High Flow Nasal Canula: management of COVID-19 patients

April 2020
Principle setup of high-flow nasal cannula oxygen therapy. An air-oxygen blender, allowing from 0.21 to 1.0 fraction of inspired oxygen, generates up to 60 L/min flow. The gas is heated and humidified through an active heated humidifier and delivered via a single-limb heated inspiratory circuit. The patient breathes the adequately heated and humidified medical gas through nasal cannulas with a large diameter. (From Nishimura, M. [2015]. High-flow nasal cannula oxygen therapy in adults. Journal of Intensive Care, 3[1], 15.)
HFNC

High flow improves oxygenation for the patient by washing out dead space in the lungs and clearing out the CO₂. The positive end expiratory (PEEP) effect oxygenates the airway and the warm water creates vapors which loosens mucus so the alveoli can fully expand.

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Physiologic and clinical benefit</th>
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<tbody>
<tr>
<td>Small, pliable nasal prongs</td>
<td>• Enhanced patient comfort</td>
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<tr>
<td>Heat and humidification</td>
<td>• Facilitates removal of airway secretions</td>
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<td></td>
<td>• Avoids airway desiccation and epithelial injury</td>
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<td></td>
<td>• Decreased work of breathing</td>
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<td></td>
<td>• Enhances patient comfort</td>
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<td>Washout of nasopharyngeal deadspace</td>
<td>• Improved ventilation and oxygen delivery</td>
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<td>Positive end-expiratory (PEEP) effect</td>
<td>• Unload auto-PEEP (if present)</td>
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<td></td>
<td>• Decrease work of breathing</td>
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<tr>
<td></td>
<td>• Enhance oxygenation</td>
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<tr>
<td>High nasal flow rate</td>
<td>• Reliable delivery of fraction of inspired oxygen (FiO₂)</td>
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<td>• Improved breathing pattern (eg, increased tidal volume, decreased respiratory rate)</td>
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Aerosol-generating Procedure

**Health Care Worker**
- N95 respirator or PAPR
- Gloves
- Gown
- Eye protection: face shield or goggles

**Patient**
- Surgical face mask over nose and mouth
Indication for HFNC

- \( \text{SaO}_2 <92\% \), or ↑ work of breathing (WOB), despite supplemental oxygen up to 6 LPM NC

- If COVID confirmed or COVID PUI, trial any of the following:
  - HFNC
  - Helmet continuous positive airway pressure (CPAP)
  - NRB

* If oxygen requirement is increasing quickly → consider proceeding directly to early intubation
HFNC Settings

- **HFNC Settings**: 10-60 LMP, flow up to an FiO$_2$ of 100%
  - FiO$_2$ : percentage of oxygen
    - normal range - 21-100%
  - Flow : generally 15-60 liters

- Partner with respiratory therapist
  - RT will titrate FiO$_2$ and flow to promote comfort and oxygen saturations at or above goal
HFNC Monitoring

- Determine the patient’s baseline
- Notify covering provider of any signs of deterioration in mental OR respiratory status
- Ensure the patient is always on continuous pulse ox
  - Monitor the SpO₂ pleth wave for uniformity, ensuring accuracy
  - Monitor trends in oxygenation status including:
    - SpO₂ saturation and pleth wave form
    - Respiratory rate
    - Work of breathing
    - LOC – decreased LOC could indicate ↑ CO₂ levels
HFNC Interdisciplinary Monitoring

- If patient stabilizes within 1 hour → continue HFNC
- If work of breathing ↑ or SaO$_2$ <92% despite 60 LPM and/or up to FiO$_2$ 100%
  → proceed with intubation
HFNC Intervention

- Is the patient experiencing mild distress? (SpO₂ < 92%, increased RR or increased WOB)
  - Can occur during/after patient activity due to increased O₂ demand
    - Consider NRB: place on patient to allow hyper oxygenation prior to physical activity (e.g. toileting, ambulation)
Non-Rebreather (NRB) Mask

- NRB mask from 10-12 LPM sufficient to inflate the bag
  - With surgical face mask over NRB mask to cover the holes
HFNC Transport

- If patient needs to leave for test/procedure,
  - Ensure patient maintains O2 saturations on NRB mask
    *10-12 liters with loosely fitted surgical mask over NRB
  - RN to travel with patient off the floor
HFNC Troubleshooting

▶ In the event of SpO2 desaturations, address the following:

- Is the SpO₂ sensor clean?
- Is the patient moving, resulting in poor reading?
- Are both nasal cannula prongs in the nostrils?
- Is FiO₂ fluctuating? – ensure the cannula is not kinked inside the nares
- Is the nasal cannula cracked?

*Collaborate with respiratory therapist and covering provider if unable to troubleshoot and patient demonstrates signs of deterioration*