Evidence-based pathway for the diagnosis and treatment of bronchiolitis in outpatient and inpatient settings

Goals:

- Deliver high quality, evidence-based care.
- Reduce unnecessary interventions that may cause harm, increase cost and increase length of stay.
- Provide education regarding best practices across the continuum of pediatric care.

Exclusion criteria:

- Children younger than 2 months or older than 2 years
- Congenital heart disease
- Anatomical airway abnormality
- Chronic lung disease
- Immunodeficiency
- Neuromuscular disease
- History of wheezing in the absence of a viral illness
- Gestational age <35 weeks
- Prior history of requiring respiratory support (ventilator, CPAP, BiPAP, HFNC)
- Severe co-morbid disease
- Concern for sepsis

Recommendations:

Diagnosis of bronchiolitis should be made on history and physical examination. In otherwise healthy children with bronchiolitis, data suggests additional diagnostic testing often causes unintended harm. The risk for concurrent bloodstream or CSF bacterial infection with bronchiolitis is estimated at less than 1%. We do not routinely recommend:

- Viral testing, unless concern for flu
- Chest X Ray
- CBC
- Blood culture
- UA
- Urine culture

Many treatments have been tried for bronchiolitis. After extensive review of the current literature, there is no conclusive evidence to support:

- Deep suction
- Albuterol
- Steroids
- Antibiotics
- Racemic Epinephrine
- Chest physiotherapy (CPT)
- Decongestants
- Nebulized hypertonic saline

For a list of references and a summary of current literature to support the above recommendations, please see the end of this guideline.

Admission criteria:

- Severe respiratory distress
- Oxygen requirement (sats < 90% on RA)
- Dehydration
- Need for frequent suctioning not able to be accomplished with bulb suction or nasal aspirator
- Parent unable to care for child at home

→Admission to observation unit, inpatient unit or PICU will be determined by the clinician and need for additional respiratory support beyond simple nasal cannula

Initial management:

- Each patient suspected of having bronchiolitis should be placed in contact and droplet isolation with standard hand hygiene measures in place
- Nasal suction and saline should be utilized before feeds and as needed, preferably with a nasal aspirator such as the NasaKleen device, which is available in stores and just as effective as wall suction when used properly by a caregiver
- Patients should be positioned and repositioned to optimize air exchange and minimize work of breathing
- If unable to hydrate orally
    - Place NG for enteral hydration with breastmilk or formula, continuous vs. bolus
    - If IVF are indicated, strongly consider isotonic fluid (such as D5 – NS) to decrease complications from iatrogenic hyponatremia
- Oxygen should be utilized for saturations <90% but has no role in improvement of work of breathing
- Age appropriate antipyretic as needed
- HFNC where appropriate
- Cardiac/apnea monitor if at risk for apnea

Ongoing care decisions should be dictated by frequent reassessment and physical exam.

- In a child with worsening respiratory distress (increased respiratory rate, desaturations, increased work of breathing):
    - Re-evaluate fitness for pathway by reviewing inclusion/exclusion criteria.
    - Consider blood gas to assess air exchange and need for escalation of care.
- Oxygen should be weaned as the patient improves, and the switch to spot checks from continuous pulse oximetry should be made as soon as possible
    - Patients who remain on continuous pulse oximetry have been shown to have a more prolonged length of stay without any improvement in clinical outcomes.

Discharge criteria:

- RR< 60
- Off 02 for minimum of 6 hours, can be adjusted based on age
- No apneic episodes for at least 12-24 hours
- Feeding well enough to maintain hydration
- NasaKleen or bulb suction teaching complete
- Safe sleep education (reinforce there is no need for home oximeter)
- Smoking cessation education
- Breastfeeding support when applicable

General references:

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Albuterol

The conclusion from several large studies and reviews have found that beta adrenergic agents such as albuterol may improve unvalidated clinical symptom scores transiently. However, using albuterol does not affect disease resolution, need for hospitalization, length of stay, or any objective measure of disease. Due to clinically significant side effects such as tachycardia and tremors, albuterol is not routinely recommended.

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Nebulized epinephrine

Systematic reviews and large multicenter randomized trials have concluded that epinephrine does not decrease length of stay, other inpatient outcomes or rates of admission to the hospital.

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High flow nasal cannula

High flow nasal cannula may generate enough continuous positive airway pressure in infants to reduce work of breathing and decrease need for intubation. While high flow nasal canula has not been shown to decrease length of stay, it may have a role as a rescue therapy to reduce the need

for transfer to the ICU.

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Nebulized hypertonic saline

Previous studies have argued that the mucociliary clearance provided by treatment with hypertonic saline may reduce length of stay in patients admitted with bronchiolitis for greater than 3 days. Studies since that time have refuted this claim. Risks of use include significant bronchospasm unless premedicated with albuterol. While a recent Cochrane review concluded that hypertonic saline may modestly reduce length of stay and reduce need for hospitalization, the authors stated that the quality of the evidence was low to moderate. Multiple experts have stated that the heterogenicity of studies included within the review make comparisons difficult and continue to caution against the routine use of hypertonic saline for bronchiolitis.

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Monitoring and oximetry

Continuous pulse oximetry can be a valuable tool in assessing hypoxemia, however it has been

associated with prolonged hospitalization, ICU admission, and mechanical ventilation. Estimates indicate that 60% of healthy infants exhibit transient oxygen desaturations below 90% during sleep. Oxygen saturation has far less impact on respiratory drive than carbon dioxide concentrations in the blood. Additionally, alarm fatigue may contribute to morbidity and mortality in addition to decreasing patient and parent sleep. Therefore, if an infant is not requiring oxygen, continuous pulse oximetry should not be used.

Most healthy infants without prematurity or underlying neuromuscular disease will not experience apnea with bronchiolitis, including those who test positive for RSV. Unless other significant concerns exist, routine use of a Cardiac Apnea Monitor (CAM) or automatic admission to observe for possible apnea is not recommended.

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Risk of serious bacterial infection and antibiotics

Children with clinical bronchiolitis have a less than 1% chance of concurrent bloodstream or CSF infection. While previous studies have estimated the rate of UTI in infants with

bronchiolitis at 2-12%, a 2011 systematic review conducted by Ralston et al estimated the rate of UTI in infants younger than 60-90 days with bronchiolitis at 3.3%, but stated that asymptomatic bacteriuria could have confounded the results. They concluded that a routine screening approach to hospitalized infants with bronchiolitis was very low yield. Acute otitis media may occur concurrently and be attributable to the virus causing the bronchiolitis itself. However, a bulging tympanic membrane may be a better indicator of bacterial source and require treatment with antibiotics.

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Chest physiotherapy

Atelectasis is a well-known complication of bronchiolitis. Several randomized controlled trials have found no significant benefit from using chest vibration, percussion, or passive expiratory techniques.

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Steroids

Systematic review of large clinical trials finds no benefit from isolated therapy with corticosteroids. Use of steroids can also prolong viral shedding.

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81. Fernandes RM, Bialy LM, Vandermeer B, et al. Glucocorticoids for acute viral bronchiolitis in infants and young children. *Cochrane Database Syst Rev*. 2013;(6):CD004878.

Viral testing and additional labs

Identifying a viral etiology does not predict illness severity or alter management. In addition, prolonged viral shedding from previous illness, particularly rhinovirus, complicates diagnostic accuracy of testing.

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Hydration

Approximately one third of infants hospitalized for bronchiolitis require fluid replacement. Oral feeding may pose a risk for aspiration when respiratory rate exceeds 60-70 breaths per minute. Therefore, nasogastric or IV hydration may be appropriate. Nasogastric tubes may be easier to insert than a peripheral IV, and parental satisfaction scores do not differ with either. If IV fluids are chosen for hydration, replacement with isotonic fluids (D5 - NS) is preferred over hypotonic

fluids (D5 - 1/2 NS) due to the risk of iatrogenic hyponatremia and SIADH with bronchiolitis.

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Chest X-ray

Many infants with bronchiolitis will have radiographic abnormalities and approximately 25% will have evidence of atelectasis. Bacterial pneumonia is rare in infants with bronchiolitis. Chest X-ray should be reserved for those patients whose respiratory distress is severe enough to require ICU admission or there are signs of significant airway complication.

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96. Schuh S, Lalani A, Allen U, et al. Evaluation of the utility of radiography in acute bronchiolitis. *J Pediatr*. 2007;150(4):429-433.

Suction

Deep suction is associated with longer length of stay and can be traumatic to the airway and is not recommended. Bulb or nasal aspirator suction is beneficial.

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Cough and cold medicines

According to the American Academy of Pediatrics, cough and cold medications should not be prescribed, recommended or used for the treatment of respiratory illnesses in young children. Studies have shown that cough and cold medications in young children offer little benefit and have potentially serious side effects. These products often contain more than one medication, which increases the chance of an accidental overdose. The FDA recommends against the use of cough and cold products that contain decongestants or antihistamines and many manufacturers have relabeled their products to state that they are not appropriate for children under 4 years of age.

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NOTE: This guideline is intended to assist providers in decision making by providing the current state of evidence and recommendations for the management of bronchiolitis. This guideline is not meant to replace clinical judgement and will not be appropriate for all cases of bronchiolitis.

Bronchiolitis clinical guideline team:
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Kelly Black, MD – Emergency medicine
Cathy Carroll, RRT, NPS – Respiratory therapy
Matthew Carroll, M.D. – Hospital medicine
Stephanie Lavin, RN – Quality department
Heather Miller, M.D. – Primary care
Errin Newman, M.D. – Pulmonary medicine
Daphne Shaw, M.D. – Primary care
Kara Starnes, D.O. – Urgent care

Linda Thompson, M.D. – Pediatric critical care

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