

Oxygenation and Ventilation of COVID-19 Patients

Module 1: Noninvasive Support Overview

In collaboration with



American Society of
Anesthesiologists



American Association
for Respiratory Care

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To show skills clearly, the healthcare providers shown do not always use recommended personal protective equipment (such as gloves, masks, face shields).

Objectives

- To provide just-in-time training for the non-intensive-care-unit healthcare provider for patients requiring ventilation assistance who are under investigation for or confirmed to have COVID-19
- To mitigate risks frequently associated with ventilation-assistance devices, such as noninvasive ventilation (NIV) and high-flow nasal cannula (HFNC) in the COVID-19 pandemic
- To briefly review the benefits and functionality of NIV and HFNC

Risk mitigation

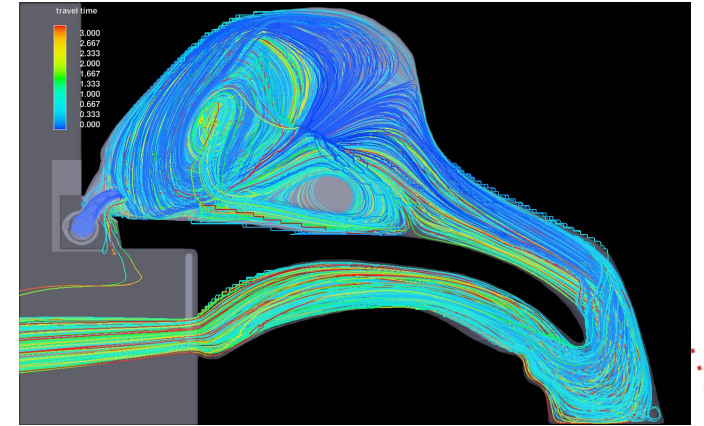
- Attempt to use ventilation equipment and methods with the least aerosol generation
- Noninvasive positive pressure ventilation (NIPPV) and HFNC have a higher risk of aerosol generation than invasive mechanical ventilation and therefore are not routinely recommended in confirmed COVID-19 cases
- Requirements if NIV or HFNC
 - Room: Airborne precautions
 - Equipment: Full face mask and filtered circuits

Risk mitigation (cont.)

- NIPPV: Initiation of NIPPV (bilevel positive airway pressure [BiPAP]/ continuous positive airway pressure [CPAP]) requires attending approval; strongly recommended to avoid NIPPV (BiPAP/CPAP) in persons under investigation and confirmed COVID-19 cases
- Rare exceptions are
 - No intubation for those with acute indications for NIV or HFNC
 - Patients who use NIV chronically or are currently stable or improving on NIV or HFNC
 - Exacerbations that are expected to have a rapid reversal such as congestive heart failure
 - Extubation failure or high risk for reintubation
 - Equipment shortages in which milder disease could be managed to save invasive ventilation devices

Quick review of HFNC

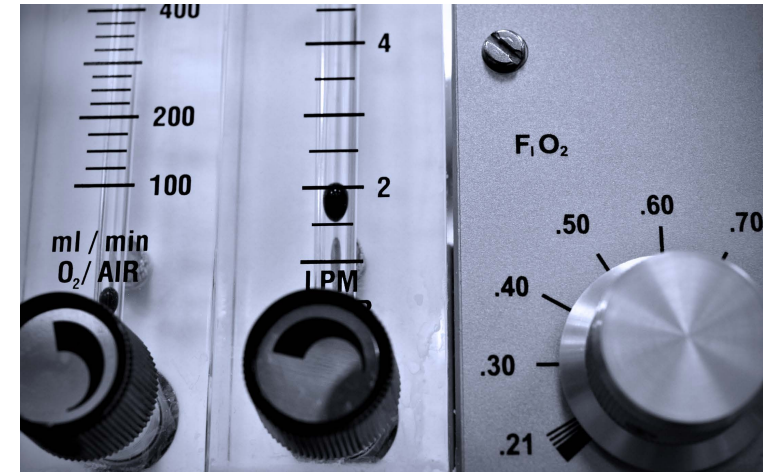
- HFNC is recommended over NIV
- Use minimal flow to maintain SpO₂ greater than 88% to 94%; lower flow rates under 30 L/min may have less aerosolization
 - To minimize flow, titrate fraction of inspired oxygen (FIO₂) to maximum support before increasing flow greater than 30 L/min
- Ensure proper size and fit of nasal canula
- Once HFNC has been initiated, an attending needs to assess the patient after 1 hour and after 3 hours to determine if the patient needs to be intubated
- While on HFNC, the patient should have on a loosely fitting surgical mask or face tent
- Do not delay intubation if there is a lack of improvement



Review of device set-up

- Requirements

- Gas source and blender
- Flowmeter: 40 to 60 L/min
- FIO₂ analyzer
- Humidifier
- Surgical mask to reduce aerosol



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Quick review of NIV

- NIV provides ventilation assistance with positive pressure at 2 levels:
 - Unload respiratory muscles
 - Lung volumes
- Successful NIV attempt requires that the patient
 - Can maintain an airway
 - Is alert and oriented with a strong respiratory drive
 - Has no facial abnormalities that would prohibit a mask seal
- Typical settings
 - Spontaneous mode
 - Peak airway pressure range from 8 to 20 cm H₂O
 - CPAP or positive end-expiratory pressure (PEEP) range from 5-15
- General guidelines
 - If you need more ventilation (more carbon dioxide [CO₂] removal), adjust the peak airway pressure
 - If you need better oxygenation, adjust the CPAP/PEEP

NIV starting settings

- NIV typical starting pressures
 - Inspiratory pressure (peak inspiratory pressure [PIP], inspiratory positive airway pressure [IPAP]) 10 cm H₂O
 - Expiratory pressure (CPAP/PEEP) 5 cm H₂O
 - FIO₂ 1.0
- Titrate to effect
 - If FIO₂ >0.6 to keep SpO₂ greater than 92%, consider increasing expiratory pressure level
 - If respiratory rate continues to be high, consider increasing the inspiratory pressure level

Some common devices

- Several brands and devices available
- Many critical care ventilators can provide NIV
- Requirements for COVID-19
 - FIO_2 .21-1.0
 - CPAP/BiPAP or Bi-level
 - Filtering of exhaled gases
 - Full face mask



Examples only

Limitation of NIV in COVID-19

- Potential aerosol generation
- Device limitations
 - Some lower-end devices cannot provide a high level of oxygen
 - Circuit configuration