4:25 – 5:05pm
Bronchiolitis: Getting with the New AAP Guidelines
SPEAKER
Kelly Vasant Sidhpura, MD

Presenter Disclosure Information
The following relationships exist related to this presentation:
► Kelly Vasant Sidhpura, MD: No financial relationships to disclose.

Off-Label/Investigational Discussion
► In accordance with pmiCME policy, faculty have been asked to disclose discussion of unlabeled or unapproved use(s) of drugs or devices during the course of their presentations.

Objectives:
1) Review the pathophysiology of bronchiolitis and its clinical course and complications
2) Identify the new treatment changes in the AAP's bronchiolitis guidelines
3) Examine the evidence based reasoning behind these new treatment guidelines
4) Summarize Palivizumab criteria

Background on Guidelines
Published online October 2014
Published in Pediatrics November 2014
Endorsed by American Academy of Family Physicians (AAFP)
Applies to children 1-23 months

What is Bronchiolitis?
<2 years
Upper respiratory symptoms (eg, rhinorrhea and cough) followed by LRTI w/:
- Inflammation
- Edema and necrosis of epithelial cells lining small airways
- Increased mucus production
- May progress to: tachypnea, wheezing, crackles (rales), use of accessory muscles, and/or nasal flaring
- Edema, excessive mucus, and sloughed epithelial cells → obstruction of small airways and atelectasis

BRONCHIOLITIS: GETTING W/ THE NEW AAP GUIDELINES
Kelly Vasant Sidhpura, MD
Mattel Children's Hospital UCLA
**Microbiology**

- Typically occurs with primary infection or reinfection with a viral pathogen
- RSV most common culprit, followed by rhinovirus (>100 serotypes!)
  - RSV peak incidence: December – March
  - 90% of kids infected w/ RSV in first 2 years of life!
  - Up to 40% have LRTI during initial infection
- Others: parainfluenza virus (1&2 \(\rightarrow\) croup), human metapneumovirus, influenza virus, adenovirus, coronavirus (SARS), and human bocavirus

**Clinical Pearl**

- **Infection with RSV does NOT** grant permanent or long-term immunity!!!
  - Reinfections are common throughout life!

**Clinical Presentation**

- Generally presents with fever (usually ≤38.3°C), cough, and respiratory distress (eg, increased respiratory rate, retractions, wheezing, crackles)
- Often preceded by 1-3 day history of upper respiratory tract symptoms
  - Nasal congestion and/or discharge and mild cough
- LRTI symptoms peak on days 5-7
- Infants with moderate to severe bronchiolitis typically present for medical attention 3-6 days after onset of illness

**Clinical Course**

- Usually self-limited
- Most children who do not require hospitalization recover by 28 days
- In previously healthy infants >6 months who require hospitalization, the average LOS is 3-4 days
  - May be longer in children with bronchiolitis due to RSV and rhinovirus co-infection
- Course may be prolonged in those <6 mos (particularly those <12 weeks) and those with comorbid conditions (eg, bronchopulmonary dysplasia)
  - These children often are severely affected and may require assisted ventilation

**Complications**

- Most previously healthy infants don’t have complications
- Dehydration – hard to hydrate when tachpneic!
- Apnea – esp preemies and <2 mos
- Respiratory failure – esp those w/ comorbidities and <6 weeks
- Secondary bacterial infection – uncommon except otitis media

**Guideline Definitions for Evidence-Based Statements**

<table>
<thead>
<tr>
<th>Evidence Quality</th>
<th>Benefit or Harm</th>
<th>Benefit and Harm Balanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level A: Well designed and conducted trials, metaanalysis, gold standard for populations</td>
<td>Strong Recommendation</td>
<td>Weak Recommendation</td>
</tr>
<tr>
<td>Level B: minor limitations; consistent findings from multiple observational studies</td>
<td>Moderate Recommendation</td>
<td>Weak Recommendation</td>
</tr>
<tr>
<td>Level C: Single or few observational studies w/ inconsistent findings or major limitations</td>
<td>Weak Recommendation</td>
<td>Weak Recommendation</td>
</tr>
<tr>
<td>Level D: Expert opinion, case reports, reasoning from first principles</td>
<td>Weak Recommendation</td>
<td>No recommendation may be made</td>
</tr>
<tr>
<td>Level X: Validating studies cannot be performed, clear benefit or harm</td>
<td>Strong or Moderate Recommendation</td>
<td></td>
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</table>
Guideline Definitions for Evidence-Based Statements

<table>
<thead>
<tr>
<th>Statement</th>
<th>Definition</th>
<th>Implication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong recommendation</td>
<td>Anticipated benefits clearly exceed harms (or vice versa), evidence is excellent or unobtainable</td>
<td>Clinicians should follow unless a clear rationale for alternative approach is present</td>
</tr>
<tr>
<td>Moderate recommendation</td>
<td>Anticipated benefits clearly exceed harms (or vice versa), evidence is good but not excellent (or unobtainable)</td>
<td>Clinicians would be prudent to follow, but should remain alert to new information and patient preferences</td>
</tr>
<tr>
<td>Weak recommendation (based on low quality evidence)</td>
<td>Anticipated benefits clearly exceed harms (or vice versa), but quality of evidence is weak</td>
<td>Clinicians would be prudent to follow, but should remain alert to new information and patient preferences</td>
</tr>
<tr>
<td>Weak recommendation (based on balance of benefits and harms)</td>
<td>Evidence of both benefits and harms that appear similar in magnitude for any available course of action</td>
<td>Clinicians should consider the options in their decision making, but patient preference may have substantial role</td>
</tr>
</tbody>
</table>

The New Guidelines: Diagnosis

- **Key Action Statement 1a-c:**
  - History and physical should dictate your diagnosis of bronchiolitis and your assessment of disease severity
  - Watch out for risk factors of severe disease when coming up with your management plan
  - Once you’ve made your diagnosis, you don’t need radiographs or lab studies
  - Exception: Children who are receiving palivizumab ppx
    - If these kids have RSV, no need to continue further palivizumab ppx as likelihood of 2nd RSV infection in same year is very low

 Risk Factors for Severe Disease

- <12 weeks
- Hx of prematurity
- Cardiopulmonary disease
- Immunodeficiency
- Episodes of previous wheezing
- Congenital and anatomical defects of airway and neurological/neuromuscular disease
  - Not mentioned in guidelines, but should be considered!

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The New Guidelines: Treatment

- **Key Action Statement 2: Don’t use albuterol**
  - Evidence quality: B; strong recommendation
  - 2006 guidelines previously stated ok to trial
  - Most randomized controlled trials have failed to demonstrate a consistent benefit from α- or β-adrenergic agents
  - Do not affect disease resolution, need for hospitalization, or length of stay
  - Potential adverse effects (tachycardia and tremors) and cost of these agents outweigh any potential benefits
  - No well-established way to determine an “objective method of response” to bronchodilators in bronchiolitis

Albuterol

- Cochrane review assessing the impact of bronchodilators on oxygen saturation reported 30 randomized controlled trials involving 1992 infants in 12 countries
  - Conclusion: no benefit in the clinical course of infants with bronchiolitis who received bronchodilators
- Chavasse et al review: β-agonists for children <2 years with recurrent wheezing
  - Conclusion: no clear benefits from the use of β-agonists in this population
**Key Action Statement 3: Don't use epinephrine**
- Evidence quality: B; strong recommendation
- Lack of efficacy compared with placebo
- No improvement in length of stay (inpatient)

A recent Cochrane meta-analysis by Hartling et al. systematically evaluated the evidence on this topic and found no evidence for utility in the inpatient setting.
- They did note epinephrine reduced hospitalizations compared with placebo on the day of the ED visit but not overall.
- Epinephrine has a transient effect and home administration is not routine practice.
- Discharging an infant after observing a response in a monitored setting raises concerns for subsequent progression of illness.

**Key Action Statement 4a-b: Don't use nebulized hypertonic saline in ED, but ok to use if/when admitted**
- Evidence quality: B; moderate recommendation (ED)
- Evidence quality: B; weak recommendation (inpatient)
- Physiologic evidence suggests that hypertonic saline increases mucociliary clearance in both normal and diseased lungs.
- Not been shown to be effective at reducing hospitalization in emergency settings.

**Key Action Statement 5: Don't use corticosteroids**
- Evidence quality: A; strong recommendation
- Cochrane review:
  - 17 trials, 2596 participants
  - Steroids do not significantly reduce hospital admissions when compared with placebo.
  - No evidence of short-term adverse effects of steroids compared with placebo.
  - However, steroids may prolong viral shedding.
### Corticosteroids

- **Canadian Bronchiolitis Epinephrine Steroid Trial**
  - Reduction in hospitalizations 7 days after treatment with combined nebulized epinephrine and oral dexamethasone as compared with placebo
  - However, after adjustment for multiple comparison, relative risk for hospitalization is insignificant
- Other bronchiolitis trials of corticosteroids administered by using fixed simultaneous bronchodilator regimens have not consistently shown benefit
- Therefore, too premature to make recs on combined dexamethasone and epinephrine therapy

- Overall, inadequate evidence to be certain of safety

### The New Guidelines: Treatment

- **Key Action Statement 6a**: Don't have to use supplemental oxygen if O2 sat ≥90%
  - Evidence quality: D; weak recommendation
- **Key Action Statement 6b**: Don't have to use continuous pulse oximetry
  - Evidence quality: C; weak recommendation

### Oxygen

- Oxygen saturation is a poor predictor of respiratory distress
  - O2 saturation has much less impact on respiratory drive than CO2 concentrations in the blood
  - However, it is associated closely with a perceived need for hospitalization in infants with bronchiolitis
  - Implicated as a primary determinant of LOS in bronchiolitis

### Oxygen

- Well understood that acidosis, temperature, and 2,3-diphosphoglycerate influence the oxyhemoglobin dissociation curve
  - But no research to demonstrate how those influences practically affect infants with hypoxemia
- No studies on the effect of short-term, brief periods of hypoxemia such as may be seen in bronchiolitis
- Transient hypoxemia is common in healthy infants
- Travel of healthy children even to moderate altitudes of 1300m results in transient sleep desaturation to an average of 84% with no known adverse consequences

- Children w/ chronic hypoxemia do incur developmental and behavioral problems
  - But kids w/ intermittent hypoxemia from disease such as asthma don't have these problems
Pulse Oximetry

- Not well studied for children admitted with bronchiolitis; may be problematic for children who do not require O2
  - Transient desaturations normal in healthy infants
- Retrospective study: 1 in 4 patients incur unnecessarily prolonged hospitalization as a result of a perceived need for oxygen outside of other symptoms
  - No evidence of benefit was found

- Prone to errors of measurement
  - Probes fall off → inaccurate measurements → alarms
- Alarm fatigue for patient and family
- False reliance on pulse oximetry may lead to less careful monitoring of respiratory status

High-Flow Nasal Cannula

- Improves physiologic measures of respiratory effort
- Can generate continuous positive airway pressure
- Likely reduced work of breathing
- May decrease need for intubation
  - Studies thus far have been small and retrospective
- Promising, but no completed randomized trial of efficacy of high-flow nasal cannula in bronchiolitis

- Key Action Statement 7: Don’t use chest physiotherapy
  - Evidence quality: B; moderate recommendation
  - Bronchiolitis babies at risk for atelectasis:
    - Airway edema
    - Sloughing of airway epithelium into airways
    - Hyperinflation
    - Poorly developed collateral circulation
  - CXRs show subsegmental atelectasis → we think, CPT!

Chest Physiotherapy

- Cochrane review:
  - 9 randomized controlled trials evaluated CPT in hospitalized patients with bronchiolitis
  - No clinical benefit found by using vibration or percussion (5 trials) or passive expiratory techniques (4 trials)
  - Since that review, a study of the passive expiratory technique found a small, but significant reduction in duration of oxygen therapy, but no other benefits.

Suctioning of Nasopharynx

- Frequent practice to remove secretions
- Provides temporary relief of nasal congestion and upper airway obstruction
- Retrospective study: deep suctioning associated with longer LOS in hospitalized infants 2-12 months
  - Also noted that lapses of ≥4 hours in noninvasive, external nasal suctioning were also associated with longer LOS
- Insufficient data to make rec on suctioning, but deep suctioning may not be beneficial
The New Guidelines: Treatment

Key Action Statement 8: Don’t use antibiotics unless there is a concomitant bacterial infection, or a strong suspicion of one
- Evidence quality: B; strong recommendation

The New Guidelines: Nutrition and Hydration

Key Action Statement 9: Administer NG or IV hydration if patient cannot maintain hydration orally
- Evidence quality: X; strong recommendation

The New Guidelines: Prevention

Key Action Statement 10a: Don’t give palivizumab to otherwise healthy babies > 29 weeks, 0 days
- Evidence quality: B; strong recommendation

Key Action Statement 10b: Administer palivizumab during 1st year of life to infants with hemodynamically significant heart disease or chronic lung disease of prematurity
- CLD of prematurity = Born < 32 weeks, 0 days and require > 21% oxygen for at least the first 28 days of life
- Evidence quality: B; moderate recommendation

Key Action Statement 10c: Give a maximum of 5 doses of palivizumab during the RSV season to those infants who qualify in the first year of life
- Evidence quality: B; moderate recommendation

The New Guidelines: Prevention

Key Action Statements 11a-b:
- All people should disinfect hands before and after direct contact with patients, after contact with inanimate objects in the direct vicinity of the patient, and after removing gloves
- All people should use alcohol-based rubs for hand decontamination when caring for children with bronchiolitis
- When alcohol-based rubs are not available, individuals should wash their hands with soap and water
The New Guidelines: Prevention

- **Key Action Statements 12a-b:**
  - Inquire about the exposure of the infant or child to tobacco smoke when completing your assessment
  - Counsel caregivers about exposing the infant or child to environmental tobacco smoke and smoking cessation

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AAP Guidelines in a Nutshell

- Your H&P = diagnosis
  - No need for labs/imaging
  - No albuterol
  - No epinephrine
  - No nebulized hypertonic saline in ED – ok once admitted
  - No corticosteroids
  - Use supplemental O2 only when O2 sat <90%
  - Don't need continuous pulse oximetry
  - No Chest PT
  - No Axa unless concomitant bacterial infection
  - Use palivizumab the right way
  - Educate on prevention

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References

- Gostomski AK, Sribani MB. Bronchodilators for bronchiolitis. Cochrane Database Syst Rev. 2011;6;CD001266
- Roque i Figul M, Gine-Garriga M, Granados Rugelès C, Perrotta C. Chest physiotherapy- oxygen for acute bronchiolitis in paediatric patients between 0 and 24 months old. Cochrane Database Syst Rev. 2012;2;CD004873

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The New Guidelines: Prevention

- **Key Action Statement 13:**
  - Encourage exclusive breastfeeding for at least 6 months to decrease the morbidity of respiratory infections

- **Key Action Statement 14:**
  - Clinicians and nurses should educate personnel and family members on evidence-based diagnosis, treatment, and prevention in bronchiolitis

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References

- Work PM, McDaid GL, Jones AR. Nebulized hypertonic saline for cystic fibrosis. Cochrane Database Syst Rev. 2005;3;CD000506
- Musman GH, Parker MV, Stetler A, Sukkiren H, Brady PF. Suctioning and length of stay in infants hospitalized with bronchiolitis. JAMA Pediatrics. 2015;169(3);414-421