**Pneumonia**

#1 cause of infection related deaths; 6th leading cause of death in US. From 1979-94 rate of death ↑ 59%
600,000 hospital admissions annually –80% treated as outpatients, 18% treated on medical floor, 2% treated in ICU
1:20 people >85 years of age get CAP
Overall mortality 12%;

**Challenges**
- Case identification difficult and not always accurate
- Definitions are problematic
- Signs and symptoms usually do not differentiate bacterial from atypicals
- Treatment must start before cause identified, difficult to standardize

**Guidelines**
- Attempt to reduce variability in care, while increasing efficiency and efficacy
- IDSA recommends empiric antibiotics, and administering antibiotics in <4hrs. Shown to improve outcomes, ↓ mortality both in hospital and @ 30days (Clin Infect Dis 2003;37:1405-33, Arch Intern Med 2004; 164 (6): 637-44)
- PORT (Pneumonia Patient Outcomes Research Team)
  Shown to reliably discriminate need to be hospitalized vs. outpatient treatment
  Shown to↓ hospitalization/resource utilization/cost of care without sacrificing patient care
- JCAHO measure implementation:  1) O₂ assessment  2) Pneumococcal screen and/or vaccine  3) Blood cultures prior to antibiotics  4) Smoking assessment and counseling  5) Antibiotics <4 hrs

**Etiology**
- Suspect anaerobes: Recent dental procedure Sedative overdose/LOC Seizures EtOHism
- Drug resistant risks: Nursing home resident Abx within 90 days Chronic dialysis Home wound care Home infusion therapy Immunosuppressed Hospitalization >2 days in previous 90days

**OUTPATIENTS**

<table>
<thead>
<tr>
<th>Previously well and no antibiotic use within 3 mo</th>
<th>Macrolide (erythromycin, clarithromycin, azithromycin) OR Doxycycline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atypicals (M. pneumo, C. psittaci, Legionella, C. burnetii), S. pneumo, viral</td>
<td></td>
</tr>
<tr>
<td>Comorbidities* or antibiotic use within 3 mo</td>
<td>Respiratory fluoroquinolone (moxifloxacin, levofloxacin gemifloxacin, gatifloxacin) OR Telithromycin</td>
</tr>
<tr>
<td>EtOH: S. pneumo, anaerobes, Klebsiella COPD: H.influenza, M. catharrhalis, S. pneumonia</td>
<td>Beta-lactam (high-dose amoxicillin or amoxicillin potassium clavulanate, cefpodoxime proxetil, cefuroxime, cefprozil, cefdinir) plus macrolide</td>
</tr>
<tr>
<td>IVDU: S. aureas Post CVA: oral flora, S. pneumo Post-obstruction: S. pneumo, anaerobes</td>
<td></td>
</tr>
</tbody>
</table>

**INPATIENTS**

<table>
<thead>
<tr>
<th>General ward</th>
<th>Respiratory fluoroquinolone OR Beta-lactam (cefotaxime sodium, ceftriaxone sodium) plus macrolide (azithromycin, clarithromycin) OR Beta-lactam plus telithromycin OR Beta-lactam plus doxycycline</th>
</tr>
</thead>
</table>

**ICU (Pseudomonas is not an issue)**
Beta-lactam (cefotaxime, ceftriaxone, ampicillin-sulbactam, ertapenem) plus macrolide (azithromycin) OR Beta-lactam plus respiratory fluoroquinolone

**ICU (Pseudomonas is an issue)**
Beta-lactam (pipracillin sodium, ceftipime HCl, imipenem, meropenem) either ciprofloxacin or levofloxacin OR Beta-lactam plus aminoglycoside plus macrolide (azithromycin)

**ICU (S aureus, especially ?CA-MRSA)**
Add linezolid or vancomycin to an appropriate CAP regimen
Comorbidities are chronic obstructive pulmonary disease, diabetes, renal or congestive heart failure, malignancy.


Elderly

- Increasing age may have decreasing focal symptoms (see table below)
- CHF, COPD may mimic
- Elevated risks include older age, swallowing difficulties, sedative meds, comorbidities, poor functional status, inadequate oral care
- 16% due to inadequate oral care alone (Clin Infect Dis 2005; 40 (1):1-6)
- Study in Japan in 11 NH, showed that toothbrushing for 5 min after meals, or OP scrubbed with applicators soaked in 1% povidone iodine, “plaque control prn”, daily denture brushing, and weekly denture cleaning decreased incidence of fever 15% vs. 29%; pneumonia 11% vs. 19%; death 7% vs. 16%. (J Am Geriatr Soc 2002; 50 (3): 430-3)

<table>
<thead>
<tr>
<th>Clinical predictor</th>
<th>Range</th>
<th>Score*</th>
</tr>
</thead>
<tbody>
<tr>
<td>White blood cell count (cells/mm³)</td>
<td>&lt;10,000</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>10,000-14,999</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>&gt;15,000</td>
<td>2</td>
</tr>
<tr>
<td>Respiratory rate (breaths/min)</td>
<td>&lt;30</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>&gt;30</td>
<td>1</td>
</tr>
<tr>
<td>Decreased mental status</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Wheezes</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Acute confusion (delirium)</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Temperature</td>
<td>&lt;38°C (100.4°F)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>&gt;38°C</td>
<td>1</td>
</tr>
<tr>
<td>Rales</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Heart rate (beats/min)</td>
<td>&lt;110</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>110-129</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>&gt;130</td>
<td>2</td>
</tr>
</tbody>
</table>

*The incidence of pneumonia by total score is: 0 equals 24.5%; 1 equals 37.7%; 2 equals 44.4%; 3 equals 55.6%; and 4 or greater equals 69.4%.


“Newer Bugs”

- RSV
  3-10% of older adults with pneumonia; similar in high risk and healthy
  Twice as prevalent as influenza
  Mortality 8% overall; 38% long term care facility and 3% in community
  RSV Ag nasal swab in children, not as sensitive in adults; viral culture or PCR

- HMPV-Human Metapneumovirus
  Discovered in 2001 in children; Hoarseness, cough, congestion, dyspnea, wheeze, fever absent
  3-9% in younger adults, 2-3% in >65yrs
  No diagnostic test, ?PCR; no treatment

- SARS-Severe Acute Respiratory Syndrome (coronavirus)
  Discovered in 2002 in Southern China with 8400 cases worldwide, >900 deaths
  No new cases since outbreak

- Influenza
  Mortality 7%, similar in community and long term care facility populations
  Vaccination may be a future JCAHO measure
Questions

24 yo university student comes to Student Health with 3 day h/o dry hacking cough that was initially non-productive, but now with scant whitish sputum. C/o malaise, HA, fever, myalgias. Roommate has similar symptoms. On exam, temp 39°C, scattered rales in LLL, otherwise wnl.

What is most likely cause? *M. pneumonia*

What other tests can you run to confirm your suspicions of the cause? *Cold agglutinins 30-50%+; acute or convalescent titers*

What is best treatment? *Azithromycin, doxycycline*

55 yo previously healthy, recovering from bronchitis, suddenly develops “shaking chills”, followed by onset of temp to 40°C, pleuritic chest pain, and productive cough with rust-colored sputum. On exam, RR of 30, CXR consolidation in LLL.

What is most likely cause? *S. pneumonia*

What is best treatment? *Levofloxacin, telithromycin*

Most common cause of CAP? *S. pneumonia*

Most likely to complicate influenza pneumonia? *S. pneumonia*

Pneumonia assoc. with HA, myalgias, anorexia, malaise, GI sx, and man made systems for heat/cool? *Legionella*

EtOH associated? *Klebsiella*

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