

1.

## Pneumonia

**Pneumonia**

Community- and hospital-  
acquired pneumonia

Michael Barza, MD

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2.

## Routes of Infection

**Routes of Infection**

- **Inhalation**
  - Usual route in healthy, younger outpatients
  - Viruses and “atypical” agents
- **Aspiration**
  - Especially in elderly, debilitated
  - Most bacterial pneumonias
- **Hematogenous**
  - Rare

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3. Pulmonary Defenses

Defense	Impaired by
<u>Nonspecific defenses</u>	
Gag reflex	Alcohol, stroke, coma
Mucociliary elevator	Alcohol, virus, smoking, Kartegener's syndrome
Alveolar macrophage	Alcohol, virus, smoking, pulmonary edema, steroids
<u>Immune defenses</u>	
Humoral	Ig deficiencies
Cell-mediated	Hodgkin's, steroids, HIV

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4. Causes of Pneumonia

Causes of Pneumonia	
<ul style="list-style-type: none"><li>● <u>Healthy, younger</u><ul style="list-style-type: none"><li>– S. pneumoniae</li><li>– Viruses (influenza)</li><li>– “Atypicals”<ul style="list-style-type: none"><li>● M. pneumoniae</li><li>● C. pneumoniae</li><li>● Legionella</li></ul></li></ul></li></ul>	<ul style="list-style-type: none"><li>● <u>Debilitated, elderly</u><ul style="list-style-type: none"><li>– S. pneumoniae</li><li>– Gram-negative enterics</li><li>– S. aureus</li></ul></li></ul> <p>Viruses and “atypicals”</p>

R/O TB; PCP

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5. Pathogenesis of Pneumonia

## Pathogenesis of Pneumonia

Setting	Pathogens	Host factors	Route of infn	Microbial factors
Community	Influenza A M. pneumoniae	Healthy, not immune	Inhalation	Adhesins
Pneumo-coccal	S. pneumoniae	Healthy, not immune N-P colonization ?viral infn	Aspiration	Capsule
Hospital	Gram-neg bacilli	Debilitated ↓ Clearance N-P colonization	Aspiration	None

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6. Diagnosis of Pneumonia

- ## Diagnosis of Pneumonia
- **Clinical**
    - Cough, fever, sputum, pleuritic chest pain
  - **X-ray**
    - Distinguishes pneumonia from bronchitis
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7. Diagnosis of Cause

## Diagnosis of Cause

- Sputum gram-stain, culture
  - Controversial utility (“good” vs “poor” sputum)
  - Only 1/3 of patients have “good” sputum
- Blood culture
  - Positive in only 10%
  - Usually for *S. pneumoniae*

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8. Additional Tests for Cause

## Additional Tests for Cause

Infection	Tests
TB	AFB smear of sputum
Legionnaire's disease	Special stains and cultures of sputum Urinary antigen test (64% sensitive)
Pneumococcus	Urinary antigen test
Influenza	Antigen detection (throat swab) – 80% sensitive

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9.

## SARS

A blue slide with the title "SARS" in large white letters. Below the title is a bulleted list of clinical features and treatment. The text is white on a blue background.

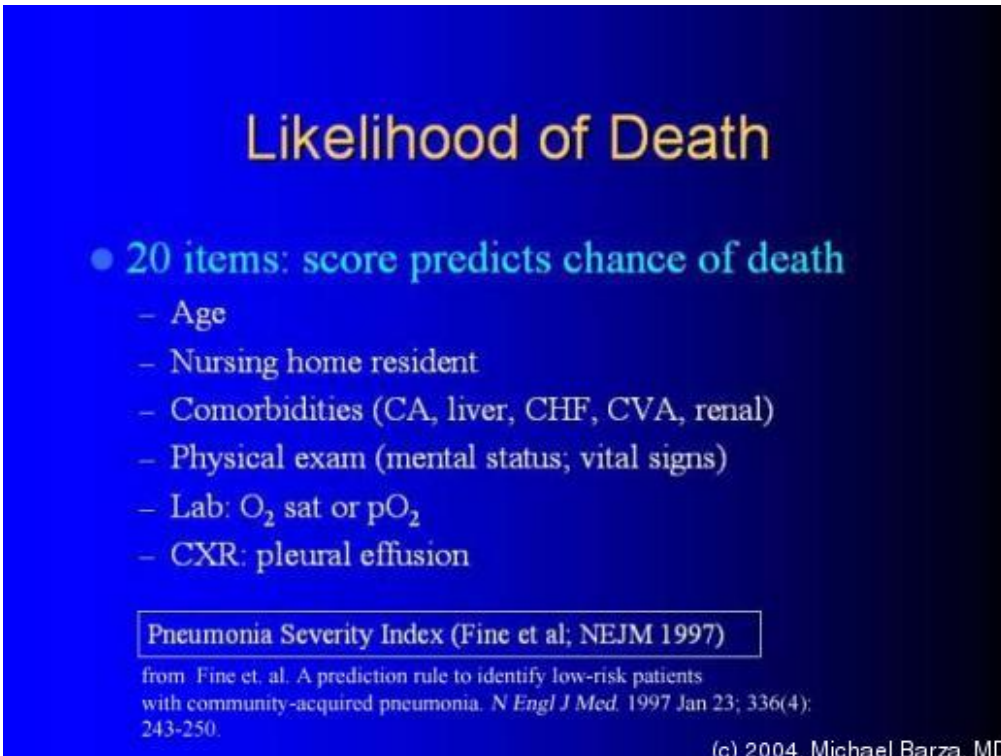
### SARS

- Prodrome: fever, chills, myalgias, diarrhea
- Consolidating lower lobe pneumonia
- Labs: Lymphopenia; +/- thrombocytopenia, increased LDH
- Main clue: known exposure
- Rx: None proven. Avoid ribavirin

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10.

## Likelihood of Death

A blue slide with the title "Likelihood of Death" in large white letters. Below the title is a bulleted list of 20 items that predict the chance of death. The text is white on a blue background.

### Likelihood of Death

- 20 items: score predicts chance of death
  - Age
  - Nursing home resident
  - Comorbidities (CA, liver, CHF, CVA, renal)
  - Physical exam (mental status; vital signs)
  - Lab: O<sub>2</sub> sat or pO<sub>2</sub>
  - CXR: pleural effusion

**Pneumonia Severity Index (Fine et al; NEJM 1997)**  
from Fine et. al. A prediction rule to identify low-risk patients with community-acquired pneumonia. *N Engl J Med.* 1997 Jan 23; 336(4): 243-250.

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11. The “Atypical” Pneumonias

## The “Atypical” Pneumonias

- No clinical or laboratory features reliably distinguish from “typical” (pneumococcal)
- Suggestive findings
  - Little sputum (“sputum-less”)
  - Not “consolidating” (CXR, auscultation)
  - Poor response to beta-lactams

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12. Chlamydiae

## Chlamydiae

<i>C. trachomatis</i>	<i>C. psittaci</i>	<i>C. pneumoniae</i>
Trachoma	Psittacosis (birds)	Bronchitis, pneumonia
STDs (NGU, PID, LGV)		
Inclusion conjunctivitis		
Neonatal pneumonia		

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13. Treatment of CAP

## Treatment of CAP

- Outpatient
  - Macrolide (younger)
  - Quinolone (elderly)
  - Doxycycline
- Inpatient
  - $\beta$ -lactam + macrolide  
OR
  - Fluoroquinolone

Macrolides and quinolones active vs. "atypicals"  
Fluoroquinolones active vs. pen-resistant pneumococci and gram-negatives

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14. Prevention of CAP

## Prevention of CAP

- **Influenza immunization (annually)**
  - Especially in elderly and those with heart, lung or metabolic disease
- **Pneumococcal immunization (once)**
  - Similar target groups
  - May repeat after 5 years in certain populations

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15. Pneumonia in Immunosuppressed

**Pneumonia in Immunosuppressed**

Parasites	Pneumocystis carinii
Fungi	Cryptococcus Aspergillus Endemic fungi
Bacteria	Mycobacteria Legionella Nocardia
Viruses	Cytomegalovirus

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16. Nosocomial Pneumonia

**Nosocomial Pneumonia**

- The most frequently fatal nosocomial infection
- Contributes to 15% of deaths in hospital

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17.

## Risk Factors

**Risk Factors**

- Intubation
- Abdominal surgery
- Old age
- Immunosuppression



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18.

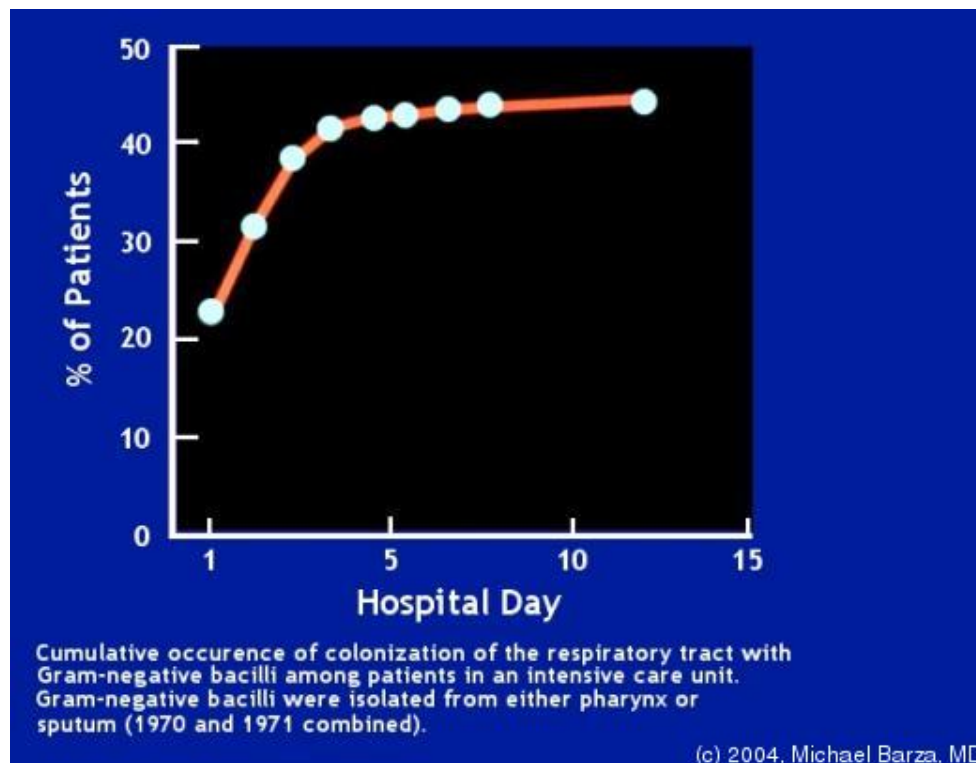
## Pathogens in Nosocomial Pneumonia

**Pathogens in Nosocomial Pneumonia**

- Gram-negatives in > 50%
  - *P. aeruginosa* in ICU, recent antibiotics
- *S. aureus*, *S. pneumoniae* in 1-30%

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19. Percent of Patients/Hospital Day



20. Empiric Treatment

## Empiric Treatment

- Broad-spectrum  $\beta$ -lactam, e.g.
  - E.g. pip-tazo, ceftazidime, imipenem
  - If high risk for *P. aeruginosa*, add aminoglycoside
- Penicillin-allergic patient
  - Vancomycin or clinda + quinolone or aztreonam or gentamicin

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21. Prevention of Nosocomial Pneumonia

**Prevention of Nosocomial Pneumonia**

- **Topical or systemic antibiotic prophylaxis**
  - NO! Does not affect mortality or ICU days
  - May lead to resistant organisms
- **Sucralfate vs H<sub>2</sub> blockers/antacids**
  - ? Preserves gastric acidity barrier vs microbes
  - No significant benefit vs pneumonia
- **Semirecumbent position**
  - Beneficial

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22. Key Points (1)

**Key Points (1)**

- **Pneumonias in healthy young people--inhalation of bacteria with adhesins, e.g. viruses, “atypicals”**
- **Pneumonias in elderly, debilitated--aspiration of gram-negs from pharynx**
- **Most pneumonias treated empirically**
  - Sputum exam, blood cultures often not diagnostic

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23.

### Key Points (2)

**Key Points (2)**

- **Outpatient treatment of CAP**
  - Macrolide; fluoroquinolone; doxycycline
- **Inpatient treatment of CAP**
  - Beta-lactam + macrolide or fluoroquinolone alone
- **Treatment of nosocomial pneumonia**
  - Broad-spectrum beta-lactam +/- aminoglycoside

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24.

### Key Points (3)

**Key Points (3)**

- **Prevention of CAP**
  - Immunize vs influenza and pneumococcus
- **Prevention of nosocomial pneumonia**
  - Semirecumbent position

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