



DAYTON CHILDREN'S HOSPITAL  
CLINICAL PRACTICE GUIDELINES

**DISCLAIMER:** This Clinical Practice Guideline (CPG) generally describes a recommended course of treatment for patients with the identified health needs. This CPG is not presented and should not be used as a substitute for the advice of a licensed independent practitioner, as individual patients may require different treatments from those specified, and guidelines cannot address the unique needs of each patient. Dayton Children's shall not be liable for direct, indirect, special, incidental or consequential damages related to the use of this CPG.



## Bronchiolitis Clinical Practice Guidelines

### Emergency Department Management

- If initial examination demonstrates life threatening symptoms (apnea, cyanosis, Severe retractions, lethargy) implement emergency management.
- Give O<sub>2</sub> if SpO<sub>2</sub> on R.A. is  $\leq$  91-94%. Patients presenting in acute respiratory distress should be placed on oxygen until respiratory status can be stabilized.
- Perform Naso-pharyngeal suction to clear secretions.
- Assess the following: Oxygen dependency, respiratory distress level, ability to feed, hydration status, fever, parent/social situation, pre-existing conditions, exposure to tobacco.

***NOTE: If above findings are within normal limits, observation should be continued and discharge preparations considered.***

### If patient at risk, continue monitoring:

- **Consider:** RSV EIA only if admission is likely. This test should not be ordered on routine patients who are being discharged from the ED. An RSV-EIA may be ordered for a repeat patient or complex patient where the etiology could help determine prognosis.
- Routine ordering of RIPD is also not recommended as it is very expensive and does not typically impact course of treatment.
- Electrolytes, CBC (only if secondary infection suspected)
- CBG/CXR, if patient exhibits significant respiratory distress or at physician discretion in borderline cases.
- Reassess respiratory status, repeat SPO<sub>2</sub> in room air. If patient is being evaluated for discharge or admission with the diagnosis of bronchiolitis, the oxygen saturation goal shall be 91% with oxygen weaning accordingly.

***Aerosol Trial:*** Routine bronchodilator trials are no longer being recommended as very few infants respond. Bronchodilator treatments have been shown to create hypoxemia in infants with bronchiolitis as the medication causes tachycardia (increased cardiac output) and tremors while doing little for improving ventilation. This can result in increased shunting and hypoxemia. Much of the improvement seen with aerosols can be attributed to the suctioning that occurs pre and post treatment and the moisture

from the aerosol. If the physician believes the level of respiratory distress in the infant warrants a trial:

- 0.5 cc (2.5 mg.) albuterol is the medication of choice. Infants with history of wheezing and night time coughing not associated with an URI, or patient's with eczema, atopy or strong family history of asthma are most likely to respond.
- Only one treatment should be ordered to gauge response; if the infant improves, additional aerosols may be ordered.
- Duoneb is not indicated, ipratropium bromide is not effective with viral wheezing.

**CONSIDER AEROSOL RESPONSE WHEN DETERMINING CONTINUED CARE, ADMITTING DIAGNOSIS AND ORDERS.**

**Criteria for Consideration of Hospitalization**

- Persistent Respiratory Distress
- Hypoxia
- Need for IV fluid
- Co-morbidity
- Apnea

**Patient Placement:**

All non- ICU admissions are placed in observation care as the normal length of stay is less than 2 days. If a patient requires a longer length of stay, the attending can change the patient's status to inpatient later in the course of care.

**ADMIT ICU** (For any of the following criteria)

- Witnessed apnea
- O2 requirement > 40%
- Severe respiratory distress
- High risk co-morbidity (severe BPD, cyanotic CHD)

**ED Discharge criteria** (All must be met)

- RR < 60
- Adequate PO intake
- Supportive social environment
- Minimal respiratory distress
- SaO2  $\geq$  91% on room air
- No co-morbidity factors

If applicable, family members should be counseled to not use tobacco products around infant.

**Inpatient/Observation Management**

**Clinical Respiratory Assessment:**

- History of upper respiratory symptoms and/or rhinorrhea.
- Respiratory rate, heart rate
- Color/Oxygen saturation
- Degree of wheezing/air entry
- Degree of retractions
- Level of consciousness

These symptoms should be evaluated and the patient assigned a score using the Bronchiolitis scoring system. This allows for an objective evaluation of the patient’s condition that can be compared to later scores, indicating improvement or worsening of the patient’s clinical condition.

**BRONCHIOLITIS SCORING SYSTEM**

	<b>0 - NORMAL</b>	<b>1 – MILD</b>	<b>2 – MODERATE</b>	<b>3 - SEVERE</b>
<b>Resp Rate</b>	<b>&lt; 40</b>	<b>40-50</b>	<b>50-60</b>	<b>&gt;60</b>
<b>Color O2 Sat on RA Cap Refill</b>	<b>Normal &gt;97% &lt;2 sec.</b>	<b>Normal 94-96% on RA &lt; 2 sec.</b>	<b>Normal 90-93% &lt; 2 sec. On O2 ≤ 30% of HFNC or ≤ 1lpm off the wall</b>	<b>Dusky, Mottled &lt; 90% =&gt; 3 sec. On O2 &gt; 30% of HFNC or &gt; 1lpm off the wall</b>
<b>Retractions / WOB</b>	<b>None</b>	<b>Subcostal</b>	<b>Intercostal and Subcostal when Quiet</b>	<b>Supraclavicular Sternal Paradoxical Respiration</b>
<b>Air Entry Wheezing</b>	<b>Breath Sounds Clear/ Good</b>	<b>Good Entry End Exp. Wheeze +/- Rales</b>	<b>Fair Air Entry Insp and Exp Wheeze +/- Rales</b>	<b>Poor/ Grunting Insp and Exp wheeze +/- Rales</b>
<b>LOC</b>	<b>Normal/ Alert</b>	<b>Mild Irritability</b>	<b>Restless When Disturbed- Agitated</b>	<b>Lethargic Hard to Arouse</b>

***Other factors used in evaluation of infants with suspected bronchiolitis:***

- Signs of dehydration/difficulty feeding.
- Parental ability to provide necessary care for child during acute infection.
- Pre-existing condition contributing to increased possibility of respiratory failure, i.e., prematurity, previous intubation, CHD, cystic fibrosis, etc.

***Laboratory and Radiologic Assessments:***

Chest X-rays, blood work, and blood gases should be ordered *only* when clinical conditions of patient warrants the test.

**Management:**

***Isolation:*** All patients in respiratory distress due to viral illness will be placed in “Droplet/Contact” isolation with or without viral confirmation.

***Cardio-respiratory monitoring:*** This should be applied during the acute phase of the disease because of the risk of apnea and bradycardia. Continuous pulse oximetry is not recommended for patients in general care.

***Oxygen per protocol:*** All patients should be placed on Oxygen per protocol upon admission, but will not be actively weaned for first 12 hours. In the protocol the patient will be set up on the appropriate oxygen delivery device with the FiO<sub>2</sub> titrated to maintain an adequate saturation. The patient will be reassessed Q30 minutes until stable then Q4 and PRN until the patients is on room air.

***Aerosol Protocol:*** This allows the patients to be evaluated by a respiratory therapist at a frequency based on their Bronchiolitis severity score. Since aerosols very rarely improve the symptoms in bronchiolitis and have been shown to cause worsening hypoxemia, bronchodilator trials should be limited to those who present with moderate to severe distress.

***Aerosol Trial:*** For patients who score 8 or higher, an aerosol trial should be considered. The respiratory therapist will notify the medical team when a patient scores  $\geq 8$  and an aerosol is being considered. For the trial, patients will be suctioned if necessary, scored, given aerosol and scored again. A positive response is defined as a decrease of the patient’s post aerosol bronchiolitis score by 2 or more (decrease wheezing, WOB, RR, increased aeration).

- **Normal – Bronchiolitis Score 0-4** Assess Q6
- **Mild Symptoms – Bronchiolitis Score 5-7** Assess Q4
- **Moderate Symptoms – Bronchiolitis Score 8-10**

Consider Albuterol trial X1. If the patient responds continue aerosols Q4 hrs for scores  $\geq 8$ , if no response to first medication, consider trial with vpponephrine. Continue to assess the patient Q2.

- **Severe Symptoms – Bronchiolitis Score 11-15**

Albuterol trial X1. Evaluate response. Consider trial with vpponephrine. If no response and severity persists, consider PICU transfer.

**Hypertonic Saline:** Hypertonic saline aerosols may be considered for those infants with documented copious secretions, after the second day of inpatient care. TID would be an appropriate frequency for 3% Saline aerosols.

**Airway Clearance:** It is recommended that patients be suctioned PRN and prior to therapies and feedings. BBG suctioning may be utilized to clear nasal passages. Nasopharyngeal suctioning is recommended when secretions are obstructive and causing respiratory distress. Chest percussion is contraindicated for patients with bronchiolitis.

**Intravenous Fluids:** The need for an intravenous line and fluid management should be based on clinical assessment of hydration and the patient's ability to feed orally. Intravenous fluids are recommended for the first day of hospitalization for those with hydration needs.

**Nutrition:** Nasogastric feeding is recommended for those requiring fluid support on the second day. NG feedings are recommended for infants on HFNC.

**Antibiotics:** Are not recommended unless patient exhibits indication of bacterial infection.

**High Flow Nasal Cannula (HFNC):** This high humidity, high flow oxygen therapy should be considered for infants with significant respiratory distress. HFNC therapy can significantly reduce the infant's work of breathing. (See attached protocol.)

**Parent Education:** Parents should be educated on:

- Bronchiolitis pathophysiology and duration of illness.
- Proper techniques for airway clearance and suctioning.
- Handwashing and infection control.
- When to call their health care provider by explaining the signs of worsening symptoms.
- The value of continuing breastfeeding up to six months of age, when applicable.

**Tobacco Counseling:**

Clinicians should counsel caregivers/family about exposing the infant to environmental tobacco smoke and offer smoking cessation counseling and information on the Ohio Quit Line. Family at the bedside will be offered free nicotine replacement therapy to reduce nicotine cravings during their infant's hospitalization, assuming no contraindications.

**Discharge Criteria:**

- Respiratory Rate < 60 breaths per minute.
- Adequate P.O. intake.

- Patient SpO2 adequate on room air or is on supplemental oxygen consistent with previous home therapy.
- Parents are proficient with all necessary therapies for home, especially, secretion clearance using a bulb syringe.

**INPATIENT/OBSERVATION MANAGEMENT PROTOCOL**

<b>SCORE</b>	<b><u>Respiratory Treatment</u></b>	<b><u>Other Therapy</u></b>
<b>0-4 NORMAL</b>	Assess Q6	Suction PRN Bulb Syringe suction for home
<b>5-7 MILD</b>	Assess Q4	Oxygen per Protocol Suction PRN
<b>8-10 MODERATE</b>	Aerosol Trial X1 with Albuterol. If the patient responds continue aerosols Q4 hrs. for scores $\geq 8$ , If not responsive consider a trial with an alternate bronchodilator. Assess Q2	IV fluids Oxygen per Protocol Consider Chest X-ray Capillary Blood Gas Suction PRN Consider HFNC if meets criteria Place on "watcher" list
<b>11-15 SEVERE</b>	Aerosol Trial X1 with Albuterol. If response is positive, continue aerosol Q2. Call PRT and consider PICU transfer	On "watcher" list IV fluids Oxygen per Protocol Chest X-Ray Capillary Blood Gas HFNC if meets criteria Excessive PCO2/acidosis warrants transfer to PICU



## **Bronchiolitis Clinical Practice Guideline:**

### **High Flow Nasal Cannula Initiation in Specialty Pediatrics**

High flow nasal cannula is an accepted treatment modality in infants with respiratory distress due to viral bronchiolitis.

HFNC therapy helps by:

- Washing out anatomic dead space
- Decreasing inspiratory resistance
- Providing positive pressure during the respiratory cycle
- Decreasing air trapping by stenting swollen airways
- Providing increased humidity to moisten retained secretions

Patients exhibiting significant hypoxemia or respiratory distress can be successfully treated with high flow nasal cannula. HFNC can prevent respiratory failure and the need for more advanced support, such as CPAP, NIV and mechanical ventilation.

#### **Inclusion Criteria:**

- Infants with viral bronchiolitis, IV fluids, and respiratory distress (i.e. retractions, tachypnea, coarse breath sounds) that does not improve with conventional therapy (generally a Bronchiolitis score of 8 or higher).

#### **Exclusion Criteria:**

- Patient exhibiting signs of respiratory failure (i.e. severe respiratory distress, decreased level of consciousness, lethargy, apnea or bradycardia) should be transferred to the PICU immediately. Patients with cardiac co-morbidities, chronic respiratory disease, history of intubation, and/or history of pulmonary hypertension should also be excluded from this protocol. A PRT should be called for any of these types of patients requiring increased support.

#### **RCP Protocol:**

Prior to initiation of HFNC the RCP should consult with the respiratory supervisor and the medical team managing the patient. The hospitalist team should come to the bedside to evaluate the patient.

As of winter 2017-18, patients placed on HFNC can be managed in PICU or in general care, based on the following criteria:

**HFNC patients who will be placed in PICU:**

- Patients with cardiac co-morbidities
- Patients with history of intubation
- Patients who require > 40% oxygen and HFNC flowrates >8 lpm or  $\geq 2\text{L/kg/min}$  to meet SpO<sub>2</sub> of 91%-94%. and/or reduce work of breathing
- Patients having apnea and/or bradycardic events

The managing medical team must notify the PICU medical staff of all patients set up on high flow therapy at the time a decision is made to initiate therapy on patients who are known or suspected to be transferring to PICU.

**HFNC patients who may stay in specialty pediatrics care on central monitoring:**

- Patient's admitted from the ED or transport on HFNC requiring  $\leq 40\%$  FiO<sub>2</sub> and  $\leq 8$  lpm of flow, not to exceed 2L/kg/min.
- Patients who require HFNC with  $\leq 40\%$  oxygen to meet SpO<sub>2</sub> of 91-94%.
- Patients whose work of breathing improves with HFNC flowrates  $\leq 8$ lpm

**HFNC initiation –first hour:**

- Patient will be set up on Vapotherm Precision Flow at 1 L/kg/min. Flow can be adjusted to a maximum of 8 lpm, not to exceed 2L/kg/min based on improvement of symptoms.
- O<sub>2</sub> will be adjusted for SpO<sub>2</sub> and increased as needed.
- Patient will be continuously monitored for HR, RR and SpO<sub>2</sub>.
- Patient will be scored prior to initiation of therapy and scored after the first hour of therapy.

Patients who demonstrate no response will require evaluation by medical staff; call PICU for immediate transfer. Those who improve will remain in specialty pediatrics care.

**Specialty Pediatrics: Patient Assessment and Care**

- HFNC patients will remain in general care on continuous central monitoring with HR, RR and SpO<sub>2</sub>.
- Nursing will assign staffing based on a goal of 1 RN: 3 Patient ratio
- After the first hour of HFNC, respiratory therapy will assess patients Q2 hrs x 2, then Q4, documenting all vital signs and bronchiolitis scores and suctioning.
- All staff will observe for signs of worsening respiratory distress; any worsening of symptoms will be called to the medical team, i.e.,  $\uparrow$ WOB,  $\uparrow$  Respiratory Rate,  $\uparrow$  HR, decreasing saturations.
- Patient to remain on watcher list until stable. Status will then be changed to high risk until HFNC is discontinued.

**Contact PICU Medical Staff Immediately for Transfer**

- Consistently rising O<sub>2</sub> (>40%) to maintain desired SpO<sub>2</sub>
- Deteriorating blood gases
- Worsening respiratory distress or impending respiratory failure.
- Apnea and bradycardia requiring manual ventilation or other interventions

**Post-acute care:**

**PICU HFNC transfers to general care for weaning:** We are requesting that the PICU send out their HFNC patients on high flow not wall gas, to continue high humidity until the oxygen requirement is gone. HFNC transfers must meet this criteria:

- O<sub>2</sub> < 40%
- Stable for >12 hours on current therapy
- Patients will be “High Risk” when they leave PICU until the HFNC is discontinued.

**General Care HFNC weaning:** HFNC Weaning should not begin until the patient has been stable on current care for 12 hours. Adjustment of flowrate and O<sub>2</sub> should be primarily limited to the RCP. If the RN or provider increases O<sub>2</sub> or flow, they should immediately notify the RCP assigned via Vocera.

- Maintain the established flowrate and wean O<sub>2</sub> to 21% while maintaining target saturations.
- After O<sub>2</sub> is 21% wean flow rate watching work of breathing and respiratory rate.
- An order is not needed to wean flow or FiO<sub>2</sub>?

Patients should not need to go to a low flow cannula. If there is a need, give just enough flow to maintain target SpO<sub>2</sub> levels, not the same flow on HFNC.

**Any increase in O<sub>2</sub> or flow during the weaning process should be called immediately to the medical team.**

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