

## Objectives and PICOT

### PICOT Question:

In hospitalized patients with COVID-19, how does using a high-flow nasal cannula (HFNC) for ventilation during hypoxemic respiratory failure impact the intubation and mortality rates during hospitalization, when compared to the standard of care of non-invasive ventilation (NIV)?

### Objectives:

- To examine the research and evidence on HFNC use among COVID-19 patients and determine its efficacy compared to conventional NIV
- To determine if HFNC reduces the need for intubation and mortality among COVID patients with acute hypoxemia
- To make recommendations for nursing practice regarding the use of HFNC

## Background and Significance

### Background

- In 2022 in the United States, 244,000 deaths were related to COVID-19 (Ahmad et al., 2023).
- It was the fourth leading cause of death, following heart disease, cancer, and unintentional injury (Ahmad et al. 2023).
- The critical illness of COVID-19 is acute respiratory distress syndrome (ARDS), defined as progressive dyspnea, a PaO<sub>2</sub>:FiO<sub>2</sub> ratio of less than 300 mmHg, and bilateral opacities on imaging (Siegel, 2023).
- For a COVID-19 patient presenting with hypoxemia, the lowest FiO<sub>2</sub> is preferred to maintain the SpO<sub>2</sub> between 90-96 percent (Anesi, 2023b).
- Patients may progress from low-flow oxygen therapy, to High-Flow Nasal Cannula (HFNC) or Non-Invasive Ventilation (NIV), which includes either Bilevel Positive Airway Pressure (BiPAP) or Continuous Positive Airway Pressure (CPAP) (Anesi, 2023b).
- Current best practice is that as a patient requires more oxygen, the patient may be put on either NIV or HFNC: it is up to the discretion of the physician (Anesi, 2023b).

### Significance

- Preliminary research showed HFNC had potential to decrease mortality and intubation rates (Nair et al., 2021).
- Invasive mechanical ventilation is associated with poor outcomes such as ventilator-associated pneumonia and barotrauma (Bonnet et al., 2021).
- During the beginning of the pandemic, two priorities were reducing mortality and reducing ventilator utilization to prevent overwhelming ICUs (Perkins et al., 2022).

## Search Methods

Research was done on PubMed and the Health and Human Services Library (HSHSL). Key search terms included "COVID" and "mortality" and "oxygenation" and "HFNC or high flow nasal cannula" and "intubation." Only results from the last 5 years were included.

A total of 7 total studies were evaluated: 5 Randomized Controlled Trials (RCTs) and 2 Retrospective Cohort studies.

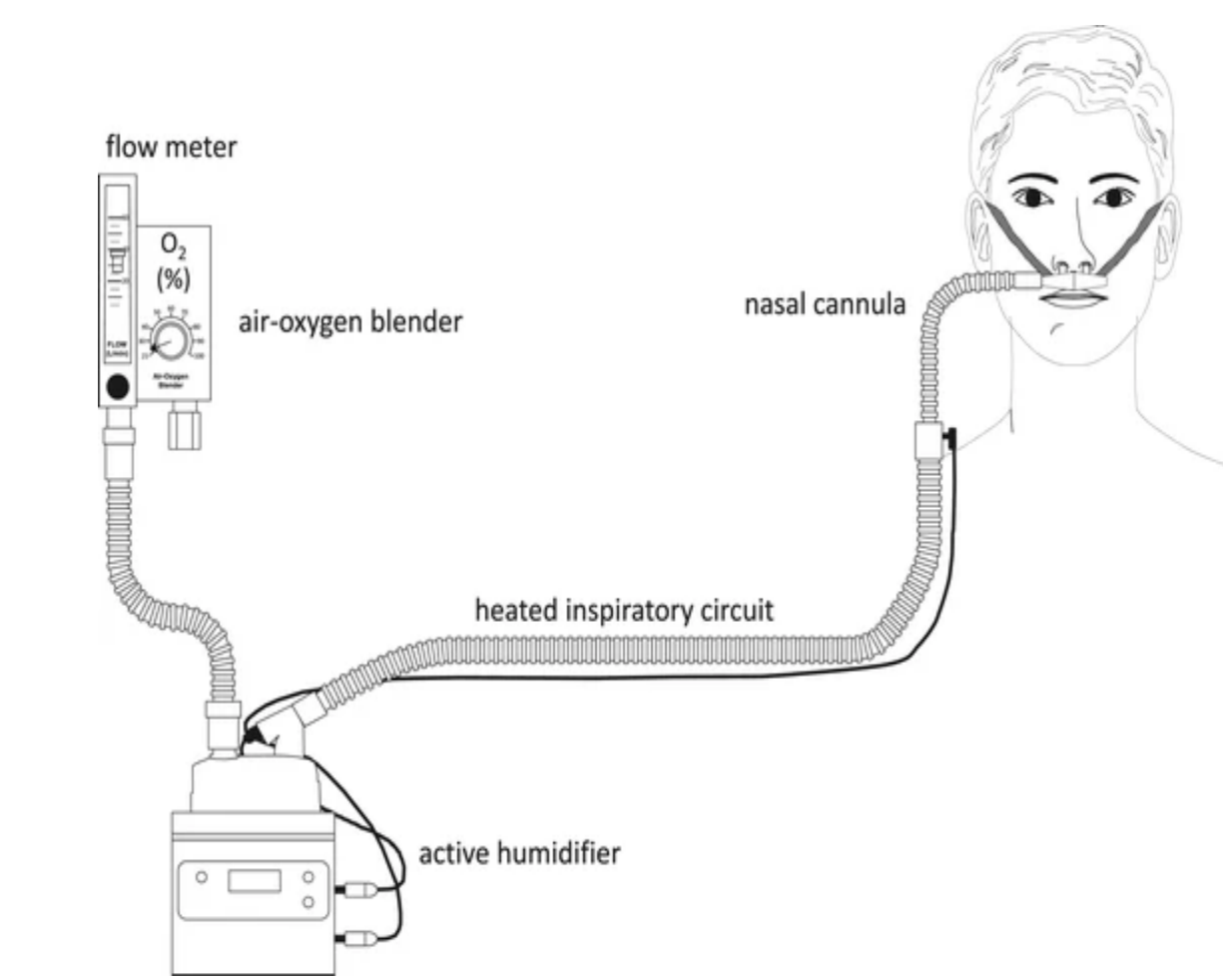
## Literature Review

Study	Study Design and Methods	Study findings
Bonnet et al., 2021	Retrospective Cohort n=138 <b>Control:</b> Received oxygen via a non-rebreather mask with a flow rate of at least 6L/min <b>Intervention:</b> Received oxygen via HFNC at flow rate of 60L/min	<b>Mortality</b> No significant difference in 28-day mortality (p=0.17) and 60-day mortality (p=0.52) between HFNC and standard oxygen groups <b>Intubation</b> Significantly lower intubation rate in HFNC (51%) vs standard (74%), (p=0.007).
Demoule et al., 2020	Retrospective Cohort n=379 <b>Control:</b> Received oxygen via non-HFNC methods <b>Intervention:</b> Received oxygen via HFNC	<b>Mortality</b> No significant difference in ICU Mortality (p=0.117) or mortality at day 28 (p=0.055), or mortality at day 60 (p=0.052). <b>Intubation</b> The 28-day intubation rate was lower in the HFNC group (56%) compared to the control group (75%), (p= <0.001).
Frat et al., 2022	RCT n=711 <b>Control:</b> Received oxygen via a nonrebreather face mask with a flow rate of greater than 10 L/minute <b>Intervention:</b> Received oxygen via HFNC for at least 48 hours	<b>Mortality</b> No significant difference in 28-day mortality (p=0.60) or 90-day mortality (p=0.56) The authors recommend this finding be treated as exploratory. <b>Intubation</b> The intubation rate was lower in the intervention group (45%) compared to the control group (53%) (p=0.04). The authors recommend this finding be treated as exploratory.
Grieco et al., 2021	RCT n=109 <b>Control:</b> Received oxygen via helmet noninvasive ventilation for at least 48 hours <b>Intervention:</b> Received oxygen via HFNC	<b>Mortality</b> No significant difference in 28-day mortality ( p=0.80) or in 60-day mortality (p=0.82). <b>Intubation</b> The 28-day intubation rate was lower in the helmet group (30%) compared to the HFNC group (51%) (p=0.03).
Nair et al., 2021	RCT n=109 <b>Control:</b> Received oxygen via NIV (either a mask or a helmet connected to a ventilator with pressure support of 10–20 cm H <sub>2</sub> O). <b>Intervention:</b> Received oxygen via HFNC	<b>Mortality</b> No significant difference in in-hospital mortality (p=0.06). <b>Intubation</b> No significant difference in 48-hour intubation rate (p=0.12). The 7-day intubation rate was lower in the HFNC group (27.27%) compared to the control group (46.29%) (p=0.045).
Ospina-Tascón et al., 2021	RCT n=220 <b>Control:</b> Received low flow oxygen via nasal cannula or venturi mask <b>Intervention:</b> Received oxygen via HFNC	<b>Mortality</b> No significant difference in 28-day mortality (p=0.11) The authors caution that the study was not powered to show mortality differences. <b>Intubation</b> The 28-day intubation rate was significantly lower in the intervention group (34.3%) compared to the control group (51%) (p=0.03).
Perkins et al., 2022	RCT n=1278 <b>Control:</b> Received oxygen via low-flow nasal cannula or standard face mask <b>Intervention:</b> <b>Group 1:</b> Received oxygen via HFNC <b>Group 2:</b> Received oxygen via CPAP	<b>Mortality</b> There was no significant difference in 30-day mortality rate between the HFNC group and control group (p=0.90, adjusted). <b>Intubation</b> There was no significant difference in 30-day intubation rate between the HFNC group and control group (p=0.72, adjusted). The authors caution that the study was possibly underpowered to show clinical differences between HFNC and conventional oxygen therapy. <b>Other significant findings:</b> CPAP intubation: The 30-day intubation rate was significantly lower in the CPAP group (33.4%) compared to the control group (41.3%) (p=0.02, adjusted).

## Synthesis

### Findings:

- No study found a significant difference in mortality.
- 5 studies (Bonnet et al., 2021, Demoule et al., 2020, Frat et al., 2022, Nair et al., 2021 and Ospina-Tascón et al., 2021) found the intubation rate was significantly lower in the HFNC intervention groups compared to the control groups.
- Perkins et al., 2022 found no difference in the 30-day intubation rate between the HFNC and control group, but found the 30-day intubation rate was significantly lower in the CPAP group (33.4%) compared to the control group (41.3%) (p=0.02, adjusted).
- Grieco et al., 2021 found the 28-day intubation rate was lower in the helmet group (30%) than in the HFNC group (51%) (p=0.03).



## Implications for Nursing Practice

### Interprofessional Teamwork

- Nurses must be trained to recognize increasing oxygen requirements and alert the healthcare team so treatment can be initiated. As appropriate, the nurse can recommend treatment options such as HFNC or NIV.

### QSEN Competencies

- The Quality and Safety Education for Nurses (QSEN) competencies provide a framework for integrating new interventions into competent nursing care.
- Quality improvement metrics like intubation and mortality rates are the benchmark by which HFNC is evaluated as an intervention. This intervention is therefore directly linked to the QSEN competency of Quality Improvement.

### Improving Education

- Nurses should be educated on advantages and disadvantages of HFNC and potential indications.
- Education in nursing schools should be updated to include HFNC as a viable treatment and nurses currently practicing should receive education from their employers

## Conclusion & Recommendation

Although HFNC may not reduce mortality, it may reduce intubation rates which is particularly valuable during ventilator shortages such as during the COVID-19 pandemic.

### Further research

- Further research must be done. Two studies (Frat et al., 2022, Ospina-Tascón et al., 2021,) recommend their findings about mortality and intubation rates be treated as exploratory. Perkins et al., 2022 caution that their study may have been underpowered to detect clinical differences between the HFNC and control groups.
- More research would include more RCTs with large sample sizes and powered to detect clinical differences.

## Bibliography

