MedStar Health

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Guide to Noninvasive Ventilation in COVID-19 patients

Noninvasive ventilation (NIV) is an important tool in our management of patients with respiratory compromise. Because of anecdotal reports of mixed results, particularly with low P:F patients in New York, China, and Italy, in addition to aerosolization risks, use has been limited in COVID-19 patients. NIV has been successfully used to stabilize and prevent intubation, preoxygenate to safely intubate and decrease duration of mechanical ventilation by using it post-extubation. The following guidelines can be used to apply NIV in the safest manner possible.

INDICATIONS / CONTRAINDICATIONS

- NIH & SCCM guidelines state that if HFNC is not available and there is no urgent need for intubation that NIV may be used to decrease work of breathing and improve ventilation and oxygenation
- When setup with non-vented, fitted mask and a filtered circuit, NIV can be considered in four scenarios:

1. Pre-intubation pre-oxygenation
    a. NIV should be considered to maximize PaO_2 prior to safely intubating a patient with hypoxemic respiratory failure
2. Therapeutic challenge or bridge to less support
    a. Temporary NIV can be considered during the initial resuscitation of the dyspneic and/or hypoxemic patient to offer a period of support that stabilizes the patient's respiratory effort in hopes of transitioning to lower levels of support
    b. Evaluate progress and trajectory within four (4) hours
    c. Obtain at least one ABG for objective oxygenation and ventilation data during the trial period
    d. Consider intubation if the patient requires escalating levels of support, becomes hemodynamically unstable, or develops decreased level of consciousness
3. Prolonged therapy
    a. Low levels of support (i.e. PS up to 10 cm H_2O; PEEP up to 10 cm H_2O) can be provided for prolonged therapy (i.e. > 12 hours) if the patient has stable work of breathing and is in a negative pressure room with ICU level care and rapid access to intubation
    b. Attending Physicians must be involved in the decision to maintain prolonged NIV use and/or higher levels of support
    c. Frequent re-evaluation of level of consciousness, hemodynamic stability, work of breathing and oxygenation is recommended
4. Post-extubation
    a. High-risk patients defined as hypercarbia due to COPD, OSA, OHS, and/or CHF
    b. Previous failed SBT attempts
    c. Prolonged duration of mechanical ventilation with multiple failed SBT attempts
    d. Marginal oxygenation and/or RSBI during SBT

- Regardless of indication, the patient must be very closely monitored for decreased level of consciousness, persistent hypoxemia (i.e. SpO_2 < 88% despite 100% FiO_2), hemodynamic instability, vomiting, and sustained elevated work of breathing that is not alleviated by NIV*. Consider intubation in any of these scenarios.
    - *Sustained work of breathing is thought to result in Patient Self-Inflicted Lung Injury (P-SILI). P-SILI is self-injurious lung injury seen in patients with high respiratory drive that results in large pleural pressure swings. The addition of positive inspiratory pressure that does not alleviate the work of breathing further increases transpulmonary pressure and exacerbates lung injury. P-SILI is thought to accelerate or cause the ARDS pathway.

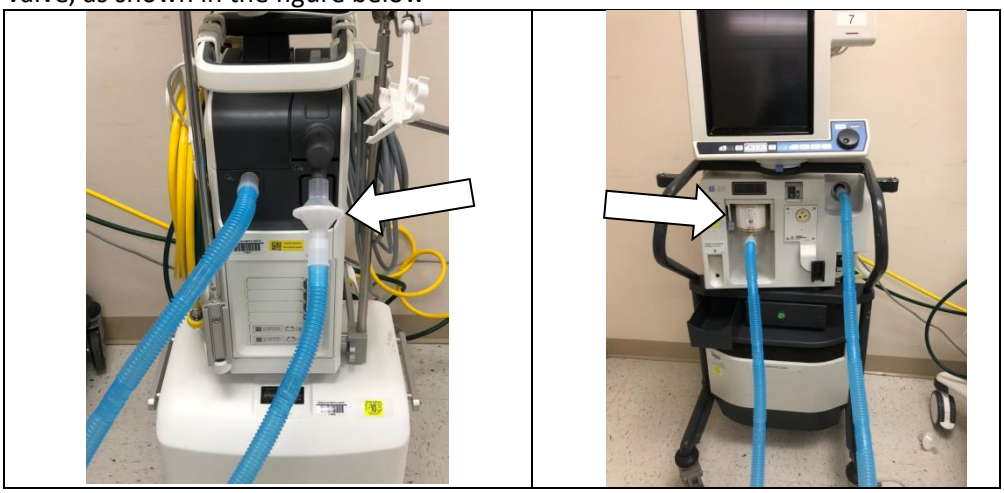
General Considerations

- All personnel in room must wear recommended PPE for Aerosol Generating Procedures (AGPs): an N95 respirator, gown, gloves, and eye protection
- Patient should be in a negative-pressure room
  - Follow guidelines for room closure post AGPs for a negative pressure room.
- Consider starting with PEEP (or EPAP) of 5 cm H_2O and minimal/no inspiratory pressure. A benefit of NIV is the variable high gas flow.
  - Titrate FiO_2 first to reach an SpO_2 goal. Add additional PEEP (or EPAP) only if needed to reach SpO_2 goal.
  - Add/Titrate inspiratory pressure (PS above PEEP; IPAP) based on work of breathing
  - Do not administer a total pressure during inspiration of > 20 cm H_2O (PS+PEEP or IPAP)
- Maintain ΔP (PS above PEEP or IPAP-EPAP) for V_T ~ 6-8 mL/kg
- Avoid large transpulmonary pressure swings or sustained work of breathing
- When removing the mask from the patient, stop flow before removing the interface by entering STANDBY or turning the ventilator off

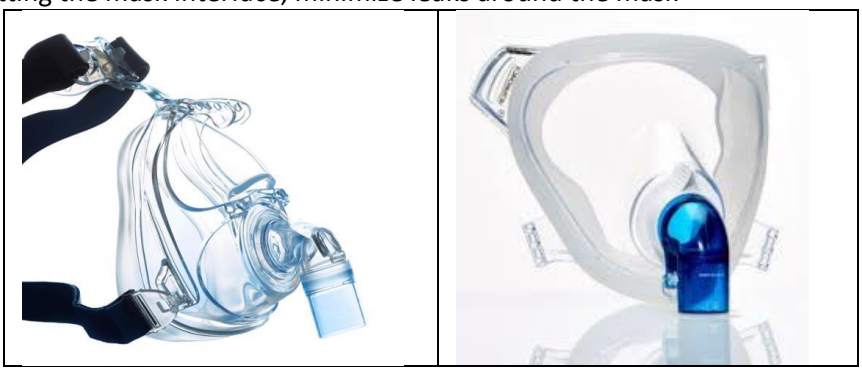
Equipment Considerations

- A critical care or sub-acute ventilator with an inspiratory valve and internal exhalation valve that utilizes a dual-limb circuit is recommended when providing NIV to a COVID+ or PUI patient
  - The non-invasive platform or mode on the ventilator should used, as opposed to invasive ventilation

- Exhaled gas should be filtered by placing a HEPA filter between the expiratory limb of the circuit and the expiratory valve, as shown in the figure below



- Use a NON-VENTED, full face or oro-nasal mask interface
  - When fitting the mask interface, minimize leaks around the mask



- Although dual limb circuit is preferred, if using single-limb circuit with exhalation leak port (figure 3) or external exhalation valve (figure 4), a HEPA filter (red arrow) should be placed between circuit and non-vented mask interface so as to filter expired gases (see figure 3)
    - The exhalation port on the single limb circuit should be open (black arrow)

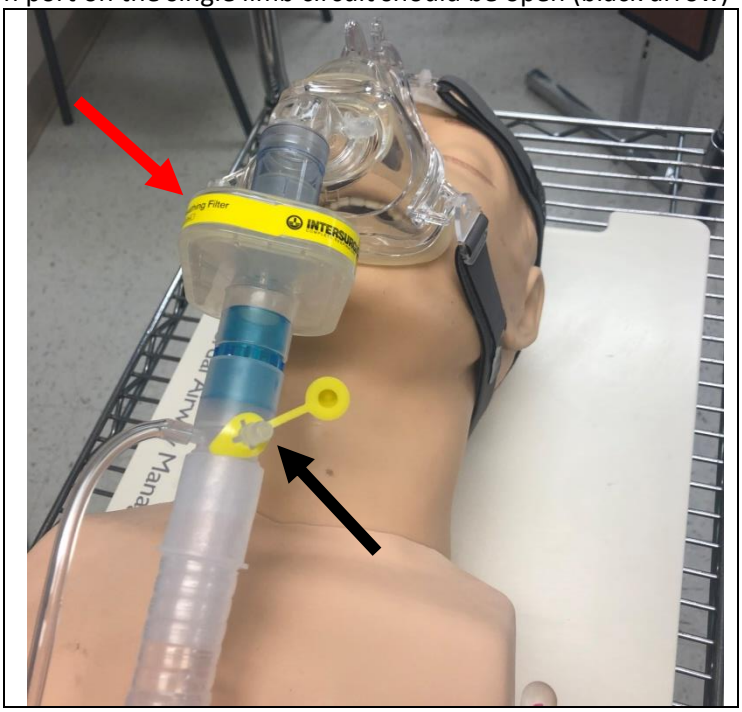


FIGURE 3

FIGURE 4