Bronchiolitis-Updated Practice Guidelines of Care

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Disclosure Statement

- I do not have any conflict of interest or will be discussing any off-label product use.
Francois-Marie Arouet (Voltaire)

- Born in Paris on November 21st, 1694
- French Enlightenment writer, historian, and philosopher
- Famous for his attacks on established Catholic Church, and advocated for freedom of religion and separation of church and state
- Author of over 20,000 letters and 2,000 books and pamphlets

“The art of medicine consists in amusing the patient while nature cures the disease”

Outline

- What is Bronchiolitis?
- Epidemiology of Bronchiolitis
- Bronchiolitis and Asthma
- Management of Bronchiolitis
  - Montelukast
  - Antibiotics
  - Bronchodilators
  - HFNC
- Palivizumab
- Clinical Practice Guidelines—Did Clinical Practice Change?
- Seattle Children’s Bronchiolitis Pathway
What is Bronchiolitis?

- Defined as inflammation of the bronchioles and usually precipitated by a viral infection
- Begins with an infection of the cells lining the small lower airways
- Infection results in edema, increased mucus production, cell death
- Clinical presentation includes rhinitis, cough, tachypnea, increased work of breathing (with accessory muscles), and variable wheezing with crackles

What is Bronchiolitis?

Signs of Respiratory Distress in Your Infant

In order to measure breathing trouble in your baby you need to know the amount of "work" or effort your child is using to breathe:

1. Know your baby's normal breathing rate when sleeping. See next page to review charts.
2. Know the important warning signs that show increased work of breathing.
3. Call and speak with your healthcare provider if any of the physical or behavior signs below are present.

What will my baby look like when they are breathing hard?

• Increased breathing rate (see next page)
• Strained looking or more than usual with breathing
• Retractions—skin pulling in around nose and mouth (in neck, above collar bone, under breast bone, between and under ribs)
• Flaring of nostrils
• Head moving back and forth with each breath (head bobbing)
• Nose flaring (sucking, grunting, high-pitched noise when breathing in or out)
• Increased coughing or sneezing
• Nasal—sneezing, sneezing
• Open mouth

What will my baby act like when they are breathing hard?

Epidemiology of Bronchiolitis

• 2014 study examined 5 year trend (2006-2010) in ED visits for bronchiolitis in the United States

Clinical Outcomes and Charges for Emergency Department Services among US Children Presenting to the Emergency Department with Bronchiolitis, 2006-2010

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>P for Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>284,959</td>
<td>291,048</td>
<td>286,980</td>
<td>283,204</td>
<td>286,013</td>
<td></td>
</tr>
<tr>
<td>Admission, % (95% CI)</td>
<td>26 (24-28)</td>
<td>26 (24-27)</td>
<td>25 (22-28)</td>
<td>24 (22-27)</td>
<td>25 (23-28)</td>
<td>0.06</td>
</tr>
<tr>
<td>Mechanical ventilation, % (95% CI)</td>
<td>4 (0-7)</td>
<td>4 (0-7)</td>
<td>4 (0-7)</td>
<td>4 (0-7)</td>
<td>5 (0-8)</td>
<td>0.41</td>
</tr>
<tr>
<td>Length of stay (days), median (IQR)</td>
<td>3 (2-4)</td>
<td>3 (2-4)</td>
<td>3 (2-4)</td>
<td>3 (2-4)</td>
<td>3 (2-4)</td>
<td>0.2</td>
</tr>
<tr>
<td>Overall mortality, % (95% CI)</td>
<td>0.02 (0.01-0.03)</td>
<td>0.01 (0.00-0.02)</td>
<td>0.01 (0.00-0.02)</td>
<td>0.01 (0.00-0.02)</td>
<td>0.01 (0.00-0.02)</td>
<td>0.51</td>
</tr>
<tr>
<td>Charge for ED services per visit, percent of median (95% CI)</td>
<td>$817 ($549-$1,005)</td>
<td>$951 ($722-$1,134)</td>
<td>$933 ($787-$1,051)</td>
<td>$948 ($790-$1,116)</td>
<td>$1035 ($752-$1,147)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Total charges per month, percent of median (95% CI)</td>
<td>$3,177 ($3,033-$3,321)</td>
<td>$3,177 ($3,033-$3,321)</td>
<td>$3,177 ($3,033-$3,321)</td>
<td>$3,177 ($3,033-$3,321)</td>
<td>$3,177 ($3,033-$3,321)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Abbreviations: ED, emergency department; CI, confidence interval; IQR, interquartile range.

Hasegawa et al., PIDJ 2014.
Epidemiology of Bronchiolitis

- Overall decrease in incidence rate of bronchiolitis hospitalizations (17% decrease) between 2000-2009
- However, incidence rate among children from 12 months to 23 months increased by 13%


Epidemiology of Bronchiolitis

- In 2002, estimated 149,900 patients hospitalized with bronchiolitis in the United States
- Total annual cost was $543 million, total hospital charges $1.4 billion


<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Cost (95% CI), $ (Millions)</th>
<th>Mean Cost per Hospitalization (95% CI), $</th>
<th>Mean Cost per d (95% CI), $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronchiolitis as primary diagnosis</td>
<td>390 (321 to 459)</td>
<td>332 (281 to 393)</td>
<td>105 (100.00 to 110.00)</td>
</tr>
<tr>
<td>All bronchiolitisa</td>
<td>543 (439 to 648)</td>
<td>370 (330 to 423)</td>
<td>104 (100.00 to 113)</td>
</tr>
<tr>
<td>By age:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1 y</td>
<td>419 (376 to 461)</td>
<td>357 (340 to 417)</td>
<td>106 (100.00 to 110.00)</td>
</tr>
<tr>
<td>1 y</td>
<td>75 (58 to 91)</td>
<td>314 (265 to 363)</td>
<td>115 (109.00 to 118)</td>
</tr>
<tr>
<td>Excluding codiagnoses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excluding pneumonia</td>
<td>419 (376 to 461)</td>
<td>357 (340 to 417)</td>
<td>106 (100.00 to 110.00)</td>
</tr>
<tr>
<td>Excluding asthma</td>
<td>487 (391 to 582)</td>
<td>381 (339 to 427)</td>
<td>107 (100.00 to 113)</td>
</tr>
<tr>
<td>Excluding pneumonia and asthma</td>
<td>306 (290 to 442)</td>
<td>307 (289 to 379)</td>
<td>105 (100.00 to 111.00)</td>
</tr>
<tr>
<td>With codiagnoses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bronchiolitis and pneumonia</td>
<td>133 (98 to 168)</td>
<td>619 (493 to 749)</td>
<td>116 (110.00 to 125.00)</td>
</tr>
<tr>
<td>Bronchiolitis and asthma</td>
<td>57 (44 to 70)</td>
<td>365 (318 to 413)</td>
<td>115 (105.00 to 125)</td>
</tr>
</tbody>
</table>

a Includes bronchiolitis in any of the 15 diagnostic fields.
**Epidemiology of Bronchiolitis**

*Most common viral illness found in viral bronchiolitis in US is:*

- a) Rhinovirus/enterovirus
- b) Respiratory syncytial virus
- c) Human metapneumovirus (hMPV)
- d) Influenza A
- e) Parainfluenza

Video Answer

**Epidemiology of Bronchiolitis (USA)**

- Described the frequency of viral infection in nasal specimens from children with bronchiolitis at Seattle Children’s Hospital from Oct 2003-Apr 2004
- Used real-time PCR for diagnosis; virus detected in 168 (93%) children

<table>
<thead>
<tr>
<th>Age</th>
<th>RSV</th>
<th>Adenovirus</th>
<th>hMPV</th>
<th>Coronavirus</th>
<th>Parainfluenza</th>
<th>Influenza</th>
<th>No virus-detected</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6 months (n = 83)</td>
<td>70</td>
<td>4 (5)</td>
<td>5 (6)</td>
<td>2 (2)</td>
<td>0 (0)</td>
<td>3 (4)</td>
<td></td>
</tr>
<tr>
<td>≥6 to &lt;12 months (n = 51)</td>
<td>37</td>
<td>11 (22)</td>
<td>7 (14)</td>
<td>3 (6)</td>
<td>6 (12)</td>
<td>0 (0)</td>
<td>3 (6)</td>
</tr>
<tr>
<td>≥12 to &lt;24 months (n = 46)</td>
<td>32</td>
<td>12 (26)</td>
<td>4 (9)</td>
<td>6 (13)</td>
<td>2 (4)</td>
<td>1 (2)</td>
<td>6 (13)</td>
</tr>
<tr>
<td>All ages (n = 180)</td>
<td>139</td>
<td>27 (15)</td>
<td>19 (11)</td>
<td>14 (9)</td>
<td>10 (6)</td>
<td>1 (1)</td>
<td>12 (7)</td>
</tr>
</tbody>
</table>

*Percentages are reflective of pathogens detected within a specific age group; totals will exceed 100% because of co-infections.

Epidemiology of Bronchiolitis (USA)

• Prospective study from 2005-2006 that included 14 Emergency centers around the United States
• Collected nasopharyngeal aspirates, and testing performed by PCR


Epidemiology of Bronchiolitis (Taiwan)

• 113 children with bronchiolitis hospitalized at Chang Gun Children’s Hospital in Taiwan
• Nasopharyngeal aspirates obtained from each case and sent for viral detection

Chen et al., Journal of Microbiology, Immunology and Infection 2014.
Bronchiolitis and Asthma

- Asthma is a Greek word derived from the verb ‘aazein’, meaning to exhale with open mouth or pant
- Best early clinical description offered by Aretaeus of Cappadocia (1st century AD): “If from running, gymnastic exercises or from any other work, the breathing becomes difficult, it is called asthma”
- Symptoms: cough (day and/or night), wheezing, difficulty breathing, chest tightness


Bronchiolitis and Asthma

- 150 infants admitted to hospital within 12 months of birth with RSV bronchiolitis
- Outcomes considered included 12-month prevalence of wheeze and prevalence of doctor-diagnosed asthma at 7-8 years of age

|                    | Non-Atopic |                | RSV | Control | p     | Atopic                  |                | RSV | Control | p     |
|--------------------|-----------|----------------|-----|---------|-------|-------------------------|----------------|-----|---------|-------|------|
| Doctor diagnosed asthma 91 months | 14/34 (41.2%) | 685/4413 (15.1%) | 3.7 (42.9%) | 437/149 (30.0%) | 1.0 |
| Odds ratio (95% CI) | 3.0 (2.0, 5.0) | 1.00 (Ref) | <0.001 | 1.2 (1.5, 1.5) | 1.00 (Ref) |
| Wheezing 68-81 months | 7/34 (20.6%) | 258/4307 (5.9%) | 4.7 (7.1%) | 281/137 (25.3%) | 1.0 |
| Odds ratio (95% CI) | 4.1 (1.8, 9.0) | 1.00 (Ref) | 0.003 | 3.9 (1.6, 17.7) | 1.00 (Ref) |
| Persistent wheeze** | 2/14 (14.3%) | 99/564 (18%) | 2.4 (4.0%) | 110/249 (43.5%) | 1.00 (Ref) |
| Odds ratio (95% CI) | 0.8 (0.2, 3.4) | 1.00 (Ref) | 1.0 | 2.2 (1.5, 15.6) | 1.00 (Ref) |

Henderson J et al., Pediatric Allergy and Immunology 2005.
Bronchiolitis and Asthma

- 259 children followed prospectively from birth to 6 years of age
- With each viral illness (with wheezing), obtained respiratory PCR
- Goal to describe relationship of virus-specific wheezing illnesses to development of asthma

Jackson DJ et al., AJRCCM 2008.

Bronchiolitis Management and Treatment

- A host of medications and treatments have been used in bronchiolitis……
  - Albuterol
  - Antibiotics
  - High flow nasal cannula
  - Hypertonic Saline
  - Montelukast
  - Chest Physiotherapy
  - Steroids
  - Epinephrine
**Bronchiolitis Management and Treatment**

**Montelukast:**

- Cochrane Review included 5 studies with 1,296 total participants <2 years of age hospitalized with bronchiolitis
- Main outcomes were length of hospital stay and clinical severity score (two studies compared montelukast to placebo)
- Results from montelukast vs placebo studies:
  * Hospital stay: mean difference -0.95 days (95% CI -3.08-1.19) (Low quality evidence)
  * Clinical severity score on day 2: mean difference -0.57 (95% CI -2.37-1.23) (Low quality evidence)
  * Clinical severity score on day 3: mean difference 0.17 (95% CI -1.93-2.28)

Liu F et al., Cochrane Database of Systematic Reviews 2015.
# Bronchiolitis Management and Treatment

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Evidence to use Treatment</th>
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## Chest Physiotherapy

- **Upper Lobes Posterior Segments Position #2**

![Chest Physiotherapy Image]
Bronchiolitis Management and Treatment

Chest Physiotherapy:
• 9 clinical trials including 891 children compared chest physiotherapy with no intervention
• 5 trials evaluated vibration/percussion techniques and 4 trials evaluated additional modes of chest physiotherapy
• No differences between groups in:
  - respiratory parameters, oxygen requirements, length of stay or severe side effects

Roque i Figuls M et al., Cochrane Database of Systematic Reviews 2012.

Bronchiolitis Management and Treatment

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Bronchiolitis Management and Treatment

Antibiotics:
- 7 studies included with a total of 824 patients
- 2 studies compared azithromycin with placebo and found no significant difference in length of hospital stay, duration of oxygen requirement, and readmission
- 2 additional studies randomized children to IV ampicillin, oral erythromycin and control and found no difference in symptom measures

Farley R et al., Cochrane Database of Systematic Reviews 2014.

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Bronchiolitis Management and Treatment

Steroids (Inhaled and Systemic):
- 17 randomized trials included in review (9 inpatient, 8 outpatient)
- Overall, 2,596 children <2 years included
- Among inpatients, no difference in length of hospital stay
- Among outpatients, no difference in hospital admission rates at 1-day follow-up and 7-day follow-up

Fernandes RM et al., JAMA 2014.

Bronchiolitis Management and Treatment

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</tbody>
</table>
Bronchiolitis Management and Treatment

Bronchodilators (albuterol, terbutaline):

- Over 30 trials included (N=1,992); 11 inpatient, 10 outpatient
- Outpatient bronchodilator treatment did not reduce the rate of hospitalization (11.9% treatment vs 15.9% placebo)
- Inpatient bronchodilator treatment did not reduce duration of hospitalization
- No change in oxygen saturation between treatment group and placebo

What about epinephrine?

Gudernski AM et al., Cochrane Database of Systematic Reviews 2014.

Bronchiolitis Management and Treatment

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Epinephrine versus placebo for acute viral bronchiolitis</th>
<th>Herning L et al., Cochrane Database of Systematic Reviews 2011.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient population: patients with acute viral bronchiolitis</td>
<td>Intervention: epinephrine versus placebo</td>
<td></td>
</tr>
<tr>
<td>Assessed risk</td>
<td>Relative effect (95% CI)</td>
<td>No. of participants (studies)</td>
</tr>
<tr>
<td>Control</td>
<td>Corresponding risk</td>
<td>Quality of the evidence (GRADE)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admissions at onset or &lt;24 hours (all patients only)</td>
<td>RR 0.87 (0.56 to 1.35)</td>
<td>50th (3 studies)</td>
</tr>
<tr>
<td>Study population</td>
<td></td>
<td>= (very) high</td>
</tr>
<tr>
<td>185 per 1000</td>
<td>124 per 1000 (82 to 165)</td>
<td></td>
</tr>
<tr>
<td>High-risk population</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 per 1000</td>
<td>127 per 1000 (50 to 165)</td>
<td></td>
</tr>
<tr>
<td>Medium-risk population</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admissions overall up to 7 days (inpatients only)</td>
<td>RR 0.81 (0.53 to 1.23)</td>
<td>40th (3 studies)</td>
</tr>
<tr>
<td>Study population</td>
<td></td>
<td>= (very) high</td>
</tr>
<tr>
<td>251 per 1000</td>
<td>262 per 1000 (100 to 265)</td>
<td></td>
</tr>
<tr>
<td>High-risk population</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 per 1000</td>
<td>151 per 1000 (100 to 250)</td>
<td></td>
</tr>
</tbody>
</table>

Hartling L et al., Cochrane Database of Systematic Reviews 2011.
## Bronchiolitis Management and Treatment

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<tr>
<td>Antibiotics</td>
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<td>Not recommended</td>
</tr>
<tr>
<td>Steroids</td>
<td>No evidence</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Bronchodilators (minus Epinephrine)</td>
<td>No evidence</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>Low-moderate quality</td>
<td>Not recommended</td>
</tr>
</tbody>
</table>

## Hypertonic Saline

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Illustrative comparative risks* (95% CI)</th>
<th>Relative effect (95% CI)</th>
<th>Number of participants (studies)</th>
<th>Quality of the evidence (GRADE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of hospital stay (days)</td>
<td>-</td>
<td></td>
<td>508 (6 input trial)</td>
<td>⚫⚫⚫⚫ high</td>
</tr>
<tr>
<td>Clinical severity score (post-treatment at day 3)</td>
<td>-</td>
<td></td>
<td>646 (7 trials: 1 outpatient, 1 high emergency department, 5 inpatient)</td>
<td>⚫⚫⚫⚫ high</td>
</tr>
</tbody>
</table>

*Hypertonic Saline - Zhang L et al., Cochrane Database of Systematic Reviews 2013.
Bronchiolitis Management and Treatment

Results since publication of 2013 Cochrane Review largely Disappointing……

- Single center study from Memphis showed no improvement in clinical severity score, admission rate, or length of stay in the Emergency Department
- Randomized-controlled trial from Cleveland reported more respiratory distress in patients treated with 7% hypertonic saline and no effect on hospitalization rate
- Large, multicenter study from the Netherlands found no differences in length of stay, need for supplemental oxygen, and clinical score in moderate-severe bronchiolitis


Bronchiolitis Management and Treatment

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High Flow Nasal Cannula (HFNC) in Bronchiolitis

• HFNC decreased rate of intubation, work of breathing, and respiratory rate in infants with bronchiolitis (McKiernan, 2010)
• In a RCT (N=72), there was a trend in improving clinical scores in HFNC group over first three hours, but no improvement in time to resolution of respiratory distress (Hathorn, 2014)
• 2014 Cochrane Review concluded there is insufficient evidence to determine effectiveness of HFNC therapy for treating infants with bronchiolitis (Beggs, 2014)

More to Come.....

Suctioning in Bronchiolitis

• Suctioning commonly performed in the hospital for children with bronchiolitis
• Retrospective cohort study (N=740 infants) examined deep vs superficial suctioning and length of stay
• Use of deep suctioning in the first 24 hours after admission and lapses >4 hours between suctioning events associated with longer length of stay

Figure 2. Unadjusted length of stay (LOS) by exposure. Error bars indicate 95% CI.

Mansman-GM et al., JAMA Pediatrics 2013.
Bronchiolitis Management and Treatment

“Oxygen is vitally important in bronchiolitis and there is little convincing evidence that any other therapy is consistently or even occasionally useful”


Bronchiolitis Management and Treatment (NICE Guidelines)

The bottom line

- A diagnosis of bronchiolitis helps parents understand that cough may persist for six weeks or more after acute illness
- Because acute bronchiolitis may become more severe, provide parents with red flag symptoms that should prompt clinical review
- Admission to hospital is for infants who cannot maintain adequate oral hydration or who have severe respiratory distress, apnoea, or hypoxia
- There are no effective treatments and minimal handling with adequate hydration is most important, with supplemental oxygen if needed

Ricei V et al., BMJ 2015.
Palivizumab (Synagis) for RSV Bronchiolitis

- Monoclonal antibody (IgG) against RSV
- In two Phase III clinical trials, palivizumab reduced the risk of hospitalization due to RSV by 45-55%
- Given 1x/month (IM injection) 15mg/kg dose

Guidelines:
1) Infants born before 29 weeks’ gestation
2) Infants with hemodynamically significant heart disease or chronic lung disease of prematurity defined as preterm infants <32 weeks gestation who require >21% oxygen for ≥28 days
3) Administer a maximum of 5 monthly doses (15 mg/kg/dose) during RSV season in first year of life

Has Clinical Practice Changed?

- Previous AAP guidelines on bronchiolitis published in 2006 similarly recommend against the use of bronchodilators, steroids, and antibiotics
- Several studies sought to determine the impact of these guidelines on the treatment of hospitalized patients with bronchiolitis
Has Clinical Practice Changed?

- Study conducted at a large, tertiary pediatric Emergency Department (N=2,929)
- Examined if implementation of 2006 AAP guidelines reduced unnecessary resource utilization and improved the value of care for infants with bronchiolitis (1-12 months old)
- Outcomes included proportion having a chest x-ray, RSV testing, albuterol or antibiotic administration, and total cost of care

Akenroye AT et al., Pediatrics 2014.

<table>
<thead>
<tr>
<th>Primary outcomes</th>
<th>Pre-EBE Utilization and Costs (Adjusted)</th>
<th>Change in Utilization and Costs From Pre to Post EBE (33% GI)</th>
<th>Pre-EBE Trend per Month (33% GI)</th>
<th>Change in Trend per Month From Pre to Post EBE (33% GI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>CXR utilization, %</td>
<td>33</td>
<td>−15 (−11 to −19)*</td>
<td>+0.3 (−0.2 to 0.6)</td>
<td>−0.3 (−1.5 to 0)</td>
</tr>
<tr>
<td>RSV testing, %</td>
<td>35</td>
<td>−11 (−5 to −17)*</td>
<td>+0.2 (−0.5 to 0.1)</td>
<td>−0.2 (−0.5 to 0.1)</td>
</tr>
<tr>
<td>Antibiotics utilization, %</td>
<td>11</td>
<td>−4 (−2 to −6)*</td>
<td>+0.2 (−0.2 to 0.3)</td>
<td>−0.2 (−1 to 0.3)</td>
</tr>
<tr>
<td>Albuterol utilization, %</td>
<td>54</td>
<td>−7 (−2 to −10)*</td>
<td>+0.2 (−0.2 to 0.3)</td>
<td>−0.2 (−1 to 0.3)</td>
</tr>
<tr>
<td>Total cost per patient, $</td>
<td>117</td>
<td>−5 (−15 to −8)*</td>
<td>+3 (−11 to 13)</td>
<td>+3 (−4 to 20)</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>Balancing measures</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admission rate, %</td>
<td>26</td>
<td>+0.8 (−2 to 3)</td>
<td>+0.1 (−0.1 to 0.3)</td>
<td>+0.1 (−0.2 to 0.3)</td>
</tr>
<tr>
<td>Return ED visit rate, %</td>
<td>2</td>
<td>+1.1 (−0.2 to 2.3)</td>
<td>+0.1 (−0.1 to 0.3)</td>
<td>+0.1 (−0.4 to 0.3)</td>
</tr>
<tr>
<td>ED LOS, min</td>
<td>24</td>
<td>−4 (−8 to −0)*</td>
<td>+0.2 (−2.2 to −1.0)</td>
<td>+0.2 (−1.5 to -1.9)</td>
</tr>
</tbody>
</table>

Covariates were adjusted for age, gender, race/ethnicity, oxygen saturation, initial temperature, and disposition. EBE: evidence-based guideline. *Significant P value <0.05 after adjustment for presenting trends and covariates.  
* Trend (slope) ** indicates increasing trend; *** indicates decreasing trend.
* Change in trend indicates a significant difference between the pre-EBE and post-EBE slopes. For instance, the albuterol utilization rate revealed a significant pre-EBE trend. Post-EBE, however, the rate decreased at an additional 0.8% per month.
* No deaths occurred during either period.

Akenroye AT et al., Pediatrics 2014.
Has Clinical Practice Changed?

Bronchiolitis Management Before and After the AAP Guidelines

- Analyzed data on inpatients from the Pediatric Health Information System (PHIS) database from 2004-2012
- 41 pediatric hospitals included with a total of 130,262 patients
- Compared trends in the use of diagnostic and treatment resources before and after the 2006 published guidelines

Parikh K et al., Pediatrics 2014.
Bronchiolitis Pathway

Bronchiolitis v.5.0 Criteria and Respiratory Score

- Executive Summary
- Test Your Knowledge
- Citation Information
- Explanation of Evidence Ratings
- Summary of Version Changes

**Inclusion Criteria**
- Age ≤ 2 years (peak age 0-6 months)
- Visit symptoms associated with increased work of breathing & lower respiratory tract symptoms that may include:
  - Increased work of breathing, persistent cough, feeding difficulty, 
  - Wheezing, rapid shallow respiration, 
  - Fever
- Preterm delivery or age < 12 weeks: Expect a more severe course of illness.

**Exclusion Criteria**
- Cardiac disease impacting baseline respiration
- Anesthetic, history of
- Neurologic disorder
- Immunodeficiency
- Chronic lung disease

Bronchiolitis v.5.0: ED Management

- **Phase 1 (ED)**
  - **Management**
  - Place in high-resistance minimal-creep (MCR) to start therapy
  - Monitor Fio2, pulse oximetry, Pao2, and ECG until stable
  - **Therapies NOT routinely recommended**
    - Albuterol
    - Racemic epinephrine
    - Hypertonic saline
    - Combination medications
    - Corticosteroids
    - Chest physiotherapy
    - Suction

- **Phase 2 (ICU)**
  - **Management**
  - Place in high-resistance, high-flow (HFNC) with high Fio2 to stabilize
  - **Therapies NOT routinely recommended**
    - Albuterol
    - Racemic epinephrine
    - Hypertonic saline
    - Combination medications
    - Corticosteroids
    - Chest physiotherapy
    - Suction

- **Phase 3 (Hospital)**
  - **Management**
  - Place in high-resistance, high-flow (HFNC) with high Fio2 to stabilize
  - **Therapies NOT routinely recommended**
    - Albuterol
    - Racemic epinephrine
    - Hypertonic saline
    - Combination medications
    - Corticosteroids
    - Chest physiotherapy
    - Suction

- **Fate of the Infants**
  - Hospitalized
    - Neonatal intensive care unit (NICU)
  - Discharge
    - Home care

- **Follow-up**
  - Follow-up with healthcare provider
  - Symptom management
  - Symptom monitoring
  - Consider follow-up for symptom management & symptom monitoring

- **Catheter placement**
  - Consider placement of central venous line
  - Symptom control

- **Symptom resolution**
  - Symptom stabilization
  - Symptom management
  - Symptom monitoring

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Conclusions

- Over 150,000 children hospitalized with bronchiolitis in the United States yearly
- (Almost) all medications and treatment strategies not shown to be effective in regards to length of stay and clinical severity scores
- Hypertonic Saline (3%) might have some benefit in decreasing length of stay and day 1 clinical severity score in bronchiolitis
- Oxygen therapy remains ‘gold standard’ for management
References


