Community Acquired Pneumonia: Navigating the new IDSA/PIDS 2011 Guidelines

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Faculty Disclosure Information

In the past 12 months, I have participated in clinical trials of PCV13 with Wyeth/Pfizer.

I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.

Objectives

- Describe the epidemiology, etiology, and clinical features of community acquired pneumonia (CAP) in children
- Discuss the diagnosis, treatment, and prevention of CAP, including CAP complicated by empyema in the outpatient and inpatient settings
- Discuss upcoming national guidelines for pediatric CAP

History

- Pneumonia: The Captain of the Men of Death
  - Sir William Osler (1849-1919)
  - Death due to empyema during the Spanish influenza pandemic

Global causes of child deaths

**Definition of Pediatric CAP**

• CAP is the presence of signs and symptoms of pneumonia in a previously healthy child due to an infection acquired outside of the hospital

• Signs and symptoms
  - Best positive predictive value
    • Nasal flaring (<12 months)
    • Oxygen saturation < 94% (sea level)
    • Tachypnea/retractions
  - Best Negative Predictive Value
    • Absence of tachypnea or other respiratory signs

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**Etiology of Pediatric CAP**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Viral Pathogens</th>
<th>Bacterial Pathogens</th>
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</thead>
<tbody>
<tr>
<td>&lt;3 months</td>
<td>RSV</td>
<td>Streptococcus</td>
</tr>
<tr>
<td>3 months-5 years</td>
<td>Influenza</td>
<td>Moraxella</td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>Adenovirus</td>
<td>Moraxella pneumonia</td>
</tr>
</tbody>
</table>

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**Epidemiology of Pediatric CAP**

• Pneumonia has decreased significantly following the introduction of PCV-7
  - 16.3 cases/100,000 (1998-1999)
  - 8.3 cases/100,000 (2006-2007) *p < 0.001*

• Complicated pneumonia including empyema significantly increased
  - 2.2 cases/100,000 (1997)
  - 5.5/100,000 (2006) *p < 0.001*

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**Association of CAP with Influenza**

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**Association of 2009 Pandemic Influenza (H1N1) Infection and Increased Hospitalization with Parapneumonic Empyema in Children in Utah**

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**RSV, IV (A & B), and hMPV and hospitalizad Parapneumonic Empyema (PPE) at PCMC, Utah, 2009**
Laboratory Diagnosis

Diagnostic Testing: Radiography
- Chest Radiography
  - Routine Chest Radiographs are not necessary for the diagnosis of CAP in children who are well enough to be treated as outpatients
  - Chest Radiographs should be obtained for:
    - All children who will be admitted
    - For children with hypoxia or significant respiratory distress
    - CAP is prolonged or unresponsive to antimicrobials
    - A pleural effusion or empyema is suspected

When to suspect an Empyema
- Prolonged fever or fever that resolved and has now returned
- Chest pain
- Abdominal pain
- Use of ibuprofen
- Use of azythromycin or IM ceftriaxone without improvement
- Recent history of varicella or influenza

Diagnostic Testing: Acute Phase Reactants
- Complete Blood Count
  - not required for those who will be treated in the outpatient setting
  - Should be obtained for children with hypoxia or those who will be admitted
- CRP and procalcitonin
  - Single value may not distinguish between bacterial and viral disease
  - Procalcitonin is more reliable and is predictive of bacteremic pneumonia
    - but less available and more expensive
Diagnostic Testing: Blood Cultures

- Blood cultures should not be performed in non-toxic, immunized children who will be managed as outpatients
  - Positive in < 2% prior to introduction of HiB
  - Positive < 1% after introduction of HiB and PCV-7
- Blood cultures should be performed in children requiring admission for CAP or those who have evidence of empyema
  - Positive in 2%-11% of CAP
  - Positive in 14%-27% CAP complicated by empyema

Rates of Positive Blood Cultures in Utah children with CAP (Byington, CID 2002)
- 11.4% of children admitted for CAP
- 27% of children admitted with empyema

Diagnostic Testing: Viral

- Rapid diagnosis of influenza or RSV is helpful
  - Allows antiviral treatment (influenza)
  - May decrease antibiotic therapy
  - May identify those at HR for admission
  - Allows cohorting of patients if admitted

Antigen Testing and Molecular Diagnosis

- Urinary antigen tests for S. pneumoniae are not recommended for children as false positive tests are common
  - Nasopharyngeal colonization may result in positive tests in 15-35% of children
- Antigen or molecular testing of pleural fluid in cases of complicated pneumonia may help identify pathogens
  - Positive in ~ 70% (antigen) and 80% (PCR)

Concomitant Viral and Bacterial Infections

- Concomitant infections may occur in up to 23% of children hospitalized for pneumonia
- Post-viral bacterial pneumonia is common in children during the influenza season
- Bacterial pneumonia is present in ~ 20% of infants with RSV infection AND respiratory failure resulting in mechanical ventilation

Rapid Influenza Testing

- Problems with rapid influenza testing
  - Rapid Influenza testing by rICA
    - 61% sensitivity during peak of H1N1
    - 56% PPV during peak of H1N1
  - DFA or PCR are preferred tests
Predictive Value of rICA Influenza Testing

Sensitivity and Positive Predictive Value

CAP: Treatment

- Which antibiotic should be offered to a child with CAP in the outpatient setting?
  - Children who are preschool aged (< 5), previously healthy, and immunized should receive amoxicillin to provide coverage for *S. pneumoniae*
    - For PCN allergic clindamycin is preferred
    - Alternatives: Amoxicillin/clavulanate (especially if no HiB) or second or third generation cephalosporin

CAP: Treatment

  - School-aged children should receive the same treatment for *S. pneumoniae*
    - For bilateral non-acute disease consider treatment with macrolide for *Mycoplasma* or *Chlamydia*

CAP: Treatment Duration

  - Treatment courses of 10 days have been studied the most and are effective for most cases of pneumonia
    - There are trials ongoing evaluating shorter courses

Treatment of Complicated CAP

  - Pleural fluid drainage is recommended for all moderate or large effusions
  - Choice of drainage technique depends on local expertise
    - Chest thoracostomy and fibrinolytics
    - Video-assisted thoracoscopic surgery (VATS)
Treatment Complicated CAP

- Complicated pneumonia with empyema or necrosis or pneumonia caused by drug resistant pathogens such as MRSA will require longer treatment courses
  - In general treatment is ~ 4 weeks for empyema with combination of IV agents followed by oral agent(s).

CAP: Prevention

- Palivizumab according to American Academy of Pediatrics (AAP) recommendations
- Influenza vaccine
- Hib vaccine
- PCV-13

PCV13

- S. pneumoniae vaccine
  - PCV13 (PCV7 + 1, 3, 5, 6A, 7F and 19A)
  - PCV13 coverage varies by clinical syndrome
    - Pneumonia with and without empyema- 85%

National Guidelines

- Infectious Disease Society of America (IDSA) and Pediatric Infectious Disease Society (PIDS) collaborating to draft evidence-based guidelines
- Publication expected in Summer 2011
- Endorsed by the American Academy of Pediatrics (AAP)

Questions?