The New PIDS-IDSA Community Acquired Pneumonia Guidelines
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Goal
To review key elements of the IDSA-PIDS CAP Guidelines

Objectives
At the end of this activity participants should be able to:
1. Discuss key elements of the new CAP guidelines as it relates to diagnosis, evaluation and management
2. Appreciate limitations in the evidence behind some recommendations

Background - CAP
World-wide 150 million new cases in children per year
11-20 million hospitalizations
4 million annual deaths
Leading cause of mortality under 5 years of age
WHO, 2004

Why Guidelines
Adult Guidelines (IDSA/ATS)
• Published 2007
• Adherence Decreases mortality and time to clinical stability

Mandell LA et al, CID, 2007
Arnold FW et al, Arch Int Med, 2009
Machabe C et al, Arch Int Med, 2009

The New Pediatric Community Acquired Pneumonia Guidelines – What the General Pediatrician Should Know

Disclosure
I have no relevant financial relationships with the manufacturers(s) of any commercial products(s) and/or provider of commercial services discussed in this CME activity
I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.

John S. Bradley, Carrie L. Byington, Samir S. Shah, Brian Alverson, Edward R. Carter, Christopher Harrison, Sheldon L. Kaplan, Sharon E. Mace, George H. McCracken Jr, Matthew R. Moore, Shawn D. St Peter, Jana A. Stockwell, and Jack T. Swanson
CID, Aug 30, 2011
Overview

52 pages

92 recommendations

Used GRADE to rate recommendations

Strength of recommendation – consensus
  strong or weak

Quality of Evidence – more objective
  high, moderate, low, very low

Diagnosis

Chest Radiograph

Recommend against routine chest radiography for outpatient evaluation of CAP

Recommend against obtaining chest radiography in patients who present with wheezing in the absence of fever and hypoxia

Recommend against routine follow-up chest radiography in patients who recover completely from CAP

Recommend obtaining chest radiography in children with suspected complications, such as effusion; in children with significant respiratory distress; or in children with hypoxia

Recommend obtaining chest radiography in children admitted to the hospital.

CXR

“Gold Standard” for Dx of pneumonia

Significant intra and inter-observer variation in interpretation

Limited correlation with etiology

Poor correlation with clinical criteria

Does not affect clinical outcomes

CXR Virus vs. Bacteria

Virkki et al, Thorax, 2002

Evaluated 254 cases of suspected CAP

Etiology found in 85% of cases

Compared to CXR findings

Results:

Acute and especially inter - 78% bacterial (p=0.001)

Interstitial - 50% bacterial, 50% viral
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CXR and Wheezing

- Multiple studies found that chest x-rays among pediatric patients with wheezing were positive approximately 5% of the time, and impacted clinical management in only about 2% of cases.


Laboratory Testing

- Recommend against routinely obtaining a CBC for children with CAP in the outpatient setting
- Recommend obtaining a CBC for patients with severe pneumonia
- Recommend against measuring inflammatory markers or acute-phase reactants in outpatients or to distinguish between viral and bacterial causes of CAP
- Recommend against obtaining blood cultures in the outpatient setting
- Recommend obtaining blood cultures on patients admitted to the hospital

Laboratory findings

WBC

- Likelihood of bacterial infection increases as WBC surpasses 15,000/mm³
  - Shuttleworth, D., Amer J Dis Child., 1971

- Occult pneumonias in fever and leukocytosis (20,000/mm³)
  - Pre-PCV7 - 15 - 19%
  - Post-PCV7 - 9%
  - Ruttman MS et al, Pediat. Emer. Care, 2009

CRP

- Several conflicting studies
  - Viral vs. Bacterial CAP
  - Typical vs. Atypical CAP

  - Flood et al, PDJJ, 2/2008
    - Meta-analysis of 8 studies
    - 1230 children
    - Pooled incidence of bacterial CAP – 41%
    - CRP concentrations exceeding 4-6 mg/dl has a PPV of 64%

Blood Cultures in CAP

- Outpatient CAP
    - 409 children with radiographic evidence of CAP
    - 2.7% positive
    - No changes in management due to results

- Inpatient CAP
  - Inpatient incidence
    - Juven et al – 1 of 125 (0.8%)
    - Michelow et al – not reported
    - Cecvey-Macherei et al
      - Positive - 2 of 99 (2 %)
      - False + - 3 of 99 (3%)
      - Tsolia et al – 1 of 75 (1.3%)
Blood Cultures Inpatient CAP

Adults

IDSA/ATS guidelines recommends BCx’s for inpatient CAP

Evidence against

Systematic review – 13 studies, > 2700 cultures
ATBx narrowed < 3%
ATBx broadened in less than 1%
False positive cultures matched or exceeded the rate for true positives.
Clinical decisions were almost never made based on blood culture results

Shah et al, PIDJ, 6/2011

Retrospective cohort of BCx cultures obtained in EC on patients with final Dx of pneumonia
291 cultures
2.1% pathogens 1% contaminants
13.6% of patients with complicated pneumonia
Management altered in 5 of 6 patients
Authors do not recommend obtaining cultures on a routine basis in patients with CAP who present to ED

Pathogen specific testing

Test for Mycoplasma pneumoniae in children with signs and symptoms suspicious for this pathogen

Recommend using sensitive and specific rapid tests for influenza and other respiratory viruses in the evaluation of CAP

Recommend against using antibiotics in children who test positive for influenza in the absence of any other signs of bacterial co-infection

“Atypical” Bacteria

M. pneumoniae and C. pneumoniae

Children older than 5 yrs significant burden

Emerging disease in children ≤ 5 yrs
Esposito et al, Eur Resp J 2000
Principi et al, CID, 2001
Esposito et al, CID, 2002
Thurmer et al, Pediatr Pulm, 2003
Michelow et al, Pediatrics, 2004

Atypical bacteria testing

- Esposito et al, CID, 2002
  - 196 children hospitalized with CAP age 2 – 5 years
  - PCR and acute and convalescent serology
  - No difference in clinical, laboratory and radiographic presentation between “typical” pathogens and M. pneumoniae

Management
Outpatient
Recommend against routine use of antimicrobials in pre-school-age children with CAP.
Recommend oral amoxicillin as first-line therapy for outpatient CAP.
Recommend macrolides for school-age children and adolescents with clinical or laboratory evidence of CAP caused by atypical pathogens.
Recommend treatment for influenza early during the course of an illness in which influenza is likely to play a role, especially during the season when widespread circulation of influenza is likely.

Inpatient
Recommend intravenous ampicillin or penicillin G as first-line therapy for patients admitted for CAP who are fully immunized.
Recommend combination therapy with a beta-lactam antibiotic and a macrolide if atypical pathogens are suspected.

Antibiotics – What to use
Etiology
- S. pneumoniae
  - Penicillin resistance increasing
  - TCH – 45% resistant
- Atypical bacteria
  - To treat or not to treat
- Other bacteria
  - H. influenzae, M. catarrhalis

Antibiotics - What to use
- H. influenzae, M. catarrhalis
  - Beta-lactamase producers
  - Evidence behind their role in CAP controversial
    - Indirect evidence - Serology
    - May be “innocent bystanders”
  - All studies sputum, naso/pharyngeal Cx or serology
  - 8 well documented case reports in all of literature
  - Extremely uncommon cause
- Unlikely significant cause

Streptococcus pneumoniae
Is penicillin resistance clinically relevant?
Resistance is due to alterations in penicillin binding proteins
Increasing dose overcomes resistance
Pigman et al, Ped. Inf. Dis. 2003

Multicenter retrospective study of invasive infections caused by S. pneumoniae
2100 children
No difference in outcome due to antibiotic resistance
MIC up to 2.0 microg/ml (interm. resistance)
**Duration**
Recommend 10 days of treatment for uncomplicated, non-severe pneumonia

**Other Recommendations**
US instead of CT for evaluating effusions
VATS or fibrinolytics + thoracostomy for complicated effusions

**Impact**
Will they have the same effect as adult guidelines?

**2006 Pneumonia hospital stays for children only**

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<th>Total number of discharges</th>
<th>LOS days (mean)</th>
<th>In-hospital deaths</th>
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<td>All discharges</td>
<td>167,221</td>
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<td>Age group</td>
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Weighted national estimates for children 0-17 years from HCUP Kids’ Inpatient Database, 2009, Agency for Healthcare Research and Quality (AHRQ)

**Impact**
Antibiotic stewardship
Decrease use of broad spectrum antibiotics
No change in outcomes

Newman RE, Pediatrics, 3/2012
Smith MJ et al, Pediatrics, 5/2012

Thank you