Coughing and Wheezing: An Evidence-Based Approach to Asthma, Community Acquired Pneumonia and Bronchiolitis

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Objectives

Asthma
• Differentiate use of dexamethasone in lieu of prednisone
• Recognize need to begin inhaled corticosteroids

Community Acquired Pneumonia
• Recall 1st line antibiotic choice and dosing schedule

Bronchiolitis
• Recognize futility of using albuterol treatments
Asthma
Evidence-Based Guideline
Who is included?

- ≥ 18 months of age
- otherwise healthy
- asthma symptoms
- non-ICU
Key Changes in the ED

• Medication changes
  – Albuterol HFA MDI with spacer
  – Oral Steroid: Dexamethasone instead of Prednisone

• Discharge Criteria
  – Identify the High Risk patient
  – Inhaled Corticosteroid (ICS)
MDI with Spacer

- Initial treatment for patients with Clinical Respiratory Score (CRS) <3
  - 6 puffs with spacer instead of nebulizer treatment
- Goal is to decrease ED length of stay and increase compliance at home
- Will continue to discharge with MDI/spacer NOT neb machines
- Formal teaching of MDI/spacer occurs prior to discharge
  - Modeled at triage with initial admin
Dexamethasone - 2 dose course

- similar efficacy as 5 days of predisone/prednisolone with improved compliance and fewer side effects
- mean decrease in LOS
- using 4 mg tablets of dexamethasone
  - crushing tabs with administration of 1st dose in ED, RX for 2nd dose
  - not enough IV formulation available for number of asthma patients seen
  - crushed tabs being used for single dose for croup in ED
  - Oral concentrate (1 mg/mL) and elixir/solution (0.5 mg/5 mL) each contain 30% alcohol = avoid prescribing
Dex dosing

- **Dosing:**
  - 12 to <15 kg: 8mg and Rx for 8mg second dose
  - 15 to <25 kg: 12mg and Rx for 12mg second dose
  - > to 25 kg: 16mg and Rx for 16mg second dose
- **Consider steroid taper with prednisolone/prednisone if two or more steroids “bursts” in past 30 days**
  - Involve the PCP or Pulmonologist
- **Parenteral:**
  - IV: methylprednisolone
  - IM: dexamethasone
ED Discharge Criteria

• CRS \( \leq 3 \)
• Breathing easy with good air exchange
• \( \text{SpO}_2 \) consistently \( \geq 90\% \) on room air
• Family able to manage patient at home
• Able to maintain \( \text{SpO}_2 \geq 90\% \), work of breathing and respiratory rate through feeding/activity
ED Discharge Criteria: ID the High Risk Patient

- **Chronic influences:**
  - Hospitalized 2 or more times in past 6 months
  - History of past ICU admission/intubation
  - >3 ED visits in past 6 months
  - 2 or more canisters of albuterol in past month

- **Acute influences:**
  - Parent an active smoker
  - History of daily albuterol/oral steroids in days prior to ED

- **Risks trigger admit discussion**
Inhaled Corticosteroid (ICS) at Discharge

• ICS decrease the frequency of acute care visits

• Asthmatics seen in the ER at high risk for future exacerbations, imperative to start preventive care

• Preventive care ideally occurs in outpt setting, but follow-up visits are suboptimal

• NHLBI Asthma 2007 guidelines recommend:
  Consider initiation of an ICS upon ED discharge if child has had one or more courses of oral steroids in past 6 months
ICS at Discharge

Uniform prescribing of ICS at ED discharge
• over the next 30 days...
  - decreased number of ED visits
  - decreased hospital admissions
  - substantial cost-savings

Bottom line:
Your order for dex in the ER prompts Rx for ICS
ICS at Discharge

- Discharged with inhaled corticosteroid
  - Flovent 44mcg 2 puffs bid OR
  - QVAR 40mcg 2 puffs bid
    - Based on Medicaid formulary
    - If patient already on ICS then do not change
- Prescription for one canister with *no* refills
- Patient to follow-up with PCP/specialist for additional medication and further management
Discharge

- Albuterol HFA MDI with spacer
  - 4 puffs QID and q4 hours prn x 2 days, then q4 hours prn

- Dexamethasone
  - second dose to be taken next day

- ICS - if dex given in ER
  - two puffs with spacer twice a day

- Follow up with PCP/Specialist in the next week
  - sooner to ER if needing to use albuterol more often than every 4 hours
Community Acquired Pneumonia (CAP) Evidence-Based Guideline
Definitions

Community Acquired pneumonia (CAP)
• acute infection of the pulmonary parenchyma, acquired outside of a hospital setting

Complicated Pneumonia:
• Parapneumonic effusion is a collection of fluid in the pleural space in association with an underlying pneumonia
• Empyema is the presence of pus in the pleural space. Epidemiology: Occurs in 6-8% of hospitalized children with community-acquired pneumonia

Hospital-acquired pneumonia (HAP) or nosocomial pneumonia
• pneumonia contracted by a patient in a hospital at least 48–72 hours after being admitted. It is thus distinguished from community-acquired pneumonia
Who is included?

- infants and children $\geq 2$ months to 18 years
Who is excluded?

- Immunocompromised
- Cystic Fibrosis
- Infants <2 Months Of Age
- Nosocomially Acquired Pneumonia (>48 Hrs)
- Medically Complex Patients
- Suspected Aspiration
- Multilobar Pneumonia With Consolidation
- Moderate to Severe Effusion, Empyema/Abscess, or Necrosis
Etiologies:

Viral etiologies of CAP have been documented in up to 80% of children younger than 2 years of age

The other 20%...

- *Strep pneumoniae* is still the most common bacterial cause of pneumonia in childhood, especially < 2 years of age
- Others include:
  - *Group A strep*
  - *Staph aureus* (most often treated in the inpatient setting and typically results in complicated pneumonia)
  - *Mycoplasma and chlamydial pneumonia* are more common in school-aged children (> 5yo)
First Steps:

Clinical Exam: Abnormal Auscultatory Findings (Crackles, Decreased Or Abnormal Breath Sounds) Suspicous For Pneumonia

Interventions

- Provide O2 To Keep Sats >90%
- Administer Antipyretics For Temp ≥ 101
- Hydrate With Oral Fluids If Tolerated

Reassess

Does Patient meet discharge criteria?

Discharge:
- Discharge Teaching (Refer To Teaching Sheet)
- Prescription, See Medication Chart if Indicated
- Follow-up With PCP

Consider Chest X-ray² (2View)
Kids Ready to be Discharged:

- We do not recommend CXR or labs for those being discharged from the ED/UC with a diagnosis of Uncomplicated CAP

Discharge:
- Discharge Teaching (Refer To Teaching Sheet)
- Prescription, See Medication Chart If Indicated
- Follow-up With PCP
Next Steps:

Clinical Exam: Abnormal Auscultatory Findings (Crackles, Decreased Or Abnormal Breath Sounds) Suspicious For Pneumonia

Interventions

- Provide O2 To Keep Sats >90%
- Administer Antipyretics For Temp ≥ 101
- Hydrate With Oral Fluids If Tolerated

Reassess

Provide hydration: Oral or Place IV & hydrate with NS

Inadequate Oral Intake/Dehydration

- Yes

Consider Chest X-ray (2View)

- No

Signs & Symptoms of Respiratory Distress

- Yes

- No
Kids Needing to be Admitted:

- Could consider (but are NOT ROUTINE):
  - CBCD
  - Blood culture
  - CRP
  - Viral resp panel (may help assess the role of antiviral therapy and also reduce antibiotic use)
Recommendation/Evidence/Rationale to obtaining a **CXR** at admission:

- **CXR’s** offer valuable information including disease severity and complications that may alter management.

- **Repeat CXR** are **NOT routinely required** in children who recover uneventfully from an episode of uncomplicated CAP:
  - Radiographic resolution often lags clinical improvement.
  - Repeat CXR rarely changes management.
Recommendation/Evidence/Rationale
AGAINST getting a CBC with diff:

• Poor sensitivity and specificity of the WBC count in making the diagnosis of bacterial pneumonia
• Cut-offs are problematic
• Rarely changes clinical management and serves as a potential source of waste/overuse

Table 2  Laboratory findings and combinations of chest radiographic and laboratory findings in 215 children with community acquired pneumonia

<table>
<thead>
<tr>
<th></th>
<th>Total n (%)</th>
<th>Total bacterial n (%)</th>
<th>Exclusively viral n (%)</th>
<th>p Value</th>
<th>Sensitivity (bacterial)</th>
<th>Specificity (bacterial)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC &gt;15.0 x 10⁹/l</td>
<td>102 (47)</td>
<td>64 (48)</td>
<td>38 (47)</td>
<td>NS</td>
<td>0.48</td>
<td>0.53</td>
</tr>
<tr>
<td>ESR &gt;30 mm/h</td>
<td>137 (64)</td>
<td>88 (66)</td>
<td>49 (60)</td>
<td>NS</td>
<td>0.66</td>
<td>0.40</td>
</tr>
<tr>
<td>CRP &lt;20 mg/l</td>
<td>57 (27)</td>
<td>30 (22)</td>
<td>27 (33)</td>
<td>NS</td>
<td>0.33†</td>
<td>0.78†</td>
</tr>
<tr>
<td>CRP &gt;40 mg/l</td>
<td>127 (59)</td>
<td>89 (66)</td>
<td>38 (47)</td>
<td>0.004</td>
<td>0.66</td>
<td>0.53</td>
</tr>
<tr>
<td>CRP &gt;80 mg/l</td>
<td>93 (43)</td>
<td>70 (52)</td>
<td>23 (28)</td>
<td>0.001</td>
<td>0.52</td>
<td>0.72</td>
</tr>
<tr>
<td>&lt;2 years of age</td>
<td>23 (11)</td>
<td>18 (13)</td>
<td>5 (6)</td>
<td>0.003</td>
<td>0.35</td>
<td>0.90</td>
</tr>
<tr>
<td>≥2 years of age</td>
<td>70 (33)</td>
<td>52 (39)</td>
<td>18 (22)</td>
<td>NS</td>
<td>0.63</td>
<td>0.44</td>
</tr>
<tr>
<td>CRP &gt;120 mg/l</td>
<td>60 (28)</td>
<td>48 (36)</td>
<td>12 (15)</td>
<td>0.001</td>
<td>0.36</td>
<td>0.85</td>
</tr>
<tr>
<td>Alveolar infiltrates* + CRP &gt;80 mg/l</td>
<td>80 (37)</td>
<td>62 (46)</td>
<td>18 (22)</td>
<td>0.001</td>
<td>0.46</td>
<td>0.78</td>
</tr>
</tbody>
</table>

WBC=white blood cells; ESR=erythrocyte sedimentation rate; CRP=C reactive protein.
*Includes mixed interstitial and alveolar infiltrates; †sensitivity and specificity for viral pneumonia.
Recommendation/Evidence/Rationale AGAINST getting a Blood culture:

- Most blood cultures obtained from fully immunized children with non-severe pneumonia are sterile

*Would consider in the following situations:
  - If failed first-line antibiotic therapy with focal consolidation
    - One must always take into consideration whether failure is a “true failure” rather than failure secondary to patient with a virus
  - Complicated pneumonia
# Treatment:

## Simple Community Acquired Pneumonia (CAP) Medication Chart

**Patients: 2 Months - 18 Years Of Age With Signs And Symptoms Of Community Acquired Pneumonia (Bacterial)**

<table>
<thead>
<tr>
<th>First Line</th>
<th>IV choice for admitted patients</th>
<th>Dose &amp; Schedule</th>
<th>Max Single Dosage</th>
<th>PO Step Down and/or Discharge Medications</th>
<th>Dose &amp; Schedule</th>
<th>Max Single Dosage</th>
<th>Total Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Ampicillin</strong></td>
<td>75mg/kg q6h</td>
<td>2000mg</td>
<td>Amoxicillin</td>
<td><strong>30mg/kg TID</strong></td>
<td>1000mg</td>
<td>Minimum of 7 days or continue through 48 hours without fever, whichever is longer</td>
</tr>
</tbody>
</table>

**With Penicillin Allergy**

<table>
<thead>
<tr>
<th></th>
<th>Ceftriaxone <strong>OR</strong></th>
<th>75mg/kg q24h</th>
<th>2000mg</th>
<th>Clindamycin</th>
<th>10mg/kg TID</th>
<th>600mg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Levofloxacin <strong>B</strong></td>
<td>&lt;5yo:10mg/kg BID ≥ 5yo:10mg/kg QD</td>
<td>500mg</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**If Failed First Line Therapy**

|            | Ceftriaxone | 75mg/kg q24h | 2000mg | Levofloxacin | <5yo:10mg/kg BID ≥ 5yo:10mg/kg QD | 500mg |

**For Atypical Pathogen Coverage**

|            | Azithromycin | 10mg/kg x 1 then 5mg/kg daily x 4 days | 500mg | Azithromycin | 10mg/kg x 1 then 5mg/kg daily x 4 days | 500mg | 5 days |

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**A** Known susceptibility should be used to guide therapy

**B** For type 1 penicillin allergy defined by urticaria or anaphylaxis.

**C** Verify appropriate dose of antibiotic (per guidelines), compliance, and >48h on regimen. Call SOAP team at 404-225-0011 for questions on outpatient failure. Please note, in some studies, viral etiologies of CAP have been documented in up to 80% of children, especially those < 2 years of age. (IDSA, Byington 2011)

**D** Definition of fully immunized - Up to date for age

**E** If patient on levofloxacin, atypical pathogens are covered and an addition of azithromycin is not needed.
Summary of Treatment Changes:

- AMP/amox is first-line
  - mg/kg and dosing schedule changed
- Ceftriaxone dosing has changed to 75mg/kg
- Oral cephalosporins no longer recommended
- Clindamycin can be used in PCN allergic
- Levofloxacin is step-up PO antibiotic
- Length of treatment 7 days or through 48 hours without a fever (whichever is longer)
CAP Summary:

- Discharged patients with Uncomplicated Community Acquired Pneumonia DON’T NEED: CBCD, CRP, Blood cultures, Viral resp panel or CXR (costly and don’t change management)
- Admitted patients with Uncomplicated Community Acquired Pneumonia (likely due to hypoxia +/- dehydration) NEED a CXR
- >80% of kids with pneumonia < 2yo have viral etiology and will improve w/o antibiotics
CAP Summary:

- Amoxicillin/Ampicillin is first-line antibiotic therapy for suspected bacterial CAP (use Clinda for Type I PCN allergy)
- **DO NOT** use Rocephin unless indicated (see guideline)
- **DO NOT** use oral cephs or azithromycin – TERRIBLE strep pneumo coverage
- Amoxicillin should be dosed TID to get adequate time above the MIC in the lung parenchyma for resistant pneumococci (you can still use BID for the middle ear)
- Mycoplasma is more common > 5yo, and less common < 5yo and some studies have show even if these kids have it they often recover without treatment
Bronchiolitis
Evidence-Based Guideline
Who is included?

0 to 18 months

**If wheezed before OR eczema OR food allergies OR significant family history of asthma, consider use of asthma treatment guidelines**
Treatment and Assessment

• Bulb suctioning

• Degree of respiratory distress
  – Comfortably tachypneic
  – Able to PO

• Oxygen saturation
  – 90% and above
“Just say NO…”

- Say NO to albuterol aerosols
- Say NO to epinephrine aerosols
- Say NO to hypertonic saline aerosols unless hospitalized
- Say NO to steroids
- Say NO to oxygen if saturations > 90%
- Say NO to chest physiotherapy
- Say NO to antibiotics
- Say NO to IV fluids or NG feeds if baby is drinking well
- Say NO to CXR
“Just say YES…”

• Say YES to good hand hygiene
• Say YES to breast feeding
• Say YES to avoidance of smoke exposure
Who to admit?

- Respiratory distress
- Hypoxia
- Poor feeding
- Dehydration
- Consider if high risk of severe disease
  - < 12 weeks of age
  - History of prematurity
  - Early in illness
  - Immunodeficiency
  - Co-morbidities
Questions...

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