High Flow Nasal Cannula Use in Patients Outside of the Pediatric Intensive Care Unit

Kathy Kalkbrenner, MD
Rosanne Salonia, MD
Kara Denz Fluck, PA-C
What is a Clinical Pathway?

An evidence-based guideline that decreases unnecessary variation and helps promote safe, effective, and consistent patient care.
Objectives of Pathway

- To define the criteria for patients on high flow nasal cannula (HFNC) who may be appropriate for transfer to the medical/surgical floors
- To outline the management for titration and weaning of respiratory support
- To review the feeding and monitoring guidelines for this group of patients
- To identify the circumstances under which a Medical Emergency Team (MET) should be activated
Why is Pathway Necessary?

• To ensure an optimal, consistent approach to the medical management of acute respiratory illness patients on HFNC who meet criteria for transfer from the PICU to the MS floors
Background on High Flow Systems

- Designed to heat and humidify gas mixtures so that patients can tolerate high rates of gas flow
- Designed to decrease the patient’s work of breathing
- Decreases the use of CPAP, BiPAP, and mechanical ventilation
- Potentially decreases metabolic demands and facilitates safe enteral nutrition earlier
Background on High Flow Systems

• Two components to high flow:

1. Oxygen
   – High flow systems allow titration of the amount of oxygen a patient receives based on their oxygen saturations

2. Flow
   – Flow rates are titrated based on work of breathing.
• HFNC = High flow nasal cannula
• SpO2 = Peripheral oxygen saturation (O2 sats)
  o Measurement used to guide oxygen weaning
• FiO2 = Fraction of inspired oxygen (percentage oxygen delivered to the patient)
  o Percentage of oxygen being delivered to the patient
  o Room air = 21%
  o Must be less than 50% to be transferred to Med/Surg unit
• LPM = liters per minute
  o The rate at which air/oxygen flows to the patient
  o Also known as Flow
• PEWS = Pediatric Early Warning Score
  o Score used to predict patient deterioration
• MET = Medical Emergency Team
  o A multidisciplinary team of physicians and nurses who evaluate a patient that may be deteriorating
HFNC Equipment

Flow meter:
- Controls the quantity of air, in liters per minute (LPM), that the patient is receiving through their nasal cannula.
- The Respiratory Therapist (RT) is in charge of changing the flow based on the orders of the provider.

Oxygen blender:
- Adjusts the amount of Oxygen (FiO2) delivered to patient.
- Goal is to decrease to room air (FiO2 21%)
- FiO2 does not affect the flow
- Any provider can decrease or increase the oxygen as needed.

This is where the blended air travels from the flow meter to get heated and humidified.
HFNC Equipment

Blended air from flow meter travels here to be heated and humidified before going to the patient.

This tubing leads to the nasal cannula in the patient’s nose to deliver high-flow humidified and heated air.
Deep Suctioning

- Nasotracheal or Deep suctioning is defined as suctioning past the posterior pharynx and through the vocal cords into the trachea.
- Nasotracheal suctioning is necessary when a patient is unable to effectively mobilize pulmonary secretions and does not have an artificial airway.
How To Deep Suction

• Open suction kit or catheter using aseptic technique. Do not allow the suction catheter to touch any nonsterile surfaces.

• Secure catheter to tubing aseptically. Coat distal 2-3 inches of catheter with water-soluble lubricant (K-Y Jelly/Lubricant).

• Estimate depth of insertion based on the distance from the patient’s nose to the base of the earlobe and then down to the thyroid cartilage as a guide.

• Remove oxygen delivery device with non-dominant hand. Without applying suction, and using the dominant thumb and forefinger, gently but quickly insert the sterile catheter into either naris during inhalation with a slight downward slant.

• Remember that the epiglottis is open during inspiration and facilitates insertion of the catheter into the trachea.
How To Deep Suction (continued)

• Do not force the catheter. Try the other naris if insertion meets resistance or is difficult to insert.
• Apply intermittent suction by placing and releasing non-dominant thumb over the vent of catheter. Slowly withdraw the catheter while rotating it in a circular motion with suction on for as long as 10-15 seconds.
• Assess the need to repeat suctioning procedure. Allow adequate time between suction passes for ventilation and oxygenation. Keep oxygen readily available in case the patient exhibits signs of hypoxemia. Administer oxygen to the patient between suctioning attempts
• When the pharynx and trachea are cleared of secretions, perform oral suctioning to clear the mouth of secretions. Do not suction the nose or trachea after suctioning the mouth.
• Deep suctioning may cause trauma and/or edema to the mucosa. Discontinue deep suctioning if bleeding occurs, until discussed with the physician/practitioner.
How To Find HFNC Data in Epic
This is the High Flow Nasal Cannula Use in Patients outside of the Pediatric Intensive Care Unit Clinical Pathway.

We will be reviewing each component in the following slides.
In general a patient must be consistently improving in order to transfer to Med/Surg unit on HFNC

Prior to transfer patients must meet ALL of these criteria:
- HFNC therapy for acute respiratory illness
- Flow less than 3 LPM/kg
- FiO2 less than 50% with SpO2 >92%
- Tolerating wean or stable on max support for 6hrs

**Inclusion Criteria:**
Receiving High Flow Nasal Cannula (HFNC) therapy for acute respiratory illness, requiring < 3 LPM/kg flow, max of 50% FiO2 to maintain SpO2 of ≥92%; tolerating weaning of flow rates or stable on max support for at least 6 hours

**Exclusion Criteria:**
None

If all inclusion criteria met, may be appropriate for transfer from PICU to MS floors
• Supplemental oxygen (FiO₂) should be titrated to maintain a minimum SpO₂ of 92%
• All health care providers can wean FiO₂ as tolerated and communicate with RN to document in the patient’s chart
• Oxygen should be weaned first before any flow changes
Weaning Flow:
- Changes in flow are ordered by a provider, but completed and documented by RT.
- Consider weaning when SpO₂ is stable ≥ 92% on FiO₂ of 40% or less AND stable or improving clinically.
- May decrease flow by 2 LPM every 4 hours, or faster by the discretion of the provider.
- At 4 LPM and stable may change to conventional nasal cannula.

Escalation of Flow:
- If signs of distress, increase flow by 2 LPM as needed.

**CLINICAL PATHWAY:**
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**WEANING:**
Flow rate changes must be ordered by provider and may only be completed by RT.

Can initiate when:
- Able to maintain SpO₂ of 92% with no more than 40% FiO₂ AND WOB improved; HR/RR may be elevated but are stable.

Wean by:
- Decrease flow by 2 LPM q4hr as tolerated; may wean faster if condition allows.
- If HR/RR/WOB stable at 4LPM: transition to conventional nasal cannula (1-2 LPM).
- Wean NC as tolerated based on WOB and SpO₂.

**INCREASING CARE:**
- May increase flow by 2 LPM PRN (to max flow rate patient was receiving at time of PICU transfer).
• Treatments and feeds should be clustered as much as possible to allow for patient to have periods of rest
• Continue treatments until tolerating a significant decrease in flow and secretions are controlled
• Patients will be WATCHER status until HFNC is discontinued for 24 hours
• PEWS scores should be documents per policy.
  • Note that PEWS scores may may be greater than 7 due to flow rates.
• MET should be called for any increase in PEWS score from time of transfer
• Feeding is at discretion of the Attending on service and based on clinical exam
• Cluster feeds with respiratory treatments if possible
Patients are selected for transfer with the expectation that they are stable and recovering. However, there may be times when the patient clinically deteriorates.

A MET activation is indicated in the following situations:

- **ANY increase of PEWS** from score at time of transfer from the ICU
  - *NOTE* these patients will frequently have a PEWS of 7 or greater at time of transfer
- Staff and/or family concern for decline
- Oxygen demand exceeds 50% FiO2
- Any significant increase in flow support after transfer
- Any decline in respiratory status that requires restarting HFNC after 12 hour period of stability on standard nasal cannula or room air

**WHEN TO CALL A MET:**

- **Any increase of PEWS** from score at time of transfer from PICU
- Staff and/or family concern for decline in clinical status
- Oxygen demands exceeds 50% FiO2
- Any significant increase in support after transfer to MS floor
- Any decline in respiratory status that requires restarting HFNC after a 12 hour period of stability on standard nasal cannula or room air (if respiratory distress shortly after HFNC discontinuation requires resuming support at low flow rates, this does not necessarily warrant a MET)
Patients may be ready for discharge when:

- Stable on room air 90% or greater for more than 4 hours
- Infants should be stable on RA through a feed.
- Appropriate caregiver education and supports in place, including PCP follow up.
Provider Roles

- **Respiratory Therapist (RT):**
  - In charge of HFNC equipment set-up
  - Every 4 hour checks on patient, administers nebulizer treatments, chest physiotherapy and deep suctioning
  - May decrease or increase *flow* per provider order
  - Communicate with house staff every 4 hours about patient’s status and any potential changes to care plan
  - Responsible for documentation of HFNC in EPIC

- **Nursing Staff:**
  - May wean *oxygen (FiO2)* if patient is clinically stable
  - Administer chest physiotherapy and/or deep suctioning as needed for the patient if RT is unavailable
  - Communicate with house staff and RT about patient’s status and potential changes to care plan
  - Document any changes in FiO2 that they or the providers make on rounds and during the day

- **Providers (attending physician and house staff):**
  - Assess patient with RT and RN at least every 4 hours and communicate clearly about care plan
  - Put in orders pertaining to flow changes
  - May wean *FiO2* if patient is clinically stable and communicate with RN to document change
Review of Key Points

• This pathway is for acute respiratory illness patients transferring from the PICU to the MS floors on HFNC

• Continue patients on WATCHER status until HFNC has been discontinued for 24 hours

• Cluster respiratory treatments and feeding if possible

• Have a low threshold to call a MET if a patient is clinically worsening and has the need for escalated care
Use of Order Set

- Please make sure to use the order set associated with this pathway to ensure pathway adherence.
- This order set is specific for the transfer of these HFNC patients.
- Preselected items in the order set include Initiate Pathway and MET activations.
Quality Metrics

- Percentage of patients with use of HFNC order set
- Average number of days on HFNC (PICU)
- Average number of days on HFNC (Med/Surg)
- Percentage of patients requiring increase in respiratory support on med/surg units (increased flow rates)
- Percentage of patients with MET activations post PICU transfer to med/surg unit
- Percentage of patients requiring transfer back to the PICU
- Average length of stay
Pathway Contacts

• Kathy Kalkbrenner, MD
  o Pediatric Hospital Medicine

• Rosanne Salonia, MD
  o Pediatric Intensive Care

• Kara Denz Fluck, PA-C
  o Pediatric Hospital Medicine
References

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About Connecticut Children’s Clinical Pathways Program

Clinical pathways guide the management of patients to optimize consistent use of evidence-based practice. Clinical pathways have been shown to improve guideline adherence and quality outcomes, while decreasing length of stay and cost. Here at Connecticut Children’s, our Clinical Pathways Program aims to deliver evidence-based, high value care to the greatest number of children in a diversity of patient settings. These pathways serve as a guide for providers and do not replace clinical judgment.

This Educational Module was edited by:
Abby Theriaque, APRN
Educational Module Specialist