Approach to Diagnosis, Treatment & Prevention of Bacterial Pneumonia in the Elderly

What is different about this population?
What is different.

- Incidence
- Morbidity/Mortality
- Etiology
- Presentation
- Residents of long term care facilities
Incidence

- Higher incidence in this population
  - 6/1000 for those aged 15-59 years
  - 15.4/1000 for those aged 60-74 years
  - 34.2/1000 for those >= 75 years
- Elderly account for 50% of all diagnosed pneumonias

Upshot: Expect to see more pneumonia in our elderly patient population

Jokinen et al Am J Epidemiology 1993
Morbidity and Mortality

- Fifth leading cause of death in the US and an estimated 60,000 seniors die annually
- 44,000 hospitalizations in Canada for pneumonia/influenza for those >= 65 (1997)
- Recovery is prolonged

Upshot: early identification important
Etiology

- Microbiology similar to CAP in younger persons
  - Streptococcus pneumoniae (20-60%)
  - Chlamydia pneumoniae (16-28%)
  - Haemophilus influenzae (7-11%)
  - Other gram negative (1-3%)
  - Staphylococcus aureus (0-7%) - higher in LTC
  - Mixed aerobe/anaerobe pathogens (5%) - aspiration

- Aspiration as a cause much higher in this population

Upshot: treatment similar to CAP in younger age group. Consider aspiration as cause.
Clinical presentation of pneumonia in the elderly is atypical and more subtle when compared to younger age group.

Fever is absent in 30-50% of frail elderly with significant bacterial infections.
- temp of 38.3 has sensitivity of only 40% in this age group
- If threshold lowered to 37.8 sensitivity increases to 40% and specificity stays same (90%)

Symptoms can be different in the elderly
- Delirium, worsening of chronic confusion or falls might be indication of bacterial infection
Older patients with pneumonia complain of fewer symptoms than younger patients when compared to 18-44 age group

- Ages 65-74: 2.9 fewer symptoms
- Age >= 75 3.3 fewer symptoms
  - Symptom reduction was most pronounced for headache, myalgia, and anorexia.

Physical finding are less reliable in elderly patients with pneumonia.

- Physical findings consistent with the diagnosis of pneumonia were totally absent in 20-47% of patients (Donowitz et al)

Upshot: we should lower our threshold to investigate for pneumonia in this population.
### Box 2. Signs and symptoms of pneumonia in the elderly\(^{a,b}\) (% in patients >65 years)

**Respiratory symptoms**
- Cough (66%–84%)
- Sputum production (53%–55%)
- Pleuritic chest pain (17%–45%)
- Hemoptysis (3%–13%)
- Dyspnea (70%–82%)

**Non-respiratory symptoms**
- Chills (23%–51%)
- Sweats (45%–55%)
- Fatigue (84%–88%)
- Abdominal pain (18%)
- Anorexia (57%–64%)
- Altered mental status (11%–45%)
- Myalgia (8%–23%)

**Findings on physical examination**
- Fever (40%–78%)
- Tachypnea (65%–68%)
- Tachycardia (37%–40%)
- Rales (77%–84%)

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\(^{a}\) Adapted from Refs. [14,17–20,22,23].

\(^{b}\) Values of patients ≥65 years of age.
LTC homes

- Differences noted for pneumonia in the elderly are exaggerated for the elderly in LTC homes
  - Even higher incidence
  - Higher morbidity and mortality
  - Presentations even more subtle and atypical

- Microbiology of nursing home acquired pneumonia (NHAP) similar to CAP.
  - Higher incidence of aspiration seen in this population
  - NHAP more similar to CAP than nosocomial pneumonia
Increased Risk Factors for LTC residents

- Frail, older patients with altered presentation
- Increased risk factors
  - Individual
    - Older age – OR 1.7 per 10 years age
    - Male – OR 1.9
    - Swallowing – OR 2.0
    - Inability take oral medications – OR 8.3
    - Immobility OR 2.6

(Loeb et al. Arch Int Med 1999 159 2058-2064)
Diagnosing Pneumonia in the LTC Setting

Making the diagnosis

- A respiratory rate of > 25 breaths per minute has a sensitivity of 90% and a specificity of 95% for the diagnosis of pneumonia.

- A temperature of 37.8°C or greater is both a sensitive and specific predictor of infection (positive predictive value of 55% in nursing home residents).

- Evidence of acute pneumonia i.e. new infiltrate is present in 75% to 90% of CXRs done in LTC.

### Assessing the Probability of Pneumonia in LTC

<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>≥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>≥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>≥130</td>
<td>2</td>
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</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%.
Alberta Clinical Practice Guidelines for Nursing Home Acquired Pneumonia

http://www.topalbertadoctors.org/TOP/
Diagnosis of Pneumonia in LTC
Alberta Clinical Practice Guideline for NHAP, Revised 2007

- Gold standard - chest x-ray with compatible clinical signs
- If chest x-ray unavailable diagnosis based on having:
  - Tachypnea
  - AND at least one of:
    - Fever \( \geq 37.8 \)
    - New productive cough
    - Pleuritic chest pain
    - New or increased rales, ronchi, wheezes, bronchial breath sounds
    - New onset delirium and/or decreased level of consciousness
    - New or worsening hypoxemia
    - Dyspnea
    - Tachycardia
Assessment

Assess appropriate level of care and personal directives

Review vital signs

Oxygen therapy is indicated for hypoxemia

Antibiotic therapy should be initiated within 4 to 8 hours of diagnosis and prior to transfer

Ensure adequate hydration
Empiric therapy of NHAP

- Should always cover likely pathogens such as *S pneumoniae*, *H influenzae*, *M catarrhalis*, and *C pneumoniae*

- Occurring within 4 days of hospitalization in patients without severe comorbidities or exposure to antibiotics need not encompass *P. aeruginosa* or potentially resistant pathogens
Patient treated in LTC

Alberta Clinical Practice Guideline for NHAP, Revised Jan 2005

- Oxygenation if available
- Administer antibiotics as soon as possible
  - Amoxicillin 500mg PO tid
    +/-
    **Macrolide** (eg Azithromycin 500mg PO 1st day then 250mg PO daily for 4 days) or **Doxycycline** (200mg PO 1st day then 100mg PO daily)
  or
  - Cefuroxime 500mg PO bid
    +/-
    **Macrolide** (eg Azithromycin 500mg PO 1st day then 250mg PO daily for 4 days) or **Doxycycline** (200mg PO 1st day then 100mg PO daily)
  Or
  - Cefotaxine 1g IM q8H plus Macrolide
  Or
  - Quinolone (Levoloxacin 500mg IV/PO daily)
### Pneumonia – Long-Term Care: Mild to Moderate

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>FIRST LINE</th>
<th>Alternative Treatment</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>S. pneumoniae</em></td>
<td>Amoxicillin</td>
<td>Amoxicillin/Clavulanate</td>
<td>1 g TID or 875 mg BID</td>
</tr>
<tr>
<td><em>H. influenzae</em></td>
<td></td>
<td>Cefuroxime-AX</td>
<td>500 mg BID</td>
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<tr>
<td>Gram -ve bacilli</td>
<td></td>
<td>Cefprozil</td>
<td>500 mg BID</td>
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<tr>
<td><em>S. aureus</em></td>
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<td></td>
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<tr>
<td><em>Legionella spp.</em></td>
<td></td>
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<tr>
<td><em>C. pneumoniae</em></td>
<td>ANY ONE of the beta-lactam agents</td>
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<tr>
<td></td>
<td>above PLUS ONE of the following</td>
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<tr>
<td></td>
<td>Clarithromycin</td>
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<td>$1</td>
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<tr>
<td></td>
<td>500 mg BID or 1000 mg (extended</td>
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<tr>
<td></td>
<td>release) once daily</td>
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<tr>
<td></td>
<td>Azithromycin</td>
<td></td>
<td>$1</td>
</tr>
<tr>
<td></td>
<td>500 mg daily on first day</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>then 250 mg daily x 4 days</td>
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<tr>
<td></td>
<td>Doxycycline</td>
<td></td>
<td>$1</td>
</tr>
<tr>
<td></td>
<td>100 mg BID first day then</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>100 mg once daily</td>
<td></td>
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<tr>
<td></td>
<td>OR any ONE of the following:</td>
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<td></td>
<td>Levofloxacin</td>
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<td>$2</td>
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<td></td>
<td>750 mg once daily x 5 days</td>
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<tr>
<td></td>
<td>Moxifloxacin</td>
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<tr>
<td></td>
<td>400 mg once daily</td>
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</tbody>
</table>
COMMENTS

1. Duration of antibiotic therapy is 10 days
2. Amoxicillin retains the best coverage of all oral beta-lactams against *S. pneumoniae*, even intermediate strains.
3. If patient unable to tolerate oral medication use IM.
4. Consider adding a macrolide or doxycycline if there is underlying pulmonary disease:
   - Azithromycin 500mg PO 1st day then 250mg PO daily for 4 days
   - Clarithromycin 500mg PO bid
   - Erythromycin 500mg PO qid

*Note: For other erythromycin formulations give at least 1 gram per day (preferably 2 grams)*
In the nursing home setting, the care team needs to be involved in daily assessments to alert the physician to significant changes in patient status:

- Mobility
- Hydration: 1 litre/day
- Nutrition: weight loss of >5-10% is related to increased morbidity (Significant weight loss in the nursing home >5% in 30 days or >10% in 6 months)
- Review medication profile and consider holding or adjusting dosage where appropriate:
  - psychoactive drugs, including hypnotic
  - sedative drugs
  - cardiovascular drugs
- Review antibiotic treatments at 48 to 72 hours for evidence of response to therapy:
  - temperature stabilization
  - lower respiratory rate
Transfer to Acute Care

Alberta Clinical Practice Guideline for NHAP, Revised 2007

Should be considered in the following circumstances:

- Respiratory distress (e.g. respiratory rate over 40)
- Tachycardia (pulse over 125)
- CHF
- Systolic BP less than 90mmHg
- Signs of impending homodynamic instability
- Signs of respiratory failure
- Reduced level of consciousness
- Clinical judgment of the attending physician at any time
- Level of acuity that cannot be managed at the facility
- Limited capacity to support the illness at the facility e.g. oxygen not available.
Prevention

Alberta Clinical Practice Guideline for NHAP, Revised 2007

- Smoking cessation and avoidance of environmental tobacco smoke. Smoking is the strongest independent risk factor for invasive pneumococcal disease in adults.
- Limit the spread of viral infections (e.g., hand washing). Hand washing can prevent up to 80% of the most common infectious diseases (mostly viral) which may predispose to pneumonia.
- Minimizing of transmission risk (attention to cohorting and staff mixing).
- Oral hygiene.
- Influenza vaccine is recommended annually.
- Pneumococcal vaccine is recommended for all nursing home patients.
- Rehabilitation (occupational therapy and/or physiotherapy) and nutritional programs where appropriate.
Reduction in invasive pneumococcal disease in older adults after the introduction of the conjugated pneumococcal vaccine in children

* Pneumococcal conjugate vaccine (protects against 7 pneumococcal types; in use since 2000).