Managing Bronchiolitis: Just Stand There or Do Something?
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Case: Emma
- Emma is a 4 month old who is brought to your AM clinic by Mom. She has a 3 day history of rhinorrhea and a 1 day history of cough. She has had no fever and is taking PO well. On exam she appears well hydrated. She has retractions that clear when she coughs and diffuse wheezing on exam. She is breathing faster than normal per Mom. You count her respiratory rate at 50. O2 saturation is 97%.
- Her Mom is very concerned...

...does Emma need a CXR?
A. Yes to help with diagnosis
B. Yes because Mom is so concerned
C. No it is not necessary for diagnosis
D. No the risks outweigh the benefits

Bronchiolitis
- Most common lower respiratory tract infection (LRTI) in infants
- At least 1 in 7 normal infants will develop symptomatic bronchiolitis before age one
- Cardinal pathophysiologic features:
  - Increased mucus production
  - Acute inflammation
  - Edema and necrosis of small airway epithelial cells
  - (Bronchospasm)

Symptoms
- URI
  - Rhinitis, Congestion
- LRI
  - Tachypnea
  - Cough
  - Wheezing
  - Crackles
  - Nasal flaring
  - Accessory muscle use
- Fever in only 30%
- Infants to age 1-2
**Emma has bronchiolitis**

- Clinically consistent with mild presentation
- AAP Bronchiolitis Guidelines for CXR
  
  "Clinicians should diagnose bronchiolitis and assess disease severity on the basis of history and physical examination. Clinicians should not routinely order laboratory and radiologic studies for diagnosis"
- Note: CXR in bronchiolitis is between 20% and 89%

*"Diagnosis and Management of Bronchiolitis" Pediatrics 2006

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**CXR for bronchiolitis?**

- Only 2 films missed by ED had findings of concern without other warning sign (like hypoxia or severe respiratory distress)
- One lobar PNA found by radiologist, not ED (RSV+)
- 31 Children in the study were hospitalized (11%)

Schuh S et al J Peds 2007

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**Schuh et al**

- In this study, 133 bronchiolitis needed to undergo CXR to find one atypical film
- Supported AAP 2006 to avoid CXR for diagnosis
- Supported use of other markers (distress, low pulse ox) to determine need for CXR
- Adjunct study (Yong) cost/CXR: 56$*
- Consider radiation exposure risk

*Yong et al, Pediatric Pulmonology 2009

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**Emma Continued**

- Emma and her mom leave clinic. Later that evening Emma is brought to the emergency department for fast breathing and poor PO intake.
- In the emergency department, she appears well hydrated, RR 55, and her oxygen saturation is 94%. Rest of exam unchanged. She drinks ½ a bottle.
- What would you do next?

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**What would you do?**

A. Oxygen
B. Bronchodilator trial
C. Single dose dexamethasone
D. Suction
E. Observe
2006 AAP guidelines

- Pulse ox < 90% warrants O2
- Consider bronchodilators trial; continue only if documented clinical response
- No routine steroids
- No routine antibiotics
- No routine chest physiotherapy

The bronchodilator story

- Helpful: Schweich et al & Schuh et al improvement in O2 sat and clinical score after 2 albuterol treatments
- Equivocal/not helpful: Klassen et al noted improved clinical scores at 30 minutes – not sustained beyond 1 hour. Gadomski et al saw no benefit Inpatient by Dobson et al saw no benefit
- Meta-analysis (Flores et al) with no change in length of stay

Bronchodilators: 2006

- Rate of bronchodilator use is as high as 70%
- AAP Bronchiolitis Guideline*
  "Bronchodilators should not be used routinely in the management of bronchiolitis A carefully monitored trial...is an option...and should be continued only if there is a documented positive clinical response to the trial using an objective means of evaluation"

* Diagnosis and Management of Bronchiolitis. Pediatrics 2006

Reasons for avoiding

- Pharmacology: infants don’t have well-developed bronchial wall smooth muscle
- Pathophysiology: primary cause of wheezing is not bronchospasm
- Side effects: tachycardia, tremors

Summary of Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Where</th>
<th>#</th>
<th>Bronchodilator Helps?</th>
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<tbody>
<tr>
<td>Schweich</td>
<td>92</td>
<td>OP/ED</td>
<td>&lt;50</td>
<td>Y, Short-term</td>
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<tr>
<td>Schuch</td>
<td>90</td>
<td>OP/ED</td>
<td>&lt;50</td>
<td>Y, Short-term</td>
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<td>OP/ED</td>
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<td>ED</td>
<td>&lt;100</td>
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<tr>
<td>Dobson</td>
<td>98</td>
<td>IP</td>
<td>&lt;100</td>
<td>No</td>
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<tr>
<td>Flores</td>
<td>97</td>
<td>IP</td>
<td>Meta</td>
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<tr>
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<td>06</td>
<td>IP/OP</td>
<td>OK to trial</td>
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<tr>
<td>Cochran</td>
<td>10</td>
<td>IP/OP</td>
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Take home

Cochrane- Gadomski et al 2010:
"Bronchodilators produce small short-term improvements in clinical scores among infants with bronchiolitis treated as outpatients. However, given their high cost, adverse effects and lack of effect on oxygen saturation and other outcomes included in this meta-analysis, bronchodilators cannot be recommended for routine management of first-time wheezers who present with the clinical findings of bronchiolitis, in either inpatient or outpatient settings."
Controversy: hypertonic saline

<table>
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<th>Study</th>
<th>Type</th>
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<th>Prep (vs. NS)</th>
<th>Results</th>
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<td>1 day</td>
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<td>IP</td>
<td>41</td>
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<td>IP</td>
<td>96</td>
<td>3%</td>
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<tr>
<td>Luo 10</td>
<td>IP</td>
<td>93</td>
<td>3%+ alb</td>
<td>1.4 day</td>
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<tr>
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<td>IP</td>
<td>126</td>
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<tr>
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<td>3% or 5%+ epi</td>
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</tr>
<tr>
<td>Sarrell 02</td>
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*Alverson and Ralston, Contemp Peds 2011

Doing it ‘anyway’

While limited data supports many bronchiolitis interventions, there are times providers still might ‘intervene’ or ‘test’

- Parental insistence or need
- Standard of care for location
- Peer/community pressure
- Supervisor preference

Inpatient Network Data

PHM Choosing Wisely

QI Approach

- Consensus
- Measure current
- Define a shared goal (achievable)
- Intervention
- Re-measure
- Modify intervention
Summary Slide

- Current best evidence does not support ordering CXRs for diagnosis of uncomplicated bronchiolitis
- Current best evidence does not support routine use of bronchodilators in bronchiolitis
- Good hand washing and avoiding cigarette smoke are among the best evidence-supported advice we can provide patients
- Changing practice patterns takes time and may be more effective with local consensus, team approaches, and if we commit to ‘Choosing Wisely’

Acknowledgements

- Timothy Kelly MD
- Karen Sun MD
- Brad Monash MD
- Brian Alverson MD

Key References and Resources

- Gadomski AM, Brower M. Bronchodilators for bronchiolitis. Cochrane Database of Systematic Reviews 2010

References and Resources


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- PEM Bronchiolitis Blog pemcincinnati.com
- AAP Section on Hospital Medicine Listserv