiratory support and mortality.

Results: Eleven studies that enrolled 3459 patients (HFNC, n = 1681) were included. There were eight studies comparing HFNC with COT, two comparing HFNC with NIV, and one comparing all three. HFNC was associated with a significant reduction in intubation rate (OR 0.52, 95% CI 0.34 to 0.79, P = 0.002), mechanical ventilation rate (OR 0.56, 95% CI 0.33 to 0.97, P = 0.04) and the rate of escalation of respiratory support (OR 0.45, 95% CI 0.31 to 0.67, P < 0.0001) when compared to COT. There was no difference in mortality between HFNC and COT utilization (OR 1.01, 95% CI 0.67 to 1.53, P = 0.96). When HFNC was compared to NIV, there was no difference in the intubation rate (OR 0.96; 95% CI 0.66 to 1.39, P = 0.84), the rate of escalation of respiratory support (OR 1.00, 95% CI 0.77 to 1.28, P = 0.97) or mortality (OR 0.85, 95% CI 0.43 to 1.68, P = 0.65).

Conclusions: Compared to COT, HFNC reduced the rate of intubation, mechanical ventilation and the escalation of respiratory support. When compared to NIV, HFNC showed no better outcomes. Large-scale randomized controlled trials are necessary to prove our findings.

Mauri T et al.	**Physiologic Effects of High-Flow Nasal Cannula in Acute Hypoxemic Respiratory Failure**	*Am J Respir Crit Care Med* ***2017 May***

Rationale: High-flow nasal cannula (HFNC) improves the clinical outcomes of nonintubated patients with acute hypoxemic respiratory failure (AHRF).

Objectives: To assess the effects of HFNC on gas exchange, inspiratory effort, minute ventilation, end-expiratory lung volume, dynamic compliance, and ventilation homogeneity in patients with AHRF.

Methods: This was a prospective randomized crossover study in nonintubated patients with AHRF with PaO2/setFiO2 less than or equal to 300 mm Hg admitted to the intensive care unit. We randomly applied HFNC set at 40 L/min compared with a standard nonocclusive facial mask at the same clinically set FiO2 (20 min/step).

Measurements and Main Results: Toward the end of each phase, we measured arterial blood gases, inspiratory effort, and work of breathing by esophageal pressure swings (ΔPes) and pressure time product, and we estimated changes in lung volumes and ventilation homogeneity by electrical impedance tomography. We enrolled 15 patients aged 60 ± 14 years old with PaO2/setFiO2 130 ± 35 mm Hg. Seven (47%) had bilateral lung infiltrates. Compared with the facial mask, HFNC significantly improved oxygenation (P < 0.001) and lowered respiratory rate (P < 0.01), ΔPes (P < 0.01), and pressure time product (P < 0.001). During HFNC, minute ventilation was reduced (P < 0.001) at constant arterial CO2 tension and pH (P = 0.27 and P = 0.23, respectively); end-expiratory lung volume increased (P < 0.001), and tidal volume did not change (P = 0.44); the ratio of tidal volume to ΔPes (an estimate of dynamic lung compliance) increased (P < 0.05); finally, ventilation distribution was more homogeneous (P < 0.01).

Conclusions: In patients with AHRF, HFNC exerts multiple physiologic effects including less inspiratory effort and improved lung volume and compliance. These benefits might underlie the clinical efficacy of HFNC.

Hernandez G et al.	**Effect of Postextubation High-Flow Nasal Cannula vs Noninvasive Ventilation on Reintubation and Postextubation Respiratory Failure in High-Risk Patients A Randomized Clinical Trial**	*JAMA. 2016;316(15)* ***2016 Oct***

Question: Is high-flow nasal cannula noninferior to noninvasive ventilation for preventing reintubation and postextubation respiratory failure?

Findings: In this multicenter randomized noninferiority clinical trial that included 604 adults, the proportion requiring reintubation was 22.8% with high-flow therapy vs 19.1% with noninvasive ventilation, and postextubation respiratory failure was observed in 26.9% with high-flow therapy vs 39.8% with noninvasive ventilation, reaching the noninferiority threshold.

Meaning: High-flow nasal cannula immediately after scheduled extubation was not inferior to noninvasive mechanical ventilation for risk of reintubation and postextubation respiratory failure in patients at high risk of reintubation.

Coudroy R et al.	**High-flow nasal cannula oxygen therapy versus noninvasive ventilation in immunocompromised patients with acute respiratory failure: an observational cohort study**	*Ann. Intensive Care 6, 45* ***2016 May***

Background: Acute respiratory failure is the main cause of admission to intensive care unit in immunocompromised patients. In this subset of patients, the beneficial effects of noninvasive ventilation (NIV) as compared to standard oxygen remain debated. High-flow nasal cannula oxygen therapy (HFNC) is an alternative to standard oxygen or NIV, and its use in hypoxemic patients has been growing. Therefore, we aimed to compare outcomes of immunocompromised patients treated using HFNC alone or NIV as a first-line therapy for acute respiratory failure in an observational cohort study over an 8-year period. Patients with acute-on-chronic respiratory failure, those treated with standard oxygen alone or needing immediate intubation, and those with a do-not-intubate order were excluded.

Results: Among the 115 patients analyzed, 60 (52 %) were treated with HFNC alone and 55 (48 %) with NIV as first-line therapy with 30 patients (55 %) receiving HFNC and 25 patients (45 %) standard oxygen between NIV sessions. The rates of intubation and 28-day mortality were higher in patients treated with NIV than with HFNC (55 vs. 35 %, p = 0.04, and 40 vs. 20 %, p = 0.02 log-rank test, respectively). Using propensity score-matched analysis, NIV was associated with mortality. Using multivariate analysis, NIV was independently associated with intubation and mortality.

Conclusions: Based on this observational cohort study including immunocompromised patients admitted to intensive care unit for acute respiratory failure, intubation and mortality rates could be lower in patients treated with HFNC alone than with NIV. The use of NIV remained independently associated with poor outcomes.