Penn Medicine

Department of Nursing Education and Research

High Flow Nasal Canula: management of COVID-19 patients

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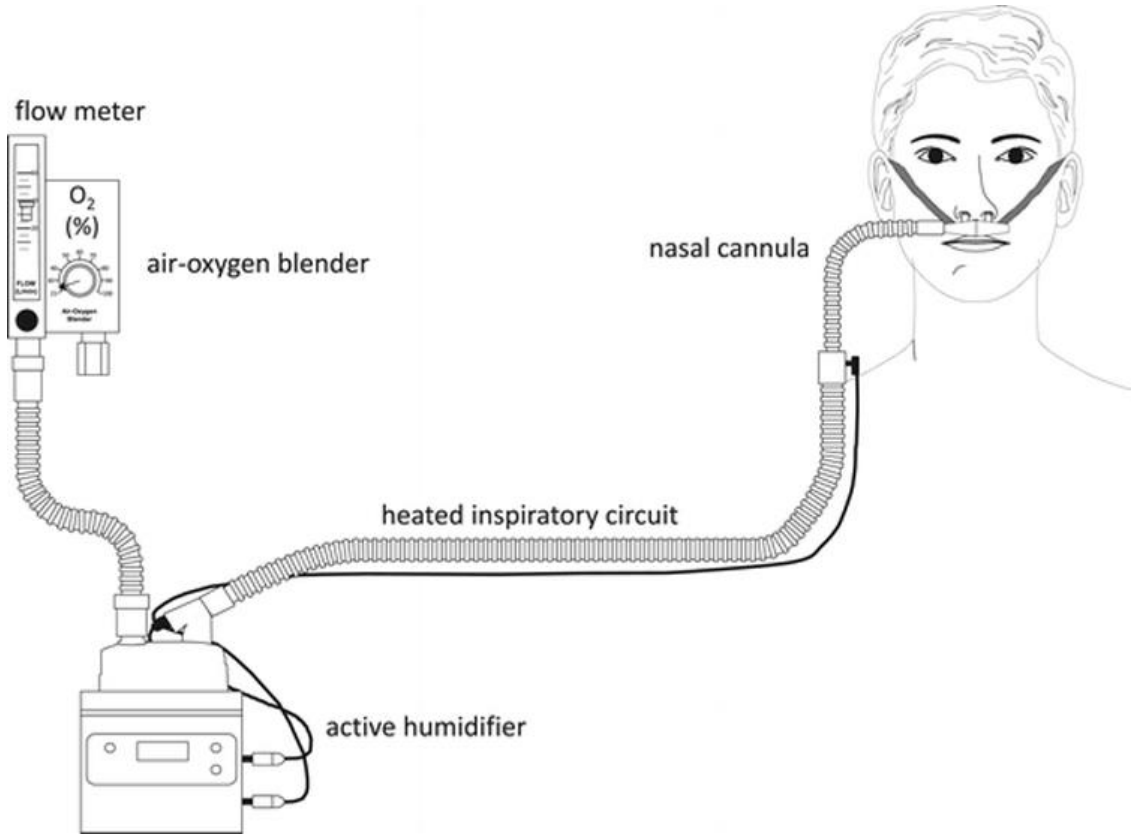
High Flow Nasal Cannula



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 CO_2. The positive end expiratory (PEEP) effect oxygenates the airway and the warm water creates vapors which loosens mucus so the alveoli can fully expand.

Mechanisms and benefits of oxygen delivered via high flow nasal cannula

Mechanism	Physiologic and clinical benefit
Small, pliable nasal prongs	▪ Enhanced patient comfort
Heat and humidification	▪ Facilitates removal of airway secretions ▪ Avoids airway desiccation and epithelial injury ▪ Decreased work of breathing ▪ Enhances patient comfort
Washout of nasopharyngeal deadspace	▪ Improved ventilation and oxygen delivery
Positive end-expiratory (PEEP) effect	▪ Unload auto-PEEP (if present) ▪ Decrease work of breathing ▪ Enhance oxygenation
High nasal flow rate	▪ Reliable delivery of fraction of inspired oxygen (FiO_2) ▪ Improved breathing pattern (eg, increased tidal volume, decreased respiratory rate)

Graphic 115105 Version 2.0

HFNC PPE

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

- 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 SpO_2 pleth wave for uniformity, ensuring accuracy
  - Monitor trends in oxygenation status including:
    - SpO_2 saturation and pleth wave form
    - Respiratory rate
    - Work of breathing
    - LOC – decreased LOC could indicate ↑ CO2 levels

Pulse oximetry with normal plethysmograph waveform.

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? (SpO_2 < 92%, increased RR or increased WOB)
  - Can occur during/after patient activity due to increased O_2 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 SpO_2 sensor clean?
  - Is the patient moving, resulting in poor reading?
  - Are both nasal cannula prongs in the nostrils?
  - Is FiO_2 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