Clinical Pathways

Bronchiolitis

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What is a Clinical Pathway?

An evidence-based guideline that decreases unnecessary variation and helps promote safe, effective, and consistent patient care.
Objectives of Pathway

- To standardize delivery of evidence based care to infants with bronchiolitis
- To avoid routine use of therapies and testing that have been shown to have little clinical benefit (i.e. routine viral testing, chest x-rays, antibiotic use, steroids, bronchodilators)
- To maximize the usage of enteral hydration when appropriate (by mouth and/or nasogastric tubes)
- To increase screening for 2nd and 3rd hand smoke exposure
- To decrease unnecessary continuous pulse oximetry use
Why is Pathway Necessary?

• Bronchiolitis is the most frequent cause of hospital admission for children under 1 year of age.
  o Accounts for upwards of 18% of all hospitalizations in the United States

• In 2014 the AAP published updated guidelines on the diagnostic work up, treatment modalities, and prevention of bronchiolitis
  o Provides evidence based recommendations for use in children 1-23 months presenting with bronchiolitis in the absence of complicating medical conditions (i.e. BPD, immunodeficiency, congenital cardiac disease)

• Pathway gives both providers and nurses guidance based on current best practices.
  o Previously there had been variation in practice amongst providers, and little evidence to support certain commonly used modalities of diagnosis and treatment
Pathophysiology of Bronchiolitis

• Viral infection of lower respiratory tract (bronchioles)
• Most common cause is Respiratory Syncytial Virus (RSV). Other potential causes are rhinovirus, influenza, coronavirus, parainfluenza, metapneumovirus.
• Leads to edema, inflammation and necrosis of respiratory epithelium and significant mucous production
• Clinically characterized by cough, tachypnea, retractions, wheezing, rhonchi and air trapping
Epidemiology of Bronchiolitis

• At ~150,000 admissions per year, it is the most common cause of hospital admission during the first year of life
• 90% of children are infected with RSV by the age of 2 years
• Accounts for upwards of 18% of all hospitalizations in the United States
• Annual cost of ~$1.73 billion dollars nationally for bronchiolitis admissions
Choosing Wisely:
5 Things Physicians and Patients Should Question

- An initiative from the Society of Hospital Medicine aimed at promoting the highest quality care for patients
- A list of recommendations created by a rigorous consensus panel of pediatric hospital medicine physicians
- 4 out of 5 recommendations pertain to bronchiolitis management!
Choosing Wisely:  
5 Things Physicians and Patients Should Question

1. Don’t order chest radiographs in children with uncomplicated asthma or bronchiolitis
2. Don’t routinely use bronchodilators in children with bronchiolitis
3. Don’t use systemic corticosteroids in children under 2 years of age with an uncomplicated lower respiratory tract infection
4. Don’t treat gastroesophageal reflux in infants routinely with acid suppression therapy
5. Don’t use continuous pulse oximetry routinely in children with acute respiratory illness unless they are on supplemental oxygen

We will discuss the evidence behind these recommendations as we go through the pathway
This is the Bronchiolitis Clinical Pathway.

We will be reviewing each component in the following slides.
This pathway is intended for otherwise healthy babies between 1 month and 24 months of age.

Initial management is focused on respiratory support and rehydration.

Specific recommendations are based on AAP guidelines and latest clinical evidence.

**Inclusion Criteria:** 1-24 mo old with bronchiolitis as primary diagnosis

**Exclusion Criteria:** Age < 1 month or > 24 months, < 35 weeks gestational age, prior wheezing episode, active cardiac disease, or congenital, chromosomal or neuromuscular abnormalities that may complicate the respiratory illness

**In ED:**
- Provide supplemental oxygen if SpO2 < 90%
- Nasal suction PRN (deep suction only for airway obstruction causing significant respiratory distress)
- Place NGT (preferred, if meets criteria*) or PIV if indicated (poor PO, dehydration, significant distress)
  - If needs fluid bolus via NGT: provide 20 ml/kg Pedialyte over 30-60 min

**Admit to Medical/Surgical Unit**

**Admission criteria:**
- Room air saturation less than 90%,
- Moderate to severe WOB,
- Dehydration with inability to take adequate oral fluids,
- History of apnea and/or cyanosis,
- Concern about the ability of the child to be cared for as an outpatient
In the past, management of bronchiolitis varied amongst providers, and certain tests and treatments were routine.

However, current AAP guidelines do NOT support the use of the tests or treatments in this box for the treatment of routine bronchiolitis.

We will review the evidence behind these recommendations in the following slides.

The following tests and treatments are NOT routinely indicated for the treatment of bronchiolitis:

- Chest x-ray
- Viral testing
- Chest physiotherapy
- Albuterol
- Steroids
- Racemic epinephrine
- Antibiotics
### Review of AAP Guidelines: Diagnostic Work Up

**Viral Testing:**
- **Currently, AAP does not recommend routine viral testing**
- Non-RSV bronchiolitis have been shown to have shorter hospital courses
- According to Cochrane review 2014, viral testing possibly decreased rate of subsequent antibiotics and CXR (but not blood or urine specimen collection)
- Value of determining specific viral etiology for individual patients has not been demonstrated

**Chest Radiography (CXR):**
- **Current evidence does not support CXR for routine work up of bronchiolitis**
- CXR does not correlate with disease severity
- Shown to increase use of antibiotics in treatment of bronchiolitis
- Initial CXR should be reserved for severe disease presentation, warranting ICU admission, or concern for airway complications (i.e. pneumothorax)
Review of AAP Guidelines: Treatment Modalities

Antibiotics:

- Clinicians should not administer antibiotics unless there is a concomitant bacterial infection or a strong suspicion of one: (Evidence B; Strong recommendation)
- May be indicated in children with severe bronchiolitis with respiratory failure requiring intubation and mechanical ventilation
- No difference in length of illness or hospitalization with use of antibiotics
- No correlation between WBC and superimposed bacterial infection in patients with bronchiolitis

Steroids:

- Clinicians should not administer systemic corticosteroids to infants with a diagnosis of bronchiolitis in any setting (Evidence Quality: A; Recommendation Strength: Strong Recommendation).
- Shown to have no reduction in hospital admissions
- May prolong viral shedding
### Review of AAP Guidelines: Treatment Modalities

#### Bronchodilators:
- **Clinicians should not administer bronchodilators to infants and children with a diagnosis of bronchiolitis** (Evidence Quality: B; Recommendation Strength: Strong Recommendation).
- Evidence based recommendations: Cochrane review 2014
  - Beta-agonists do not improve oxygen saturation, shorten duration of hospitalization or reduce the total time to resolution of illness.

#### Chest Physiotherapy:
- **Clinicians should not use chest physiotherapy for infants and children with a diagnosis of bronchiolitis** (Evidence Quality: B; Recommendation Strength: Moderate Recommendation).
- Evidence shows no different in length of stay, oxygen requirement or scoring with use of CPT compared to other therapies (Cochrane review 2012).
- There may be some exceptions in patients with poor airway clearance (patients in ICU, neuromuscular impairment).
### Review of AAP Guidelines: Treatment Modalities

#### Racemic Epinephrine:

- Clinicians should not administer epinephrine to infants and children with a diagnosis of bronchiolitis *(Evidence Quality: B; Recommendation Strength: Strong Recommendation).*

#### Hypertonic Saline:

- Hypertonic Saline should not be administered to infants with a diagnosis of bronchiolitis in the ED *(Evidence Quality: B; Recommendation Strength: Moderate Recommendation)*
- Clinicians may administer nebulized hypertonic saline to infants and children hospitalized for bronchiolitis *(Evidence Quality: B; Recommendation Strength: Weak Recommendation)*
- No difference in rates of admission with outpatient (ED and clinic) use of HTS
Review of AAP Guidelines: Monitoring

- Pulse oximetry
  - Unreliable
  - Poor marker of respiratory distress
  - Normal for healthy infants to have mild intermittent desaturations
  - May increase rate of unnecessary hospitalizations

- Clinicians may choose not to administer supplemental oxygen if saturations exceed 90% in infants and children with diagnosis of bronchiolitis (Evidence Quality: D; Recommendation Strength: Weak Recommendation)

- Clinicians may choose not to use continuous pulse oximetry for infants and children with a diagnosis (Evidence Quality: C; Recommendation Strength: Weak Recommendation)
Supportive Care in both the Emergency Department and upon Admission should be based on symptoms present.

Limit deep suction to airway obstruction or significant respiratory distress

Maintain hydration enterally whenever possible.

NG hydration is a safe alternative to IV hydration and does not prolong length of stay.

See following slides
Hydration and Nutrition Management

- Hydration and nutrition are important aspects of the supportive treatment for patients with bronchiolitis.
  - 82% of infants less than a year of age admitted for bronchiolitis had poor feeding prior to admission (Unger 2008).
  - Anywhere from 30% to 60% of patients hospitalized for bronchiolitis require hydration (Florin 2015, Johnson 2002, Srinivasan 2017)

- 2014 AAP Clinical Practice Guideline: The Diagnosis, Management, and Prevention of Bronchiolitis advises that nasogastric or intravenous fluids should be administered to infants with a diagnosis of bronchiolitis who cannot maintain hydration orally.
  - At many US institutions, IV placement is preferred route of hydration, however it may not be the best option for many patients with bronchiolitis.
Data has shown that rehydration with Nasogastric tubes (NGT) is just as effective as Peripheral Intravenous (IV) rehydration.

NG tubes may be easier to obtain and less invasive than a PIV in a dehydrated infant.

Parents may be weary about NGT placement, however, with proper education evidence shows that parents actually prefer the NGT over PIV.

Note that not every patient will be a candidate for NGT placement. See Exclusion criteria.

In ED:
- Provide supplemental oxygen if $\text{SpO}_2 < 90\%$
- Nasal suction PRN (deep suction only for airway obstruction causing significant respiratory distress)
- Place NGT (preferred, if meets criteria*) or PIV if indicated (poor PO, dehydration, significant distress)
  - If needs fluid bolus via NGT: provide 20 ml/kg Pedialyte over 30-60 min

Supportive care:
- Nasal suction PRN (deep suction only for airway obstruction causing significant respiratory distress)
- Reposition PRN
- NGT feeds (preferred, if meets criteria*) or IVFs if indicated (poor PO, dehydration, significant distress)
- If needs fluid bolus via NGT:
  - provide 20 ml/kg Pedialyte over 30-60 min; then for ongoing nutrition, can give Pedialyte or formula/breastmilk as continuous or bolus feeds
- Patient/family education

*NGT Criteria
**Inclusion Criteria**
- Infants with mild-moderate respiratory distress
**Exclusion Criteria**
- Requiring >2 L/min O2 via NC
- Severe respiratory distress with concern for respiratory failure
- Severe dehydration or shock
- Recurrent emesis
- Craniofacial abnormalities that make placing an NGT difficult
- Patient already has a GT or GJT
As with Supportive Care, Monitoring and Treatments should be based on a patient's clinical condition.

Limit routine use of continuous pulse oximetry unless supplemental oxygen is being administered

See Appendix A Below

Monitoring:
- Strict I/Os q8hr
- Continuous or intermittent pulse oximetry monitoring (per O₂ weaning and monitoring algorithm on Appendix A)

Treatments:
- Oxygen for SpO₂ < 90% (see O₂ weaning and monitoring algorithm on Appendix A)
- Consider Hypertonic Saline 3.5% for patients anticipated to have a long length of stay (i.e. hx prematurity)
If SpO2 is greater than 90% on admission, patient should get only intermittent pulse oximetry checks.

If SpO2 is less than 90%, monitor for 5 minutes to determine if hypoxemia is persistent.

Supplemental O2 is started for persistent hypoxemia or any O2 sat less than 80%.

If patient is stable, wean O2 every hour as tolerated.

Finally, if patient on RA with SpO2 ≥ 90% for 2 hours, may advance to intermittent pulse oximetry.

Appendix A: Provides guidelines for oxygen weaning and pulse oximetry monitoring in the inpatient setting.
A new order to reflect the oxygen weaning and pulse oximetry monitoring algorithm was added to the Bronchiolitis Pathway admission order set.
Clinical Worsening

When patient shows any clinical worsening such as increased work of breathing, persistent hypoxemia, increased supplemental oxygen requirement consider:

- Capillary blood gas
- Chest x-ray
- Making NPO/holding NGT feeds
- MET activation
Continue Supportive measures until patient meets discharge criteria.

Ensure proper follow up is in place, and that guardian(s) are able to continue to care for the child on an outpatient basis.

Discharge Criteria:
- Room air saturation ≥ 90% for ≥ 4 hours including through 1 feed
- Age appropriate respiratory rate without significant work of breathing; maintaining adequate hydration without need for IVFs
- Caregiver education complete
- Responsible and capable parent(s) or guardian(s) to care for the child as an outpatient;
- PCP identified and follow-up appointment made
Review of Key Points

- Clinicians should diagnose bronchiolitis and assess disease severity on the basis of history and physical.
- Per AAP recommendations, bronchodilators, corticosteroids, antibiotics and chest physiotherapy are not recommended in the treatment of bronchiolitis.
- Patients on room air without hypoxia do not require continuous pulse oximetry monitoring.
- Hypertonic saline is not recommended in the outpatient or emergency department setting, but may be beneficial in the inpatient setting for patients with expected long LOS.
- NGTs are a safe alternative to IV fluids in infants with bronchiolitis requiring rehydration or who are unable to PO feed.
Order Set Use:
• Use of the order set improves compliance with the pathway.
• Also assists with tracking of quality metrics

Several items are preselected in the order set including:
• Communication for discharge readiness
  • Provides guidelines for RNs for when a patient may be considered discharge ready
• Appropriate isolation orders
Use of Order Set

Order Set Use:

- IV fluids and analgesics are available to order as needed.
- The only preselected respiratory medication is sodium chloride nasal drops.
  - Supports the AAP guidelines for avoiding routine use of albuterol and racemic epinephrine.
Quality Metrics

- Percentage of eligible patients treated per pathway by order set usage
- Percentage of patients without CXR ordered (ED and inpatient separately)
- Percentage of patients without viral testing ordered in ED (excluding influenza)
- Percentage of patients without albuterol ordered (ED and inpatient separately)
- Total number of bronchodilator doses used in the ED and/or inpatient settings
- Percentage of patients with inpatient discharge summary sent to PCP with evidence based bronchiolitis management/AAP Bronchiolitis clinical guideline
- Average LOS ED (minutes), inpatient (days)
Pathway Contacts

- Ilana Waynik, MD
  - Pediatric Hospital Medicine
- Eric Hoppa, MD
  - Pediatric Emergency Medicine
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About Connecticut Children’s Clinical Pathways Program

Clinical pathways guide the management of patients to optimize consistent use of evidence-based practice. Clinical pathways have been shown to improve guideline adherence and quality outcomes, while decreasing length of stay and cost. Here at Connecticut Children’s, our Clinical Pathways Program aims to deliver evidence-based, high value care to the greatest number of children in a diversity of patient settings. These pathways serve as a guide for providers and do not replace clinical judgment.

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