Community-Acquired Pneumonia
and other Respiratory Tract Infections

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Disclosures

none

Case 1

64 year old man presents to the office for the second time in a week with cough productive of yellow sputum, and rhinorrhea that he “just can’t shake”. Mild erythema of the oral mucosa. Lungs clear. He requests antibiotics because he saw an appealing ad on TV.

What do you recommend?

(A) Erythromycin
(B) Doxycycline
(C) Levofoxacin
(D) Azithromycin
(E) Assurance without antibiotics

Acute Bronchitis

• Definition: Upper respiratory infection associated with cough, lasting less than 2-3 weeks.
• Sinus and pharynx symptoms may be present, but do not predominate.

Acute Bronchitis

• Common, seasonal illness
• 70% of cough presentations
• 30-170 cases/100,000 per year
• Generally viral (influenza, adenovirus, rhinovirus, parainfluenza, RSV)
• Generally self-limited (1-2 weeks)
• Seven large randomized, controlled trails and 3 metanalyses show no effect of antimicrobial treatment in general populations
Acute Bronchitis

- Antibiotic Overuse
  - $1.2 billion is spent yearly on unnecessary antibiotics (40% for acute bronchitis)

NCQA, 2005.

Acute Bronchitis

- Who to treat??
  - During documented pertussis outbreaks
  - Chronic bronchitis (M. pneumonia, B. pertussis)
  - Underlying lung disease (asthma, COPD, heavy tobacco use)

  - Macrolide

Case 2

63 year-old woman with diabetes and obesity presents with productive cough for 6 days, fever, dyspnea, and right pleuritic CP.

- No extremis. T=103.5°; BP 118/60; RR 26.
  - Crackles are noted at the right lung base. SaO2 96% on room air.

Should this woman be admitted to a hospital?
A. Yes
B. No
C. Depends on CXR result
D. Depends on the ABG result
E. Need more information

CAP--Epidemiology

- Leading infectious cause of death in the USA
- 4.8 million cases per year in the USA
- 1.3 million hospitalizations per year
- 80,000 deaths per year
  - OP 1-2%
  - IP 10-14%
  - ICU 40%

CAP--Epidemiology

- 3 fold variances in admission rates across the USA, results in large cost differential
  - Average OP cost $264
  - Average IP cost $7500

Health care providers (MD’s, RN’s etc) tend to overestimate mortality
Clinical Diagnosis

• Fever, cough with sputum production, dyspnea with or without pleurisy.

• With rhinorrhea or sore throat, think of another diagnosis.

• Elderly patients: may have few or no respiratory symptoms (e.g. confusion or abdominal pain).

Clinical Diagnosis

• “Atypical pneumonia”:
  – gradual onset
  – lacks mucoid sputum production
  – often associated with extrapulmonary symptoms/signs.

• Clinicians can not accurately distinguish on clinical grounds

How an I.D. doc views pneumonia:

**TABLE 46-1: Common Agents of Acute Pneumonia**

<table>
<thead>
<tr>
<th>Organism</th>
<th>OP (%)</th>
<th>IP (%)</th>
<th>ICU (%)</th>
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<tbody>
<tr>
<td><strong>Viruses</strong></td>
<td></td>
<td></td>
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<tr>
<td>rhinovirus</td>
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<tr>
<td>RSV</td>
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<tr>
<td>metopneumovirus</td>
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<tr>
<td><strong>Bacteria</strong></td>
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<td></td>
<td></td>
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<tr>
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Etiology of CAP (%)

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Webster et al. AFC 2004;8;3-6

Etiology in Children 5-14 years (N=75)

**Virus (65%)**:  
- rhinovirus (40)
- adenovirus (12)
- parainfluenza (8)
- Influenza (7)
- RSV (3)

**Bacteria (40%)**:  
- mycoplasma (35)
- pneumococcus (7)
- chlymidia (3)

**No etiologic diagnosis (23%)**

Tsolia, et al. CID. 2004;39:681-6
Evidence-based Testing

Blood Cultures
- 13% sensitivity
- Track *S. pneumoniae* antimicrobial sensitivity
- Marker for high risk

Chest Radiograph
- Summary: Useful in establishing diagnosis when uncertain. Useful in excluding associated findings, especially in the elderly. Routine for all hospitalized patients and *most* ambulatory patients with suspected pneumonia.
- Tobacco smokers or those 65 years old should get a follow-up CXR in 3-6 months.

Chest Radiograph
- Clearance of CXR
  - age <50 usually clear by 3-4 weeks
  - age >50 usually clear by 8-12 weeks

Gram Stain & Sputum culture

From: [http://textbookofbacteriology.net/S.pneumoniae.html](http://textbookofbacteriology.net/S.pneumoniae.html) (1-15-12)
**Gram Stain & Sputum Culture**

- 30% pneumonia, non-productive
- 14% adequate sputum sample G.S.
- 15-30% prior antibiotic therapy
- 40-60% “negative” culture results

→ Etiology can be established <50% of cases, and
→ Etiologic dx does NOT reduce mortality, LOS, cost
→ Testing can potentially can delay treatment

**Sputum Gram Stain and Culture**

A properly collected and screened (25 PMN, <10 epis/LPF) sputum sample can be useful for evaluating hospitalized patients, but should not delay treatment. This is particularly true for severely ill or immunocompromised patients, or for patients with environmental risk factors.

**Other testing**

- Legionella urinary antigen
- Legionella culture
- PCR for *C pneumoniae* and *M pneumoniae* (nasopharynx swab)
- Pneumococcal urinary antigen
- Pneumococcal sputum PCR

**Risk Stratification in CAP**

- CURB-65
- Pneumonia Severity Index (PSI)

**Risk Stratification in CAP**

- Many prediction models available
- Large retrospective and prospective cohorts demonstrate that medical co-morbidities, age, physical exam findings and laboratory results can predict mortality
- Goal of prediction rules is to identify *low risk patients who may not need hospitalization.*

**CURB-65 Risk Score**

- Confusion
- Urea > 30
- Respiratory rate ≥ 30
- Blood pressure < 90 systolic or diastolic blood pressure < 60
- Age 65 or older
**PORT Study Prediction Rule (PSI)**

- Can patient be cared at home (social)?
- Is patient 50 years old or younger?
- Does the patient lack these comorbid disease?
  - Cancer, CHF, cerebrovascular, renal failure, liver disease
- Are vital signs “stable”?
  - Normal mental status
  - Pulse < 125
  - RR < 30
  - SBP > 90
  - Temp 35°C-40°C
- If all “yes” → **Category I**
- If any “no” → go to point scoring system

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**PORT Study Prediction Rule**

- Admit all patients risk categories IV and V
- Consider short admission for category III
- Admit all patients with hypoxemia (by SaO2<90%; or PaO2<60mm Hg)

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**PORT Validation Results**

- Reduces hospitalization by 26%
- About 10% of non-hospitalized patients will later be hospitalized
- No change in mortality
- Patient satisfaction decreased from 90% → 71%
- Physician satisfaction increased from 50% → 90%

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**Who should go to the ICU?**

- Major criteria:
  - Requires mechanical ventilation or pressors
- Minor criteria (≥3)
  - RR ≥ 30 → WBC < 4000
  - PaO2/FiO2 ration ≤ 250 → Platelets < 100,000
  - Multilobar infiltrate → Temperature < 36°C
  - BUN ≥ 20 → Hypotension requiring IVF

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**30-day Mortality**

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<th>Percentage</th>
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<tr>
<td>I</td>
<td>0.1%</td>
</tr>
<tr>
<td>II (&lt;70)</td>
<td>0.6%</td>
</tr>
<tr>
<td>III (71-90)</td>
<td>0.9%</td>
</tr>
<tr>
<td>IV (91-130)</td>
<td>9.3%</td>
</tr>
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<td>V (&gt;130 pts)</td>
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**CURB-65 Risk Score**

Risk of death or ICU admission:

- 0—0.7%
- 1—3.2%
- 2—13.0%
- 3—17.0%
- 4—41.5%
- 5—57.0%


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Case (continued)

What treatment would you initiate?


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Webster et al. AFC 2004;8;3-6

Beta-lactam activity

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Macrolide activity

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So-so

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2007 ATS/IDSA Treatment Guidelines

- Clinical Infectious Diseases 2007;44:S27–S72
- [http://www.idsociety.org/content.aspx?id=4430#cap](http://www.idsociety.org/content.aspx?id=4430#cap)


Empiric Treatment of Outpatients

Outpatient, healthy:
- advanced macrolide or doxycycline
- Consider recent antibiotics (3 months)

Outpatient, with comorbidities (COPD, DM, RF, CHF, cancer, etoh, steroids):
- advanced macrolide and b-lactam; or
- fluoroquinolone

Treatment of suspected aspiration:
- amoxicillin-clavulanate or clindamycin

Treatment of Influenza with bacterial superinfection:
- b-lactam or fluoroquinolone

Receiving tx in a nursing home
- fluoroquinolone alone, or advanced macrolide plus amoxicillin/clavulanate
Treatment of Inpatients

General Medical Ward:
- fluoroquinolone (alone); or
- advanced macrolide plus b-lactam
- consider recent antibiotic exposure

ICU:
- β-lactam plus either an advanced macrolide or fluoroquinolone
- Consider MRSA treatment

Penicillin allergy:
- fluoroquinolone + clindamycin

When to suspect MRSA ….
- Health care associated
- History of MRSA colonization
- Recent antibiotic exposure
- Sicker than you expect
- Not responding to standard antibiotics
- Rapid recurrence

Pneumonia Quality Indicators

<table>
<thead>
<tr>
<th>PNEUMONIA</th>
<th>NEW QI's &amp; STATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement of O2 sat</td>
<td>Patient satisfaction</td>
</tr>
<tr>
<td>Blood cultures before antibiotics</td>
<td>Disease-specific cost per episode</td>
</tr>
<tr>
<td>Appropriate antibiotics w/in 6 hours of diagnosis</td>
<td>Disease-specific mortality</td>
</tr>
<tr>
<td>Tobacco cessation counseling, if appropriate</td>
<td>Disease-specific readmission rates</td>
</tr>
<tr>
<td>Pneumococcal vaccine before discharge</td>
<td>Percentage Medicare pts</td>
</tr>
<tr>
<td>Influenza vaccine, if approp.</td>
<td>Use of Medical Imaging</td>
</tr>
<tr>
<td>Ventilator associated pneumonia rates</td>
<td></td>
</tr>
</tbody>
</table>

Pneumonia prevention

1. Pneumococcal vaccination
2. Influenza vaccination

23-valent pneumococcal vaccine: Randomized placebo-controlled trial
- Japan; 9 hospitals, 23 nursing homes (N=1006)

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Placebo</th>
<th>RRR</th>
<th>NNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>All PNA</td>
<td>13%</td>
<td>21%</td>
<td>39%</td>
</tr>
<tr>
<td>Pneumoc. PNA</td>
<td>2.8%</td>
<td>7.3%</td>
<td>62%</td>
</tr>
<tr>
<td>Mortality</td>
<td>18%</td>
<td>16%</td>
<td>NS</td>
</tr>
</tbody>
</table>

Pneumococcal vaccine

- Pneumovax
  - 23 valent polysaccharide vaccine
  - 88% of strains causing bacteremia/meningitis
  - 0.5mL IM (25ug of each polysaccharide)
  - 35% effective, pneumonia
  - 75% effective, bacteremia
  - Prevents mortality ??

- Prevnar
  - 7 valent protein conjugated vaccine, rec for children

Pneumococcal vaccine – Who?

- Indications:
  - 65 yo
  - Lung disease, CHF, immunosuppressed, DM, cirrhosis, corticosteroid use, transplantation, asplenia (functional or anatomic), nephrotic syndrome, renal failure, HIV, CSF leaks
  - specific populations (long-tem care, certain native Americans)
  - About 1/3 of 50-64 year olds have an indication

- Revaccinate in 5 years x 1 only if first vaccine was at age < 65, or for asplenia (see recommendations)

Influenza

- Seasonal (Dec-March)
- Epidemic (H1N1)
- Secondary bacterial pneumonias
- H1N1 – pregnant, obese, young

Take Home Points

- PNA and bronchitis are clinical diagnoses
- Bronchitis does not require antibiotics, in almost all cases
- All patients with PNA should have a CXR
- Use (and document) evidence-based triage algorithms
- Consider epidemiology, co-morbidity and recent exposure when choosing antibiotics
- Don’t miss the chance to use hospitalization as an opportunity to vaccinate your patients.
Influenza vaccine – Who?

• Age > 6 months
• Ages 6 months to 8 years require 2 doses, 4 weeks apart

Special considerations:
• Live attenuated (Flumist) – healthy people 2-49 yrs old
• High-dose vaccine (Fluzone) – high risk individuals ≥ 65 yrs old

http://www.cdc.gov/flu/about/qa/vaxsupply.htm