High Flow Nasal Cannula (HFNC) Therapy: Initiation and Escalation for Respiratory Distress

**Target Group**

- See TCH Bronchiolitis Guideline
- Consider for other age groups and disease entities, such as asthma and CAP

**Clinical Respiratory Score (CRS)**

<table>
<thead>
<tr>
<th>Score 2</th>
<th>Score 1</th>
<th>Score 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory Rate</td>
<td>Auscultation</td>
<td>Mento Status</td>
</tr>
<tr>
<td>0-2.5 mins</td>
<td>Good air movement, scattered expiratory wheezing, voice rates moderate</td>
<td>Normal</td>
</tr>
<tr>
<td>2.5-5 mins</td>
<td>Slight wheezing, expiratory noise, voice rates rapid</td>
<td>Moderately labile</td>
</tr>
<tr>
<td>&gt; 5 mins</td>
<td>Severe stridor, long expiratory noise, voice rates rapid</td>
<td>Deeply labile</td>
</tr>
</tbody>
</table>

**Use of Accessory Muscles**

- Minimal to no use of accessory muscles, mild to moderate retractions, nasal flaring on inspiration
- Moderate to severe retractions, mild to moderate use of accessory muscles, nasal flaring
- Severe retractions and subcutaneous retraction, nasal flaring

**Room Air SpO2**

- < 90%
- 90-95%
- 95-100%

**Color**

- Normal
- Pale to normal
- Cyanotic

*(Add score from all rows to calculate total CRS)*

**CRS**

- **0-4**
  - Continue current therapy
  - Reassess as needed
  - Start low-flow O2 supplementation if SpO2 < 90%
  - Disposition:
    - In EC, refer to respective guideline for admission/discharge criteria
    - In acute care, may remain
    - See oxygen weaning protocol

- **5-8**
  - RN/RT to:
    - Assess the patient
    - Notify responsible provider(s) (attending/fellow/resident APP)
    - Perform nasopharyngeal suctioning
    - Obtain and document CRS (RT) and a full set of vitals (RN) in Epic
    - MD/RN/RT to consider:
      - Beta-agonist, nebulized hypertonic saline, or vaprophenine treatment, as appropriate for diagnosis
      - Place on NPO status
      - Treating pain and/or fever

- **9**
  - RT & RN to reevaluate within 30 min of respiratory interventions and document CRS (RT) and vitals (RN) in Epic

**ACUTE CARE:**

- For CRS 6-7
  - Proceed down algorithm

- For CRS 9
  - Activate RRT for potential escalation to CPAP, BIPAP or intubation and/or potential transfer to PCU or ICU
  - Proceed down algorithm

**EC/PCU/PICU:**

- For CRS 5-7
  - Proceed down algorithm

- For CRS 8
  - Consider initiating HFNC, CPAP, BIPAP or intubation
  - If HFNC attempted, proceed down algorithm

****Patient dispositions should NOT be based on HFNC settings (i.e., FiO2 flow). Patient disposition should be determined by the overall clinical condition, which is mainly defined by CRS. See next page for additional guidance.
The following are general admission/exclusion criteria for acute care areas and are not exclusive to this protocol. These are provided to assist and offer general guidance on patient disposition and are not meant to be all-inclusive. Patient needs and status will ultimately determine disposition and will be based on discussion amongst the multidisciplinary providers (i.e., RT, physician, nurse).

<table>
<thead>
<tr>
<th>MC Acute Care</th>
<th>Inclusion:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>o CRS 0-5 at time of disposition and/or transfer, if stable or improving on allowable max. therapies</td>
</tr>
<tr>
<td>Exclusion:</td>
<td>o Patient is not stable or improving on allowable max. therapies</td>
</tr>
<tr>
<td></td>
<td>o Patient requiring continuous albuterol therapy</td>
</tr>
<tr>
<td></td>
<td>o CPAP or BiPAP use for patients with acute respiratory disease</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MC Respiratory Unit (Abercrombie 6N)</th>
<th>Inclusion:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>o Patient requiring continuous albuterol therapy</td>
</tr>
<tr>
<td></td>
<td>o CRS &lt;8 at time of disposition and/or transfer, if stable or improving on allowable max. therapies</td>
</tr>
<tr>
<td>Exclusion:</td>
<td>o CPAP or BiPAP use for patients with acute respiratory disease</td>
</tr>
<tr>
<td></td>
<td>o Need for additional magnesium doses or terbutaline infusion</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WC Acute Care*</th>
<th>Inclusion:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>o Patient requiring continuous albuterol therapy</td>
</tr>
<tr>
<td></td>
<td>o CRS &lt;8 at time of disposition and/or transfer, if stable or improving on allowable max. therapies</td>
</tr>
<tr>
<td>Exclusion:</td>
<td>o Patient is not stable or improving on allowable max. therapies</td>
</tr>
<tr>
<td></td>
<td>o CPAP or BiPAP use for patients with acute or chronic respiratory disease</td>
</tr>
</tbody>
</table>
**Critical Points of Evidence**

**Evidence Supports**
- Use HFNC therapy in children experiencing respiratory distress. Use the maximum flow rate for the patient’s appropriate cannula size. *(11-12) – Strong recommendation, low quality evidence*
- Identify nonresponders as patients exhibiting no response (e.g., HR, RR) within 1 hour of therapy. *(13-16) – Strong recommendation, low quality evidence*
  The clinical respiratory score (CRS) used at TCH includes respiratory rate, among other markers. Patients with a significant cardiopulmonary disorder may have a higher HFNC therapy failure rate than the general population.

**Evidence Lacking/Inconclusive**
- Utilize the oxygen weaning protocol for HFNC therapy weaning. – Consensus recommendation

**References**
Clinical Standards Preparation
This clinical standard was prepared by the Evidence-Based Outcomes Center (EBOC) team in collaboration with content experts at Texas Children’s Hospital. Development of this clinical standard supports the TCH Quality and Patient Safety Program initiative to promote clinical standards and outcomes that build a culture of quality and safety within the organization.

HFNC Therapy Content Expert Team
Brian Bassham, MD, Emergency Medicine
Brandy Biellik, RT, Respiratory Care
Jeffery Campbell, RT, Respiratory Care
Danny Castro, DO, MEd, Critical Care
Kimberly Davis, RT, Respiratory Care
Julia Lawrence, RT, Respiratory Care
Katherine Leaming, MD, Emergency Medicine
Brent Mothner, MD, Pediatric Hospital Medicine
Robert Moore, MD, Pulmonary
Matthew Musick, MD, Critical Care
Jacqueline Newton, RN
Vipul Parikh, MD, Pediatric Hospital Medicine
Binita Patel, MD, Emergency Medicine
Matthew Pesek, MD, Critical Care
Kevin Roy, MD, Critical Care
Monica Simmons, RN, Inpatient
Paul Sirbaugh, MD, Emergency Medicine
Emily Weber, RN
Donna Williams, CNS

EBOC Team
Jennifer Loveless, MPH, Research Specialist
Charles Macias, MD, MPH, Medical Director

Additional EBOC Support
Tom Burke, Research Assistant
Sherin Titus, Research Assistant
Karen Gibbs, MSN/MPH, RN, Research Specialist
Andrea Jackson, MBA, RN, Research Specialist
Sheesha Porter, MS, RN, Research Specialist
Ellis Arjmand, MD, PhD, MMM, Associate Medical Director
Steven Clark, MD, Associate Medical Director
Anne Dykes, MSN, RN, Assistant Director
Kathy Carberry, MPH, RN, Director

Development Process
This clinical standard was developed using the process outlined in the EBOC Manual. The literature appraisal documents the following steps:
1. Review Preparation
   - PICO questions established
   - Evidence search confirmed with content experts
2. Review of Existing Internal and External Guidelines
   - N/A
3. Literature Review of Relevant Evidence
   - Searched: Cochrane, PubMed, Google
4. Critically Analyze the Evidence
   - 1 randomized controlled trial and 14 nonrandomized studies
5. Summarize the Evidence
   - Materials used in the development of the clinical standard, literature appraisal, and any order sets are maintained in a HFNC Therapy evidence-based review manual within EBOC.

Evaluating the Quality of the Evidence
Published clinical guidelines were evaluated for this review using the AGREE II criteria. The summary of these guidelines are included in the literature appraisal. AGREE II criteria evaluate Guideline Scope and Purpose, Stakeholder Involvement, Rigor of Development, Clarity and Presentation, Applicability, and Editorial Independence using a 4-point Likert scale. The higher the score, the more comprehensive the guideline. This clinical standard specifically summarizes the evidence in support of or against specific interventions and identifies where evidence is lacking/inconclusive. The following categories describe how research findings provide support for treatment interventions.

“Evidence Supports” provides evidence to support an intervention.
“Evidence Against!” provides evidence against an intervention.
“Evidence Lacking/Inconclusive” indicates there is insufficient evidence to support or refute an intervention and no conclusion can be drawn from the evidence.

The GRADE criteria were utilized to evaluate the body of evidence used to make practice recommendations. The table below defines how the quality of the evidence is rated and how a strong versus weak recommendation is established. The literature appraisal reflects the critical points of evidence.

<table>
<thead>
<tr>
<th>Type of Evidence</th>
<th>HIGH</th>
<th>MODERATE</th>
<th>LOW</th>
<th>VERY LOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desirable effects clearly outweigh undesirable effects or vice versa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evidence for at least 1 critical outcome from observational studies, RCTs with serious flaws or indirect evidence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evidence from RCTs with important limitations (e.g., inconsistent results, methodological flaws, indirect evidence, or imprecise results) or unusually strong evidence from unbiased observational studies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consistent evidence from well-performed RCTs or exceptionally strong evidence from unbiased observational studies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evidence from unbiased observational studies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evidence lacking/inconclusive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Recommendations
Practice recommendations were directed by the existing evidence and consensus amongst the content experts. Patient and family preferences were included when possible. The Content Expert Team and EBOC team remain aware of the controversies in the initiation and escalation of HFNC therapy in children. When evidence is lacking, options in care are provided in the clinical standard and the accompanying order sets (if applicable).

Approval Process
Clinical standards are reviewed and approved by hospital committees as deemed appropriate for its intended use. Clinical standards are reviewed as necessary within EBOC at Texas Children’s Hospital. Content Expert Teams are involved with every review and update.

Disclaimer
Practice recommendations are based upon the evidence available at the time the clinical standard was developed. Clinical standards (guidelines, summaries, or pathways) do not set out the standard of care and are not intended to be used to dictate a course of care. Each physician/practitioner must use his or her independent judgment in the management of any specific patient and is responsible, in consultation with the patient and/or the patient’s family, to make the ultimate judgment regarding care.

Version History
<table>
<thead>
<tr>
<th>Action</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Originally completed</td>
<td>September 2016</td>
</tr>
</tbody>
</table>