Bronchiolitis Pathways and the Evidence

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Objectives

- Describe our best understanding of the role of the following therapeutic regimens in Bronchiolitis:
  - Aerosol Therapy
  - Bronchial Hygiene
  - Corticosteroids
  - Oxygen Therapy
Epidemiology of Bronchiolitis

- One of the most common seasonal admitting diagnosis for children
  - <2 years of age
  - 90% hospitalizations < 12 months
  - Peak incidence 3-6 months
- A disorder characterized by the acute inflammation, edema, and necrosis of epithelial cells in the smaller airways.
- Primary viral origin
  - RSV most common, parainfluenza, adenovirus, influenza, metapneumovirus
Epidemiology cont.

- Seasonal (November – March)
- Self limiting
  - median <12 days
  - Approx. 20% > 21 days
  - Hospitalizations range 2-7 days
- Recurrent wheezing may occur in up to 40% of pts.
- High Risk Groups – prematurity, cardiopulmonary dz, immuno-suppressed
The National Respiratory and Enteric Virus Surveillance System (NREVSS)
Number of Influenza-Associated Pediatric Deaths by Week of Death: 2006-07 season to present

- 2006-07: Number of Deaths Reported = 77
- 2007-08: Number of Deaths Reported = 88
- 2008-09: Number of Deaths Reported = 133
- 2009-10: Number of Deaths Reported = 269

Legend:
- Yellow: 2009 Influenza A (H1N1) Deaths Reported Current Week
- Light Blue: Other Influenza Deaths Reported Current Week
- Magenta: 2009 Influenza A (H1N1) Deaths Reported Previous Weeks
- Green: Other Influenza Deaths Reported Previous Weeks
Pathophysiology

- Terminal airway inflammation
- Airway epithelial shedding
What Works?

What Doesn’t?
Assessment and Diagnosis

- Clinical history and physical exam is basis for diagnosis, not labs or diagnostic tests.
- RSV swab, CXR, cultures, Blood gases have not been shown to be of value in either diagnosis or guiding therapy.\(^1\)\(^-\)\(^3\).
- Preceding URI, rhinorrhea
- Clinical Signs
  - Wheezing
  - Retractions
  - SOB
  - Tachypnea
  - Nasal flaring
  - Color
  - Dehydration
A Multicenter, Randomized, Controlled Trial of Dexamethasone for Bronchiolitis


- Double blind, RCT
- 20 ED’s, 600 infants
- Single dose of 1mg/Kg Dexamethasone
- Respiratory severity score


<table>
<thead>
<tr>
<th>Symptom</th>
<th>Points</th>
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<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Wheezing</td>
<td></td>
</tr>
<tr>
<td>During expiration</td>
<td>None</td>
</tr>
<tr>
<td>During inspiration</td>
<td>None</td>
</tr>
<tr>
<td>No. of involved lung fields</td>
<td>0</td>
</tr>
<tr>
<td>Retractions</td>
<td></td>
</tr>
<tr>
<td>Supraclavicular</td>
<td>None</td>
</tr>
<tr>
<td>Intercostal</td>
<td>None</td>
</tr>
<tr>
<td>Subcostal</td>
<td>None</td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

* Both wheezing and retractions were scored. The total score on the RDAI is the sum of the scores for each row, with a range of 0 to 17; higher scores indicate more severe disease.
Figure 2. Risk Ratios for Hospital Admission.
Epinephrine and Dexamethasone in Children with Bronchiolitis


- Double blind, RCT
- 8 ED’s, 800 infants
- 4 arms (2 neb tx. of epi/placebo, 6 oral doses dex/placebo
- Primary outcome – hosp in 7 days of enrollment
## Grades of Recommendation

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>High quality meta-analysis, multiple RCT, low bias risk</td>
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<tr>
<td><strong>B</strong></td>
<td>High quality systematic review, RCT, case cohort, low bias, high causal probability</td>
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<tr>
<td><strong>C</strong></td>
<td>Well conducted case control/cohort studies, moderate causal probability</td>
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<tr>
<td><strong>D</strong></td>
<td>Non analytic, case report, expert opinion</td>
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* relate to the strength of the evidence on recommendation
Evidenced-Based Practice Guidelines - Review Sources

- American Academy of Pediatrics (AAP)
- Scottish Intercollegiate Guidelines Network (SIGN)
- Cincinnati Children’s Hospital Medical Center EBR-CPG
- Cochrane Database of Systematic Reviews
Aerosolized Bronchodilators should not be routinely used 1-5 (Grade A/B evidence)

- A single trial of racemic epinephrine or albuterol is an option if familial history for allergy, asthma or atopy 1,3 (Grade D, expert opinion).
- Treatments are not continued unless clinical improvement (resp rate, wheezing, accessory muscle use, WOB) within 15 minutes after aerosol 3 (Grade D, expert opinion).
Aerosolized Bronchodilators should not be routinely used...

- The use of albuterol does not shorten length of illness or hospital stay (LOS) \(^1,2,3\) (Grade A).
- If started, treatments should be DC’ed when the child fails to continue to demonstrate pre/post clinical improvement \(^3\) (Grade D, expert opinion).
- If treatments improve the clinical score, treatment frequency should be no more often than Q 4-6 hrs, Q1-3 hr. regimens are not warranted (Grade D, expert opinion).
Analysis 1.5. Comparison 1 Bronchodilator versus placebo, Outcome 5 Duration of hospitalization (inpatients).

Review: Bronchodilators for bronchiolitis

Comparison: 1 Bronchodilator versus placebo

Outcome: 5 Duration of hospitalization (inpatients)

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Bronchodilator</th>
<th>Placebo</th>
<th>Mean Difference</th>
<th>Weight</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chowdhury 1995</td>
<td>67 4.5 (1.4)</td>
<td>22 4.3 (1.1)</td>
<td>0.20 [-0.37, 0.77]</td>
<td></td>
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<tr>
<td>Karadag 2005 - IPR</td>
<td>22 2.91 (1.65)</td>
<td>11 2.48 (1.2)</td>
<td>0.43 [-0.56, 1.42]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Karadag 2005 - SAL</td>
<td>24 2.17 (1.2)</td>
<td>12 2.48 (1.2)</td>
<td>-0.31 [-1.14, 0.52]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patel 2002</td>
<td>51 2.56 (2.25)</td>
<td>48 2.64 (1.96)</td>
<td>-0.08 [-0.91, 0.75]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wang 1992</td>
<td>40 2.7 (1.65)</td>
<td>17 2.9 (1.24)</td>
<td>-0.20 [-0.98, 0.58]</td>
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<tr>
<td><strong>Total (95% CI)</strong></td>
<td><strong>204</strong></td>
<td><strong>110</strong></td>
<td><strong>0.02 [-0.32, 0.36]</strong></td>
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Heterogeneity: Chi² = 2.01, df = 4 (P = 0.73); I² = 0.0%
Test for overall effect: Z = 0.11 (P = 0.91)
Aerosolized Corticosteroids should not be used\textsuperscript{1,2,3} (Grade A/B evidence)

- Inhaled corticosteroids showed no benefit in the acute stage of the disease.
Aerosolized Hypertonic saline (3%) may improve symptoms and ↓LOS 6-8 (Grade B/C evidence)

- Minimal (4) clinical studies
- Meta-analysis, RCT and quasi-RCT methodology.
- 3% Saline concentration via nebulization three/four times-day (Q6-8 hrs).
**Routine Use of chest physiotherapy (CPT) should not be used** \(^1-3,9\) 
(Grade A/B evidence)

- No clinical benefit was found with either vibration and percussion techniques.
Nasopharyngeal suctioning should be used to clear secretions in infants hospitalized with acute bronchiolitis who exhibit respiratory distress due to nasal obstruction\(^1\)-\(^3\) (Grade \(D\) evidence – expert opinion).

- No clinical trials assessing the benefit of nasal suctioning.
- No evidence to support routine “deep” suctioning to the lower pharynx or larynx.
Oxygen is indicated if SpO2 levels persistently fall < 90% in previously healthy infants \(^1, 3, 10\) (Grade D evidence – expert opinion).

- Continuous measurement of SpO2 is not routinely needed and may prolong LOS.
- Intermittent SpO2 may be sufficient to assess oxygenation status.
- Before delivering O2 therapy, the infant’s nose and mouth should be suctioned.
The Sandman and Lung Volume

- REM induces airway muscle relaxation
  - Upper airway muscles (genioglossus, geniohyoid, pharyngeal and laryngeal abductors) depressed
  - Reduction in chest wall recoil
  - Diaphragmatic placement, movement
- Reduction in lung volumes
  - Vt
  - FRC
- Transient drops in SpO2% by up to 4%
- Transient elevations in PaCO2
References


3. Bronchiolitis Guideline Team, Cincinnati Children’s Hospital Medical Center: Evidenced based clinical practice guideline for medical management of bronchiolitis in infants 1 year of age or less presenting with a first time episode, [Website](http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/bronchiolitis.htm), Guideline 1, pages 1-13, Aug 15, 2005


