Wheezing in children <24 months of age

Emergency Department Management Clinical Practice Guideline (CPG)

Protocol approved by:
Division of Pediatric Emergency Medicine
Date of approval: 3/09, 10/16

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Wheezing in Children < 24 Months of Age
Evaluation and Management

**EXCLUDE**
* Chronic lung disease
* Cystic fibrosis
* Congenital heart disease
* Neuromuscular disease
* Immunodeficiencies

**CONSIDER**
**ED asthma guidelines** if:
* Recurrent wheezing
* Reactive airway disease
* Prior steroid use
* Strong response to albuterol
* Age > 12 months with any of the above

**History and Physical exam**
**Respiratory Assessment Score (RAS)**

**Suspected diagnosis of Bronchiolitis**

**Nasal suction with normal saline**
Repeat RAS

**Mild (0-2)**
Nasal suction (bulb) with normal saline as needed

**Moderate (3-4)**
Nasal suction (bulb/ deep) with normal saline
Consider albuterol trial if RAS ≥ 4₄₅ (Document reason for trial)
Repeat RAS

**Severe (5-10)**
If no improvement, consider HFNC or CPAP

**DISCHARGE CRITERIA**
* Oxygen saturation > 90% awake and calm
* Tolerating adequate oral intake
* Mild/ moderate work of breathing (See age-based respiratory rate scale)
* Reliable caretaker
* Able to obtain follow-up care
* MDI/spacer teaching for albuterol MDI if meaningful response based on repeat RAS was documented (decrease in overall score of 2 points or more)

**ADMISSION CRITERIA**
* If discharge criteria is not met

**Inpatient/TCU**
* O₂ requirement
* Hydration

**PICU**
* Severe distress
* Apnea or ETT

**ADDITIONAL CONSIDERATIONS**
**Higher risk of progression/complications:**
(1) Prematurity; (2) Respiratory rate ≥ 70; or (3) Age < 12 weeks
Apnea risk: (1) Gestational age < 46 weeks; (2) Witnessed/prior apnea
The 2014 AAP Bronchiolitis Clinical Practice Guideline recommends that clinicians should NOT administer albuterol or racemic epinephrine to infants and children with a diagnosis of bronchiolitis. There is no published evidence to suggest benefit for overall prognosis, including hospitalization, length of stay or duration of illness. However, in an acutely ill child, the use of rapidly-acting beta-agonists such as albuterol or racemic epinephrine may be trialed to provide short-term symptomatic relief.

Consider an albuterol trial if RAS ≥ 4 and/or if they have a history of strong response to albuterol administration. Repeat RAS 20 minutes after albuterol trial and discontinue if there is no decrease in overall score of 2 points or more.

See Oxygen delivery guidelines for placement. Flow limit for inpatient floor is HFNC 8 L/min and/or bubble CPAP 8 cm H₂O. TCU’s flow limit is standard CPAP off vent with full facemask up to 10 cm H₂O.

**Bronchiolitis Definition**
Bronchiolitis is a disorder commonly caused by viral lower respiratory tract infection in infants. It is characterized by acute inflammation, edema, and necrosis of epithelial cells lining small airways, and increased mucus production. Signs and symptoms typically begin with rhinitis and cough, which may progress to tachypnea, wheezing, rales, use of accessory muscles, and/or nasal flaring.

**Bronchiolitis Clinical Practice Guideline Application**
This guideline was developed for the evaluation and management of previously healthy children from 1-23 months of age with a clinical diagnosis of bronchiolitis. This guideline does not apply to children with chronic lung disease (bronchopulmonary dysplasia), anomalies of the airway (tracheomalacia) or croup, congenital heart disease, neuromuscular disease, cystic fibrosis or immunodeficiencies, including those with HIV infection or recipients of solid organ or hematopoietic stem cell transplants.

**Alternative Clinical Practice Guideline Considerations**
Asthma Clinical Practice Guideline: Patients with history of reactive airway disease or recurrent wheezing, described as 3 or more wheezing episodes, parental history of asthma or eczema, maternal smoking during pregnancy or patient history of pneumonia.
Community-acquired Pneumonia Clinical Practice Guideline: Patients with signs and symptoms of lower respiratory tract infection, persistent fever ≥ 40°C, fever late in the course of illness or toxic appearance suggestive of super infection.

**Respiratory Assessment: Key Points**

<table>
<thead>
<tr>
<th>Variability</th>
<th>The physical exam varies from minute to minute based on physiology and response to treatment as well as the child’s position, level of alertness and cooperation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Examination</td>
<td>Assessment is ideally done with the child upright, awake after suctioning the upper airway, as nasal congestion may transmit to the lungs and simulate wheezing. A reliable assessment often requires repeated examinations over the course of the ED visit.</td>
</tr>
<tr>
<td>Progression of Illness</td>
<td>Symptoms tend to worsen over the first 3-5 days of illness and then gradually resolve over the following weeks. Assessment of the stage of illness and potential progression is an important factor in the disposition decision.</td>
</tr>
<tr>
<td>Pulse Oximetry</td>
<td>Hypoxemia is usually due to ventilation-perfusion mismatch from mucus plugging</td>
</tr>
</tbody>
</table>
of the airways, not hyperinflation of the lungs or bronchospasm.

Bronchodilator therapy can worsen this effect temporarily.

Pulse oximetry is important, as mild hypoxemia may not be apparent on physical exam. However, changes can be transient, the decisions to initiate oxygen should be based on repeated observation of pulse oximetry < 90% after routine measures such as positioning and suction.

Continuous pulse oximetry is NOT needed for stable infants. Check oxygen saturation prior to ANY intervention and reassessment. Oxygen saturation should be recorded as the first read after 30 seconds of stable signal during spot check.

Mild hypoxemia is a predictor of potential progression to severe disease requiring hospitalization, particularly if the child is in the early stages of illness.

### Apnea

Apnea is a concern in young and premature infants. Factors predicting very low risk of apnea include:
- Age > 4 weeks for full-term or 48 weeks post-conception for pre-term infants,
- Absence of prior history of apneic episode before presentation.

### Respiratory Assessment Score (Clinical Asthma Score)

Respiratory distress assessment should be done prior to ANY intervention. Allow 20 minutes after each intervention to reassess.

<table>
<thead>
<tr>
<th>Score points</th>
<th>SpO₂</th>
<th>Auscultation</th>
<th>Accessory muscle use</th>
<th>Inspiratory breath sounds</th>
<th>Dyspnea</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>&gt;95% on room air</td>
<td>None or end expiratory wheezes</td>
<td>None</td>
<td>Normal</td>
<td>Speaks in sentences/ coos and babbles</td>
</tr>
<tr>
<td>1</td>
<td>90-95% on room air</td>
<td>Wheezing through entire expiratory phase</td>
<td>Substernal/ subcostal/ intercostal/ nasal flaring</td>
<td>Unequal</td>
<td>Speaks in partial sentences/ short cry</td>
</tr>
<tr>
<td>2</td>
<td>&lt;90% on room air/ requiring any oxygen</td>
<td>Inspiratory and expiratory wheezing</td>
<td>Supraclavicular/ See-saw respirations</td>
<td>Decreased</td>
<td>Speaks in single words/ short phrase/ grunting</td>
</tr>
</tbody>
</table>

### Age-based Respiratory Rate Scale

<table>
<thead>
<tr>
<th>Age-based Respiratory Rate Scale</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 3 months</td>
<td>30-60</td>
<td>61-80</td>
<td>&gt; 80</td>
</tr>
<tr>
<td>3 - &lt; 12 months</td>
<td>25-50</td>
<td>51-70</td>
<td>&gt; 70</td>
</tr>
<tr>
<td>≥ 12 – 23 months</td>
<td>20-40</td>
<td>41-60</td>
<td>&gt; 60</td>
</tr>
</tbody>
</table>

### Oxygen delivery guidelines for non-ICU patients

The patient should be monitored through the acute titration of flow. It is advisable to begin with a lower flow and slowly increase by 1 L/min every 1-2 minutes. Adequate flow will be evidenced by decrease in work of breathing and respiratory rate. Consider a step up approach to flow delivery if there is no improvement. Titrate \( \text{FiO}_2 \) to achieve target saturation between 90% and 97%.

<table>
<thead>
<tr>
<th>Bubble CPAP (delivers PEEP)</th>
<th>Infants (up to 8 Kg)</th>
<th>5-8 cm H₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>15-20 IP</td>
</tr>
</tbody>
</table>
| Heated nasal cannula (HNC) | Infant up to 9 months (10 Kg)  
Toddlers (10-20 Kg)  
Children (> 20 Kg) | Max flow 5 L/min  
Max flow 8 L/min  
Max flow 8-15 L/min |
|--------------------------|---------------------------------|------------------|
| High flow nasal cannula (HFNC) | Infant (up to 15 Kg)  
Pediatric (up to 22 Kg) | Optiflow Junior, Infant size, Max flow 20 L/min  
Start flow at > 2 L/min (i.e. 2L/Kg/min)  
Optiflow Junior, Pediatric size, Max flow 25 L/min  
Start flow at > 6 L/min (i.e. 1L/Kg/min) |

**Additional treatment considerations**

| Albuterol | NOT recommended  
Intermittent nebulization [0.5% solution (5 mg/mL)] 2.5 mg (0.5 mL)  
MDI (90 mcg/puff) 2-4 puffs | Albuterol should NOT be continued if the patient doesn't respond to neb trial  
If responsive to albuterol trial dose, may continue:  
MDI  
Frequency of every 1-4 hours as needed  
Intermittent nebulization  
Frequency of every 2-6 hours as needed |
|--------------------------|---------------------------------|------------------|
| Racemic epinephrine | NOT recommended, consider if croup is suspected  
Dose: 0.05 mL/kg neb; Max: 0.5 mL/dose every 1-2 hours |  
Antibiotics | NOT recommended unless there is a concomitant bacterial infection |  
Hypertonic saline | NOT recommended to be administered in the Emergency Department |

**Further diagnostic testing**

| Chest X-ray | NOT routinely recommended  
Consider if:  
Clinical picture is not consistent with bronchiolitis  
Clinical course suggests super infection  
Persistent fever ≥ 40°C or new fever late in the disease process  
Severe disease/ toxic appearance with lack of upper respiratory symptoms |  
Viral testing | NOT routinely recommended  
Consider if:  
The diagnosis is in question  
Prolonged fever  
Local epidemiology indicates significant influenza activity  
Institution requires it for inpatient allocation (optional) |

**Goals and Metrics**

- Encourage clinical diagnosis of bronchiolitis
- Document use of respiratory score BEFORE and AFTER each intervention
- Decrease
  - Chest x-ray
  - Viral testing
  - Albuterol use
  - Antibiotic use
- Decrease ED length of stay, admission rate, revisit rate
- Decrease hospital length of stay, readmit rate
REFERENCES


