HEATED HIGH FLOW (HHF) CLINICAL PATHWAY

EXECUTIVE SUMMARY

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Primary Objective

Develop a pathway to guide the initiation, escalation, and weaning for patients on heated high flow nasal canula (HFNC).

Recommendations

The use of high flow nasal cannula (HFNC) in the treatment of bronchiolitis has increased dramatically over the last 10 years, with wide variability in HFNC initiation and weaning practices. To date, no prospective studies have successfully predicted which patients will benefit from HFNC, which poses a challenge to creating specific initiation recommendations. There is no national clinical practice guideline to inform the appropriate use of HFNC in the treatment of bronchiolitis.[1,2,3]

We recommend a HFNC initiation pause (HIP) as a protocol to address patient state – comfort, hunger, hydration, fear, fever, congestion before initiating HFNC in patients with moderate respiratory distress. A recent study utilized this method and reduced HFNC use from 41% to 22%.[14] There was also an overall reduction in LOS by 25%, from 60 to 45 hours. HFNC can be started if a patient clinically worsens because rescue therapy is as effective as early therapy.[4,5,6] Patients with severe respiratory distress should be initiated on HFNC.

We recommend initial maximum flow rates of 2 L/kg/min (or the 15L maximum) based on observational and physiological studies that suggest these HFNC flow rates may be necessary to unload respiratory muscles, improve work of breathing, or generate positive airway pressure in children with bronchiolitis.[7-11]

We recommend weaning or discontinuing HFNC for patients who are clinically improving. The pathway guides RT or RN staff to notify providers when patients on the HFNC pathway have improves respiratory rates, work of breathing, or respiratory scores with low FiO2 needs to facilitate HFNC weaning. A prior study has shown RT assessments about patient readiness to wean can decrease HFNC therapy duration and LOS.[12] Providers also have the option to directly discontinue HFNC to trial the patient on low flow nasal canula or room air. Trials off HFNC have been demonstrated to decrease LOS and reduce unnecessary time on HFNC.[13]

Intended for patients:

- Age 40 weeks post-conceptual age to less than 2 years
- Any of the following
  - Respiratory distress
  - Hypoxemia (need for > 1L if 30-90 days, > 1.5 L for 91 days - 6 months, > 2L for 6 months – 2 years)
  - Respiratory score (RS) ≥ 5

Exclusion criteria (If using HHF, manage the following patients off this pathway):

- Cardiac disease
- Anatomic airway disease
- Neuromuscular disease

- Immunodeficiency

CLINICAL MANAGEMENT

Prior to Heated High Flow Initiation:

- Obtain RS, suction, repeat RS
  - Moderate Respiratory Distress – Perform HIP (30 min pause) before reassessing
    - HIP supportive care interventions
      - Optimize nasal suctioning
      - Attempt feeds if safe for PO (versus sucrose on pacifier)
      - Encourage parent to the patient, dim the lights
      - Administer an antipyretic for comfort
      - Address hydration needs; consider bolus if clinically dehydrated
      - Consider administration of low-flow nasal cannular (LFNC)
        - For saturation <88% and/or increased work of breathing
      - Pause to let the patient settle
      - Reassess before deciding to initiate HFNC

Initiate Heated High Flow:

- Severe Respiratory Distress or Moderate Respiratory Distress after unsuccessful HIP
- Initiate HHF at a flow rate of 2L/kg/min (max 15L/min and ≥ 30% FiO2).
- Obtain RS, suction patient, then repeat RS and vital signs per unit routine.
- Place PIV (consider normal saline bolus/IVF)
- Order NPO status

- Provider disposition assessment after 1 hour to determine if patient is clinically worsening or improving. Two licensed providers together at bedside (within 30 mins) may be required should differing opinions on disposition occur.
  - Clinically improving
    - Vital signs per Pediatric Early Warning System (PEWS) policy with suctioning as needed
    - Place NG/OG if anticipated NPO > 1 day (recommend OG for ≤ 5kg patient)
    - Wean flow rates as tolerated
    - May orally feed when patient is clearly clinically improving based on provider discretion.
  - Clinically unchanged or worsening
    - Notify PICU and arrange patient transfer
    - Manage off pathway

Weaning Heated High Flow:

- FiO2 should be weaned by RN and/or RT to maintain saturations ≥ 88%
- Flow rate should be weaned quickly in improving patients, including at night. RT/RN notify the provider to wean patient's flow rate by at least 1L every 2 hours as long as patient is clinically improving (respiratory distress, respiratory rate) and requiring less than 30% FiO2

- When flow is stable at 2L for 2 hours, discontinue heated high flow[3]. Place low flow nasal cannula O2 if needed to keep saturations ≥ 88%.
- Weaning by conducting a trail directly off heated high flow to room air (from any rate) is also possible, as patient's condition allows.

Criteria for Transfer:

- Criteria for transfer to the ICU
  - Clinically worsening on HHF trial
  - Reoccurring apnea > 20 seconds requiring intervention
  - Reoccurring desaturations with increased FiO2 needs or > 60% FiO2
  - Altered mental status (irritability, lethargy) poor perfusion (cool extremities, capillary refill > 3 seconds)
- Criteria for transfer from the ICU to the floor
  - Meets pathway criteria, stable on flow rate at or below the floor maximum for ≥ 4 hours AND respiratory score < 8 prior to transfer

Rationale

- Safety Will be maintained by close communication between beside nurse, charge nurse, RT, and providers.
- Quality: Will be improved by reducing unnecessary variation in initiation, escalation, and weaning of therapy.
- Cost: Will be reduced by reducing variation in treatment which leads to potential delays, adverse events, and readmissions.
- Engagement: Is created and supported by involvement of nursing, respiratory therapy, and providers who care for HHF patients.
- Patient/Family Satisfaction: Shall be improved by providing the highest quality care based on established guidelines and the latest evidence available in the literature.

Implementation Items

- Bronchiolitis Protocol
- Oxygen/Oximetry Protocol
- HHF Equipment Policy
- HHF Order set/Order

Metrics

- Increase HHF order utilization to ≥95% for pathway by September 2023. (Process metric)
- Reduce proportion of patients admitted for bronchiolitis initiated on HHF to <45% (bottom Quartile was 25%) by September 2023. (Outcome metric)
- Maintain current length of stay for patients requiring heated high flow during admission <48 hours by September 2023. (Outcome metric)
- Reduce total number of hours of HFNC treatment to < 30 hours (bottom quartile was 32 hours) by September 2023. (Outcome metric)

- Monitor rate of transfers from Med/Surg to the PICU. (Balancing metric)

Team Members

Champion: Jason Burrows, M.D. (Hospitalist)
Members:

- Jay Snow, M.D. (Hospitalist)
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- Stephanie Johnson, RN (Nursing Clinical Education)
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- Rachel Shirk, RT (Respiratory Therapy Director)
- Mike Haskins, RT (Respiratory Therapy Inpatient Supervisor)
- Chelsey Marion, RT (Respiratory Therapy Clinical Educator)
- Ellen Kerns, Ph.D. (Care Transformation Data Scientist)
- Kelsey Spackler, DNP, APRN-NP (Clinical Effectiveness)
- Abby Vipond, MSN, FNP-C (Clinical Effectiveness)

Evidence

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