Update in Community-Acquired Pneumonia (CAP)

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No relevant financial disclosures.

Roadmap

- Background
- Etiology
- Clinical Presentation
- Treatment

Multiple choice questions

In 1898, William Osler described community-acquired pneumonia as:

a. An ailment that often leads to suffocation and death.
b. A friend of the aged.
c. A common & mortal disease which can be diagnosed by simple observation and percussion of the chest.
In 1898, William Osler described community-acquired pneumonia as:

a. An ailment that often leads to suffocation and death.

b. **A friend of the aged**

c. A common & mortal disease which can be diagnosed by simple observation and percussion of the chest.


"Pneumonia may well be called the friend of the aged. Taken off by it in an acute, short, not often painful illness, the old man escapes those ‘cold gradations of decay’ so distressing of himself and to his friends."

— William Osler, M.D., 1898

"Brad, pneumonia sucks."
Sources

- Guidelines for Community-Acquired Pneumonia (CAP)
- Key Guidelines from 2007
- IDSA: Infectious Disease Society of America
- ATS: American Thoracic Society
- Updated Literature Review

Caveats

- Practical, nuts and bolts
- Run-of-the-mill community-acquired pneumonia
- Not other types of pneumonia you will see
  - Healthcare-associated pneumonia (HCAP)
  - HIV/AIDS or immunosuppressed
  - Aspiration pneumonia

Definition of Pneumonia(s)

- Community-acquired (CAP): pneumonia acquired outside of hospitals or healthcare setting
- Healthcare-associated pneumonia (HCAP): pneumonia with recent healthcare exposure (hospitalization, SNF, dialysis, antibiotics, etc.)
- Hospital-acquired (HAP): pneumonia acquired > 48-72 hours after admission
- Ventilator-associated (VAP): pneumonia acquired > 48-72 hours after intubation
Community-Acquired Pneumonia

**CAP: Background**

- 5.5 million cases/year in the U.S.
- Sixth leading cause of death
- Associated with morbidity after discharge

A 57 year-old man presents with 2 days of fever, cough productive of thick green sputum, uncontrollable rigors, and shortness of breath. On exam, he is febrile and has focal crackles at the left base. A white blood cell count is 20,000 and the chest x-ray shows a dense left lower lobe consolidation. He is diagnosed with community-acquired pneumonia. Which of the following is an accurate statement about his clinical presentation?

A. This is likely *S. pneumoniae* (or another typical bacteria like *H. flu* or *Moraxella*)
B. This is likely *Mycoplasma pneumoniae* (or other atypical bacteria)
C. This could be either from a typical or an atypical organism

**Roadmap**

- Background
- **Etiology**
- Clinical Presentation
- Treatment
"Typical" vs. "Atypical"

**Typical organisms**
- *S. pneumoniae, H. influenzae, M. catarrhalis, etc.*

**Atypical organisms**
- *M. pneumoniae, C. pneumoniae, Legionella spp, etc.*

Typical vs. Atypical

- Classic teaching is just, well, wrong.
- Some general trends
  - *S. pneumoniae* in older patients, co-morbidities
  - *Mycoplasma* in patients < 50 years old
- No history, exam, laboratory, or radiographic features predict organism
  - "Walking pneumonia"
  - "Classic lobar pneumonia"
A 57 year-old man presents with 2 days of fever, cough productive of thick green sputum, uncontrollable rigors, and shortness of breath. On exam, he is febrile and has focal crackles at the left base. A white blood cell count is 20,000 and the chest x-ray shows a dense left lower lobe consolidation. He is diagnosed with community-acquired pneumonia. Which of the following is an accurate statement about his clinical presentation?

A. This is likely *Strep pneumo* (or another typical bacteria like *H. flu* or *Moraxella*)
B. This is likely *Mycoplasma pneumonieae* (or other atypical bacteria)
C. This could be either from a typical or an atypical organism

---

**Etiology of CAP**

<table>
<thead>
<tr>
<th>Outpatients (mild)</th>
<th>Non-ICU inpatients</th>
<th>ICU inpatient</th>
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**Microbiology of CAP**

Community-Acquired Pneumonia Requiring Hospitalization among U.S. Adults

Community-Acquired Pneumonia

Microbiology of CAP

- Prospective study of 2320 patients with CAP admitted to 5 hospitals
- All extensive diagnostic evaluation
  - Blood cultures, sputum cultures
  - Urine antigen for *S. pneumoniae* and *Legionella*
  - *Chlamydophila, Mycoplasma*
  - Some serologic testing

**Microbiology of CAP**

- Rhinovirus
- Influenza
- *Streptococcus pneumoniae*


**Microbiology of CAP**

- Pathogen detected in less than 40% of patients
  - Real-world ~ 15%

- Many possible explanations
  - Mainly viruses?
  - Inadequate diagnostic testing


**Etiology of CAP**

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<td>Resp. viruses</td>
<td>pneumoniae</td>
</tr>
<tr>
<td><em>S. pneumoniae</em></td>
<td><em>S. pneumoniae</em></td>
<td><em>Legionella</em></td>
</tr>
<tr>
<td><em>M. pneumoniae</em></td>
<td><em>M. pneumoniae</em></td>
<td><em>H. influenzae</em></td>
</tr>
<tr>
<td><em>C. pneumoniae</em></td>
<td><em>C. pneumoniae</em></td>
<td>GNIs</td>
</tr>
<tr>
<td><em>H. influenzae</em></td>
<td><em>H. influenzae</em></td>
<td><em>S. aureus</em></td>
</tr>
<tr>
<td></td>
<td><em>Legionella spp</em></td>
<td>Resp. viruses (?)</td>
</tr>
</tbody>
</table>

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**Emerging CA-MRSA**

- Emerging pathogen, community-acquired MRSA (CA-MRSA) pneumonia
- More than 150 cases in the literature
- Many younger (< 30 years old)
- Often critically ill

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**Roadmap**

- Background
- Etiology
- Clinical Presentation
- Treatment
Community-Acquired Pneumonia

Clinical Presentation: Symptoms

<table>
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<tr>
<th>Symptom</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Cough</td>
<td>90%*</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>66%</td>
</tr>
<tr>
<td>Sputum</td>
<td>66%</td>
</tr>
<tr>
<td>Pleuritic chest pain</td>
<td>50%</td>
</tr>
</tbody>
</table>

* Yet, only 4% of all visits for cough are pneumonia


How does the clinical presentation of community-acquired pneumonia (CAP) differ in geriatric patients (older than 65 years-old) compared to younger patients?

Community-Acquired Pneumonia

Clinical Presentation: Geriatrics

- Less “classic” presentations
  - 10% have NONE of the classic signs or symptoms
- Up to 40% will NOT have fever
- Up to 50% will have altered mental status
- Can be very non-specific

Roadmap

- Background
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- Treatment

Multiple choice questions

Pair Share.

Ebbinghaus’ Forgetting Curve

(How much of something do we forget each day?)
A 72 year-old man with a PMH of HTN and CAD presents to the ED with cough and shortness of breath. Based on the history, exam, and CXR (RML infiltrate), he is diagnosed with community-acquired pneumonia. He is admitted to a regular floor (acute care) bed. What is the appropriate empiric treatment for his CAP?

A. Azithromycin  
B. Levofloxacin  
C. Ceftriaxone and azithromycin  
D. Ceftriaxone and doxycycline  
E. Cefepime and vancomycin  
F. Penicillin G

Etiology of CAP

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</tr>
<tr>
<td>C pneumoniae</td>
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<td>GNRs</td>
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"Atypical" Coverage?

"Atypical" organisms (Mycoplasma, Chlamydia spp, Legionella) are NOT covered by β-lactams (not covered by ceftriaxone)

"Atypical" treatment options:
- Fluoroquinolones (eg. levofloxacin)
- Macrolides (eg. azithromycin)
- Tetracyclines (eg. doxycycline)

All major guidelines recommend coverage for both "typical" and "atypical" organisms
- Six previous well-done observational studies showed mortality benefit to "atypical" coverage
- Six well-done observational studies showing a mortality benefit to "following the guidelines"

Antibiotic Treatment Strategies for Community-Acquired Pneumonia in Adults
"Atypical" Coverage?

- Randomized-controlled trial, > 2200 patients in the Netherlands with CAP
- Randomized to three regimens:
  1) β-lactam (amoxicillin, amox + clavulanate, 3rd-gen ceph.)
  2) β-lactam + macrolide (azithro, clarithro, erythro)
  3) Fluoroquinolone (levo or mox)


Results

- Nearly 35% got antibiotics before admission
- Deviation in ~ 25% of patients

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<th>90-day Mortality</th>
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<td>β-lactam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>β-lactam + macrolide</td>
<td></td>
<td></td>
</tr>
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Update in Hospital Medicine
Results

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<tr>
<td>β-lactam</td>
<td>9.0%</td>
<td>6</td>
</tr>
<tr>
<td>β-lactam + macrolide</td>
<td>11.1%</td>
<td>6</td>
</tr>
<tr>
<td>Fluoroquinolone</td>
<td>8.8%</td>
<td>6</td>
</tr>
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- β-lactam non-inferior to both
- No difference in adverse events

“Atypical” Coverage?

- Randomized-controlled trial, > 2200 patients in the Netherlands with CAP
- Monotherapy with a β-lactam not worse than regimens with atypical coverage
- Generalizability problems
  - Antibiotic choice
  - Microbiology in Europe
  - Antibiotics before admission
  - Length of stay

“Atypical” Coverage?

- For now, all patients with CAP need both “typical” and “atypical” coverage
- Stay tuned for better diagnostic tests
Community-Acquired Pneumonia

Treatment CAP

Community-Acquired Pneumonia

Treatment – Inpatient, Non-ICU

Non-ICU inpatients

- Resp. viruses
- S pneumoniae
- M pneumoniae
- C pneumoniae
- H influenzae
- Legionella spp

Community-Acquired Pneumonia

Treatment Inpatient CAP

Inpatient, non-ICU

<table>
<thead>
<tr>
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<tr>
<td></td>
<td>β-lactam + macrolide OR</td>
</tr>
<tr>
<td></td>
<td>β-lactam + doxycycline**</td>
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** At UCSF, we use ceftriaxone & doxycycline

Community-Acquired Pneumonia
**Doxycycline**

- Similar spectrum to macrolides
- Much cheaper!
- Good side effect profile
- Less *Clostridium difficile* infection
  - Rates 27% lower in hospitalized patients with CAP vs. other regimens


**Treatment Inpatient CAP**

| Inpatient, non-ICU | Fluoroquinolone OR  
|                    | β-lactam + macrolide OR  
|                    | β-lactam + doxycycline**  

** At UCSF, we use ceftriaxone & doxycycline

A 72 year-old man with a PMH of HTN and CAD presents to the ED with cough and shortness of breath. Based on the history, exam, and CXR (RML infiltrate), he is diagnosed with community-acquired pneumonia. He is admitted to a regular floor (acute care) bed. What is the appropriate empiric treatment for his CAP?

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F. Penicillin G
**Treatment – Inpatient, ICU**

ICU inpatient

- *S. pneumoniae* (resistant)
- *Legionella* spp
- *H. influenzae*
- *GNRs*
- *S. aureus* (MRSA)

**Treatment Inpatient CAP**

| Inpatient, non-ICU | Fluoroquinolone OR  
|                   | β-lactam + macrolide OR  
|                   | β-lactam + doxycycline**  
| Inpatient, ICU     | β-lactam + macrolide + vancomycin  
|                   | OR  
|                   | β-lactam + fluoroquinolone + vancomycin  

** At UCSF, we use ceftriaxone & doxycycline

**Treatment of CAP**

- Inpatient, Non-ICU: Ceftriaxone + Doxy
- Inpatient, ICU: Ceftriaxone + Azithromycin + Vancomycin

Uhh, like, Brad, uhh, where’s the Ceftriaxone?
Treatment of CAP

- Cefepime (or piperacillin/tazobactam) should NOT be used for run-of-the-mill CAP
- Ceftriaxone is better against Strep pneumo
- You don’t need the pseudomonal coverage
- You don’t need the anaerobic coverage

Treatment Inpatient CAP

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<td>β-lactam + macrolide + vancomycin OR β-lactam + fluoroquinolone + vancomycin</td>
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** At UCSF, we use ceftriaxone & doxycycline
4. A 67 year-old man with CHF and diabetes is admitted to the hospital with CAP (non-ICU). He is treated with ceftriaxone and doxycycline and does well. The cultures are all negative. On hospital day 3 he is ready for discharge.

What is the optimal duration of total therapy for his CAP?

A. 14 days  
B. 10 days  
C. 7 days  
D. 3 days  
E. Who cares. He probably won't take it anyway.  
I hate my job.
Duration of therapy?

- Meta-analysis of 15 RCTs, 2796 patients with mild to moderate CAP.
- Compared short-course (< 7 days) with longer courses.
- Looked at clinical failure, bacterial eradication, and mortality.

Li JZ. Am J Med. 2007;120:783.

Duration of therapy?

- No difference in clinical failure
- No difference in bacterial eradication
- No difference in mortality
- In subgroup analysis, trend toward favorable efficacy with short-course.

Li JZ. Am J Med. 2007;120:783.

Duration of therapy

- Minimum of 5 days
  - If afebrile for 48-72

  **For most, 7 days total**
**Community Acquired Pneumonia**

**What is the appropriate duration of treatment for her CAP?**

A. Treat her for a total of 2 weeks.
B. Wait, she only got 3 days of IV therapy. She needs to stay in the hospital to get 7 days of IV antibiotics.
C. Treat her for a total of 10 days
D. **Treat her for a total of 7 days.**
E. Who cares. She probably won’t take it anyway. I hate my job.

**Adjunctive Treatment**

- Many other medications have been tried
- Some of the damage done is from inflammation

*Annals of Internal Medicine*

**Corticosteroids in CAP**

- Meta-analysis & systematic review
- Total of 13 studies, 205 patients
- Hospitalized with CAP
- RCTs comparing steroids vs. placebo
## Results

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<td>Length of Stay</td>
<td>-1.0 days (-1.79 to -0.21); p&lt;0.05</td>
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### Corticosteroids in CAP

- Steroids in CAP may say lives
- May lead to less need for ventilation, earlier stability, shorter length of stay
- No difference in side effects

"Probably a real benefit in a subset of patients. We need to figure out which patients, how much, and for how long. Stay tuned." 

Community-Acquired Pneumonia
**Community-Acquired Pneumonia**

**Roadmap**
- Background
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**Take-Home Points**

**Etiology**
Viruses may be the most common cause; can’t tell if “typical” or “atypical” from clinical presentation

**Clinical**
Geriatric patients may not be so “classic” in their presentation

**Treatment**
MUST cover “typical” and “atypical” organisms

**Treatment**
Ceftriaxone + macrolide, ceftriaxone + doxy, or levofloxacin for floor; ceftriaxone + macrolide + vanco for ICU

**Treat for 7 days total**

**More to come on adjunctive steroids**
Community-Acquired Pneumonia

What did you learn today?

Community-Acquired Pneumonia (CAP)

Bradley A. Sharpe, M.D.
Professor of Clinical Medicine
Department of Medicine
UCSF
CURB-65 Score

- Validated severity-of-illness scoring system
  - Retrospective then prospective
- Advocated by the British Thoracic Society
- Based on five easily measurable clinical factors

Lim WS. Thorax 2003; 58:377-82

CURB-65 Score

C – Confusion (disoriented)
U – BUN > 20mg/dL
R – RR > 30/min
B – SBP < 90mmHg or DBP < 60mmHg
65 – Age > 65

Lim WS. Thorax 2003; 58:377-82

CURB65 Score

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<td>0</td>
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</tr>
<tr>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>2</td>
<td>11.0%</td>
</tr>
<tr>
<td>3</td>
<td>15.5%</td>
</tr>
<tr>
<td>4</td>
<td>40.6%</td>
</tr>
<tr>
<td>5</td>
<td>57.0%</td>
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Lim WS. Thorax 2003; 58:377-82
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<tr>
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<td>2.3%</td>
<td>Outpatient</td>
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- **R** – RR > 30/min
- **B** – SBP < 90mmHg or DBP < 60mmHg
- **65** – Age > 65

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