Infectious Diseases and the Internist

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Disclosures

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  – Vical Incorporated

• Consultant
  – Genocea Biosciences

• No discussion of off-label product use
So little time and so many infectious diseases...

Vitruvian Man, Leonardo DaVinci, Circa 1490
http://en.wikipedia.org/wiki/Vitruvian_Man

So little time and so many guidelines...

Despair, Max Kurzweil, 1910
www.1st-art-gallery.com/Max-Kurzweil/Despair.html
Clinically Relevant + Diagnostic and Treatment Challenges = Rationale

Topics

- Acute Rhinosinusitis
- Community Acquired Pneumonia
- HIV
- Bacteriuria
Case 1
A 42 year old women presents to clinic in July with a 3 day history of purulent nasal discharge, facial pain, and fevers. She has no other medical problems and takes no medications. She does not smoke. She reports seasonal allergies but no environmental exposures. She has had 2 sinus infections in the past. Temperature is 102°F. Rhinorrhea with yellow mucous and left maxillary tenderness is noted. Which for the following is the next best step in the care of this patient?

a. Sinus Radiography, occipitomental view 0%
b. Monitor (if symptoms present at 10d, treat with antibiotics) 0%
c. Start antibiotics now 0%
Case 1
The choice is made to treat the patient for acute bacterial rhinosinusitis. Which of the following antibiotics will you prescribe?

A. Levofloxacin 0%
B. Amoxicillin 0%
C. Trimethoprim/sulfamethoxazole 0%
D. Amoxicillin/clavulanate 0%
E. Azithromycin 0%
F. Doxycycline 0%
Case 1 Objectives

• Differentiate between viral and bacterial causes of acute rhinosinusitis

• Choose first-line antibiotics for acute bacterial rhinosinusitis
Acute Rhinosinusitis (AR)

• Inflammation of the nasal mucosa and sinuses of less than 4 weeks duration
  

• 1 in 7 adults report AR in the last 12 months
  

• Direct health costs of AR exceed $3 billion annually
  
Antibiotics and Acute Rhinosinusitis

Diagnostic Dilemma
Viral or Bacterial Acute Rhinosinusitis?

Impractical
Sinus Puncture for Culture

Nonspecific
Diffuse pan sinusitis with mucosal thickening in the anterior sinuses

Clinical Features of Viral URI

- Discharge: Clear → Purulent → Clear
- +/- Fever (present early)
- +/- Constitutional symptoms
- Time Course is Important

Conventional Criteria for diagnosing sinusitis*

- Major Symptoms
  - Purulent anterior nasal discharge
  - Purulent/discolored posterior nasal discharge
  - Nasal congestion or Obstruction
  - Facial congestion or fullness
  - Facial pain or pressure
  - Hyposmia or anosmia
  - Fever (acute only)

- Minor Symptoms
  - Headache
  - Ear pain, pressure, or fullness
  - Halitosis
  - Dental pain
  - Cough
  - Fever (subacute and chronic)
  - Fatigue

*Sinusitis diagnosed based on the presence of 2 Major or 1 Major and ≥ 2 minor symptoms

Acute Bacterial Rhinosinusitis

Onset with persistent symptoms that last ≥ 10 days (not improving)

Severe symptoms for at least 3-4 consecutive days at the beginning of illness (fever to 102, purulent nasal discharge)

Double sickening: viral URI that improves then has acute worsening
Case 1

A 42 year old women presents to clinic in July with a 3 day history of purulent nasal discharge, facial pain, and fevers. She has no other medical problems and takes no medications. She does not smoke. She reports seasonal allergies but no environmental exposures. She has had 2 sinus infections in the past. Temperature is 102°F. Purulent nasal discharge and left maxillary tenderness is noted. Which for the following is the next best step in the care of this patient?

a. Sinus Radiography, occipitomental view
b. Monitor (if symptoms present at day 10, treat with antibiotics)
c. Start antibiotics now
Empiric Antibiotic Therapy for Acute Bacterial Rhinosinusitis

First-line therapy
• Amoxicillin
• Trimethoprim/sulfamethoxazole

Second-line therapy
• 2\textsuperscript{nd} or 3\textsuperscript{rd} Gen Cephalosporin
• Doxycycline
• Macrolide
• Fluoroquinolones
Shifts in Microbiology and Susceptibility

- **S. pneumonia**: Pneumococcal vaccines
  - Less *S. pneumonia*
  - More *H. influenzae*

- **H. influenzae**: High prevalence of β-lactamase-producing respiratory pathogens

- **M. catarrhalis**
  - **S. pyogenes**: Treatment failure with amoxicillin in children with *H. influenzae* ABRS

References:
### Antimicrobial Regimens for Acute Bacterial Rhinosinusitis in Adults

<table>
<thead>
<tr>
<th>Indication</th>
<th>First-line (Daily Dose)</th>
<th>Second-line (Daily Dose)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial empirical therapy</td>
<td>- Amoxicillin-clavulanate (500 mg/125 mg PO tid, or 875 mg/125 mg PO bid)</td>
<td>- Amoxicillin-clavulanate (2000 mg/125 mg PO bid)</td>
</tr>
<tr>
<td>β-lactam allergy</td>
<td>- Doxycycline (100 mg PO bid or 200 mg PO qd)</td>
<td>- Doxycycline (100 mg PO bid or 200 mg PO qd)</td>
</tr>
<tr>
<td></td>
<td>- Levofloxacin (500 mg PO qd)</td>
<td>- Levofloxacin (400 mg PO qd)</td>
</tr>
<tr>
<td></td>
<td>- Moxifloxacin (400 mg PO qd)</td>
<td></td>
</tr>
<tr>
<td>Risk for antibiotic resistance or failed initial therapy</td>
<td>- Amoxicillin-clavulanate (500 mg/125 mg PO bid)</td>
<td></td>
</tr>
<tr>
<td>Severe infection requiring hospitalization</td>
<td>- Amoxicillin-sulbactam (1.5–3 g IV every 6 h)</td>
<td>- Ampicillin-sulbactam (1.5–3 g IV every 6 h)</td>
</tr>
<tr>
<td></td>
<td>- Levofloxacin (500 mg PO or IV qd)</td>
<td>- Levofloxacin (500 mg PO or IV qd)</td>
</tr>
<tr>
<td></td>
<td>- Moxifloxacin (400 mg PO or IV qd)</td>
<td>- Moxifloxacin (400 mg PO or IV qd)</td>
</tr>
<tr>
<td></td>
<td>- Ceftriaxone (1–2 g IV every 12–24 h)</td>
<td>- Cefotaxime (2 g IV every 4–6 h)</td>
</tr>
</tbody>
</table>

Abbreviations: bid, twice daily; IV, intravenously; PO, orally; qd, daily; tid, 3 times a day.

Case 1 (Q2)

The choice is made to treat the patient for acute bacterial rhinosinusitis. Which of the following antibiotics will you prescribe?

A. Levofloxacin
B. Amoxicillin
C. Trimethoprim/sulfamethoxazole
D. Amoxicillin/clavulanate
E. Azithromycin
F. Doxycycline
Case 2

A 68 year old male with a history of hypertension, hyperlipidemia, and osteoarthritis presents with a 2 day history of fevers and a productive cough. He has not received antibiotics for any reason in the last 12 months. Temperature is 101.0°F, blood pressure is 135/85, heart rate is 102 beats per minute, respiratory rate is 18 and oxygen saturation on room air is 95%. He has no smoking history. On examination, mental status is normal, there are rales and increased vocal fremitus in the right lower lung field. Portable chest radiograph confirms a right lower lobe PNA. Basic metabolic panel is normal. Creatinine is 1.0 and BUN is 12. Where and with what antibiotic would you initially treat this patient?
Case 2

A. Outpatient with oral Azithromycin 0%
B. Outpatient with high dose oral Amoxicillin and oral Azithromycin 0%
C. Inpatient with oral Levofloxacin 0%
D. Inpatient with intravenous Ceftriaxone and oral Azithromycin 0%
E. Inpatient with intravenous Vancomycin and intravenous Piperacillin/Tazobactam 0%
Case 2 Objectives

• Present useful tools to help decide upon the optimal site for treatment of Community Acquired Pneumonia

• Choose antibiotics for the treatment of Community Acquired Pneumonia
Community Acquired Pneumonia (CAP)

- Infection of the lung parenchyma acquired outside of hospitals or healthcare facilities

- 9th leading cause of death in the U.S., 2010
  

- Despite antibiotic availability, mortality has not substantially decreased
  
Site-of-Care Decision

- Community acquired pneumonia diagnosed
- Site of Care?
  - Patient Welfare
  - Cost
  - Patient Preference
  - Hospital Risks
  - Outpatient
  - Medical Ward
  - Intensive Care Unit

References:


Pneumonia Severity Index

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Points</th>
</tr>
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<tbody>
<tr>
<td>Demographics</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td></td>
</tr>
<tr>
<td>Nursing home resident</td>
<td>+10</td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
</tr>
<tr>
<td>Neoplasm</td>
<td>+30</td>
</tr>
<tr>
<td>Liver disease</td>
<td>+20</td>
</tr>
<tr>
<td>Heart failure</td>
<td>+10</td>
</tr>
<tr>
<td>Stroke</td>
<td>+10</td>
</tr>
<tr>
<td>Renal failure</td>
<td>+10</td>
</tr>
<tr>
<td>Physical examination findings</td>
<td></td>
</tr>
<tr>
<td>Altered mental status</td>
<td>+20</td>
</tr>
<tr>
<td>Respiratory rate ≥ 30 breaths per minute</td>
<td>+20</td>
</tr>
<tr>
<td>Systolic blood pressure &lt; 90 mm Hg</td>
<td>+20</td>
</tr>
<tr>
<td>Temperature &lt; 95°F (35°C) or ≥ 104°F (40°C)</td>
<td>+15</td>
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<tr>
<td>Pulse rate ≥ 125 beats per minute</td>
<td>+10</td>
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<tr>
<td>Laboratory and radiographic findings</td>
<td></td>
</tr>
<tr>
<td>Arterial pH &lt; 7.35</td>
<td>+30</td>
</tr>
<tr>
<td>Blood urea nitrogen &gt; 30 mg per dL</td>
<td>+20</td>
</tr>
<tr>
<td>Sodium &lt; 130 mmol per L</td>
<td>+20</td>
</tr>
<tr>
<td>Glucose ≥ 250 mg per dL</td>
<td>+10</td>
</tr>
<tr>
<td>Hematocrit &lt; 30 percent</td>
<td>+10</td>
</tr>
<tr>
<td>Partial pressure of arterial oxygen &lt; 60 mm Hg</td>
<td>+10</td>
</tr>
<tr>
<td>Pleural effusion</td>
<td>+10</td>
</tr>
<tr>
<td>Total points:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Point total</th>
<th>Risk class</th>
<th>Adults with CAP*</th>
<th>Nursing home patients with CAP†</th>
<th>Recommendation†</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 51</td>
<td>I</td>
<td>3/1,472 (0.2)</td>
<td>None</td>
<td>Outpatient therapy should be considered, especially for patients in classes I and II</td>
</tr>
<tr>
<td>51 to 70</td>
<td>II</td>
<td>7/1,374 (0.5)</td>
<td>None</td>
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</tr>
<tr>
<td>71 to 90</td>
<td>III</td>
<td>41/1,603 (2.6)</td>
<td>1/21 (4.8)</td>
<td></td>
</tr>
<tr>
<td>91 to 130</td>
<td>IV</td>
<td>149/1,605 (9.3)</td>
<td>6/50 (12.0)</td>
<td>Patient should be hospitalized</td>
</tr>
<tr>
<td>&gt; 130</td>
<td>V</td>
<td>109/438 (24.9)</td>
<td>28/85 (32.9)</td>
<td></td>
</tr>
</tbody>
</table>

**CURB-65**

<table>
<thead>
<tr>
<th>Clinical factor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confusion</td>
<td>1</td>
</tr>
<tr>
<td>Blood urea nitrogen $&gt; 19$ mg per dL</td>
<td>1</td>
</tr>
<tr>
<td>Respiratory rate $\geq 30$ breaths per minute</td>
<td>1</td>
</tr>
<tr>
<td>Systolic blood pressure $&lt; 90$ mm Hg or Diastolic blood pressure $\leq 60$ mm Hg</td>
<td>1</td>
</tr>
<tr>
<td>Age $\geq 65$ years</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total points:**

<table>
<thead>
<tr>
<th>CURB-65 score</th>
<th>Deaths/total (%)*</th>
<th>Recommendation†</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7/1,223 (0.6)</td>
<td>Low risk; consider home treatment</td>
</tr>
<tr>
<td>1</td>
<td>31/1,142 (2.7)</td>
<td>Short inpatient hospitalization or closely supervised outpatient treatment</td>
</tr>
<tr>
<td>2</td>
<td>69/1,019 (6.8)</td>
<td>Severe pneumonia; hospitalize and consider admitting to intensive care</td>
</tr>
<tr>
<td>3</td>
<td>79/563 (14.0)</td>
<td></td>
</tr>
<tr>
<td>4 or 5</td>
<td>44/158 (27.8)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRB-65 score‡</th>
<th>Deaths/total (%)*</th>
<th>Recommendation†</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2/212 (0.9)</td>
<td>Very low risk of death; usually does not require hospitalization</td>
</tr>
<tr>
<td>1</td>
<td>18/344 (5.2)</td>
<td>Increased risk of death; consider hospitalization</td>
</tr>
<tr>
<td>2</td>
<td>30/251 (12.0)</td>
<td></td>
</tr>
<tr>
<td>3 or 4</td>
<td>39/125 (31.2)</td>
<td>High risk of death; urgent hospitalization</td>
</tr>
</tbody>
</table>

Site-of-Care Decision

- Community acquired pneumonia diagnosed

Site of Care?

- Medical Ward
- Intensive Care Unit
- Outpatient


Criteria for severe community-acquired pneumonia

<table>
<thead>
<tr>
<th>Minor criteria(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate(^b) $\geq 30$ breaths/min</td>
</tr>
<tr>
<td>PaO(_2)/FiO(_2) ratio(^b) $\leq 250$</td>
</tr>
<tr>
<td>Multilobar infiltrates</td>
</tr>
<tr>
<td>Confusion/disorientation</td>
</tr>
<tr>
<td>Uremia (BUN level, $\geq 20$ mg/dL)</td>
</tr>
<tr>
<td>Leukopenia(^c) (WBC count, $&lt; 4000$ cells/mm(^3))</td>
</tr>
<tr>
<td>Thrombocytopenia (platelet count, $&lt; 100,000$ cells/mm(^3))</td>
</tr>
<tr>
<td>Hypothermia (core temperature, $&lt; 36^\circ$C)</td>
</tr>
<tr>
<td>Hypotension requiring aggressive fluid resuscitation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invasive mechanical ventilation</td>
</tr>
<tr>
<td>Septic shock with the need for vasopressors</td>
</tr>
</tbody>
</table>

**NOTE.** BUN, blood urea nitrogen; PaO\(_2\)/FiO\(_2\), arterial oxygen pressure/fraction of inspired oxygen; WBC, white blood cell.

\(^a\) Other criteria to consider include hypoglycemia (in non-diabetic patients), acute alcoholism/alcoholic withdrawal, hyponatremia, unexplained metabolic acidosis or elevated lactate level, cirrhosis, and asplenia.

\(^b\) A need for non-invasive ventilation can substitute for a respiratory rate $> 30$ breaths/min or a PaO\(_2\)/FiO\(_2\) ratio $< 250$.

\(^c\) As a result of infection alone.
Etiologies of community-acquired pneumonia

Outpatient
- S. pneumonia
- M. pneumonia
- H. influenzae
- C. pneumonia
- Respiratory viruses

Inpatient (non-ICU)
- S. pneumoniae
- M. pneumoniae
- C. pneumoniae
- H. influenzae
- Legionella species
- Aspiration
- Respiratory viruses

Inpatient (ICU)
- S. pneumoniae
- S. aureus
- Legionella species
- Gram-negative bacilli
- H. influenzae

Empiric antimicrobial therapy

Outpatient
- S. pneumoniae
- M. pneumoniae
- H. influenzae
- C. pneumoniae
- Respiratory viruses

Inpatient (non-ICU)
- S. pneumoniae
- M. pneumoniae
- C. pneumoniae
- H. influenzae
- Legionella species
- Aspiration
- Respiratory viruses

Inpatient (ICU)
- S. pneumoniae
- S. aureus
- Legionella species
- Gram-negative bacilli
- H. influenzae

Healthy
- Macrolide or doxycycline

Comorbidities
- Respiratory fluoroquinolone or B-lactam + macrolide

Comorbidities
- Chronic heart dz
- Chronic lung dz
- Chronic renal dz
- DM
- ETOHism
- Cancer
- Asplenia
- Immunosuppressed

Empiric antimicrobial therapy

**Outpatient**
- *S. pneumoniae*  
- *M. pneumoniae*  
- *H. influenzae*  
- *C. pneumoniae*  
- Respiratory viruses

**Inpatient (non-ICU)**
- *S. pneumoniae*  
- *M. pneumoniae*  
- *C. pneumoniae*  
- *H. influenzae*  
- Legionella species  
- Aspiration  
- Respiratory viruses

**Inpatient (ICU)**
- *S. pneumoniae*  
- *S. aureus*  
- Legionella species  
- Gram-negative bacilli  
- *H. influenzae*  

**Healthy**
- Macrolide or doxycycline

**Comorbidities**
- Respiratory fluoroquinolone or B-lactam + macrolide

**Drug Resistant S. Pneumonia**
- Recent Antibiotics  
- Age >65  
- ETOHism  
- Comorbidities  
- Immunosuppressed  
- Exposed to children in daycare

Empiric antimicrobial therapy

Outpatient
- S. pneumonia
- M. pneumonia
- H. influenzae
- C. pneumonia
- Respiratory viruses

Inpatient (non-ICU)
- S. pneumoniae
- M. pneumoniae
- C. pneumoniae
- H. influenzae
- Legionella species
- Aspiration
- Respiratory viruses

Inpatient (ICU)
- S. pneumoniae
- S. aureus
- Legionella species
- Gram-negative bacilli
- H. influenzae

Respiratory fluoroquinolone or B-lactam plus macrolide
- B-lactams
- Cefotaxime
- Ceftriaxone
- Ampicillin
- Ertapenem

Empiric antimicrobial therapy

**Outpatient**
- *S. pneumonia*
- *M. pneumonia*
- *H. influenzae*
- *C. pneumonia*
- Respiratory viruses

**Inpatient (non-ICU)**
- *S. pneumoniae*
- *M. pneumoniae*
- *C. pneumoniae*
- *H. influenzae*
- Legionella species
- Aspiration
- Respiratory viruses

**Inpatient (ICU)**
- *S. pneumoniae*
- *S. aureus*
- Legionella species
- Gram-negative bacilli
- *H. influenzae*

**B-lactam plus macrolide or Respiratory fluoroquinolone**

Route and Length of Therapy

- **Switch from IV to Oral**
  - Hemodynamically stable
  - Improving Clinically
  - Can Ingest Medications
  - Normally functioning GI tract
  - Inpatient observation while receiving oral therapy is not necessary

### Criteria for Clinical Stability

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature ≤ 37.8°C</td>
</tr>
<tr>
<td>Hear rate ≤ 100 beats/min</td>
</tr>
<tr>
<td>Respiratory rate ≤ 24 breaths/min</td>
</tr>
<tr>
<td>Systolic blood pressure ≥ 90 mm Hg</td>
</tr>
<tr>
<td>Arterial Oxygen saturation ≥ 90% or ( \text{pO}_2 ) ≥ 60 mm Hg on room air</td>
</tr>
<tr>
<td>Ability to maintain oral intake</td>
</tr>
<tr>
<td>Normal mental status</td>
</tr>
</tbody>
</table>

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Number of instabilities on discharge and rates of 30-day adverse outcomes. Major events were defined as death or readmission within 30 days of discharge. Not RTUA indicates not returned to usual activities within 30 days of discharge.
Route and Length of Therapy

• Treat for a minimum of 5 days
  – Should be febrile for 48-72 h
  – Should have no more than 1 CAP-associated signs of clinical instability

• Longer duration may be warranted
  – Initial therapy not active
  – Extra-pulmonary infection

A 68 year old male with a history of hypertension, hyperlipidemia, and osteoarthritis presents with a 2 day history of fevers and a productive cough. He has not received antibiotics for any reason in the last 12 months. Temperature is 101.0°F, Blood pressure is 135/85, heart rate is 102 beats per minute, respiratory rate is 18 and oxygen saturation on room air is 95%. He has no smoking history. On examination, mental status is normal, there are rales and increased vocal fremitus in the right lower lung field. Portable chest radiograph confirms a right lower lobe PNA. Basic metabolic panel is normal. Creatinine is 1.0 and BUN is 12.

Where and with what antibiotic would you initially treat this patient?

A. Outpatient with oral Azithromycin
B. **Outpatient with high dose oral amoxicillin and oral azithromycin**
C. Inpatient with oral Levofloxacin
D. Inpatient with intravenous Ceftriaxone and oral azithromycin
E. Inpatient with intravenous vancomycin and intravenous piperacillin/tazobactam
Case 3
A 68 year old male with a history of COPD with 4 hospitalization for COPD exacerbations presents with a 5 day history of worsening dyspnea with a productive cough and a 2 day history of fever. Temperature is 101.0°F, blood pressure is 135/85, heart rate is 102 beats per minute, respiratory rate is 18 and oxygen saturation on room air is 91% on 2L NC. He does not currently smoke. On examination, mental status is normal, there are rales and increased vocal fremitus in the right lower lung field. Portable chest radiograph confirms a right lower lobe PNA. CT of chest shows parenchymal changes consistent with COPD but no evidence of a lung abscess. Basic metabolic panel is normal. Creatinine is 1.0 and BUN is 12. The patient is hospitalized. Which of the following empiric regimens will you start?
Case 3

A. Ceftriaxone plus Azithromycin 0%
B. Ceftriaxone plus Levofloxacin 0%
C. Vancomycin plus Azithromycin 0%
D. Piperacillin/Tazobactam + Levofloxacin 0%
E. Piperacillin/Tazobactam + Azithromycin 0%
Case 3 Objectives

• Consider pathogens encountered in patients with specific comorbidities and diagnostic findings

• Choose empiric antibiotics to cover pathogens encountered with specific comorbidities and diagnostic findings
Diagnosing Pneumonia: Clinic Features and Infiltrate on Chest Radiograph

**Indications for further testing**

- Intensive care unit admission
- Cavitary Infiltrates
- Leukopenia
- Active alcohol abuse
- Chronic severe liver disease
- Severe obstructive/structural lung disease
- Asplenia (anatomic or functional)
- Recent travel (within past 2 weeks)
- Positive Legionella UAT result
- Positive pneumococcal UAT result
- Pleural effusion
- Epidemiological risk factor
**Table 8.** Epidemiologic conditions and/or risk factors related to specific pathogens in community-acquired pneumonia.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Commonly encountered pathogen(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcoholism</td>
<td><em>Streptococcus pneumoniae</em>, oral anaerobes, <em>Klebsiella pneumoniae</em>, <em>Acinetobacter</em> species, <em>Mycobacterium tuberculosis</em></td>
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<tr>
<td>COPD and/or smoking</td>
<td><em>Haemophilus influenzae</em>, <em>Pseudomonas aeruginosa</em>, <em>Legionella</em> species, <em>S. pneumoniae</em>, <em>Moraxella catarrhalis</em>, <em>Chlamydophila pneumoniae</em></td>
</tr>
<tr>
<td>Aspiration</td>
<td>Gram-negative enteric pathogens, oral anaerobes</td>
</tr>
<tr>
<td>Lung abscess</td>
<td>CA-MRSA, oral anaerobes, endemic fungal pneumonia, <em>M. tuberculosis</em>, atypical mycobacteria</td>
</tr>
<tr>
<td>Exposure to bat or bird droppings</td>
<td><em>Histoplasma capsulatum</em></td>
</tr>
<tr>
<td>Exposure to birds</td>
<td><em>Chlamydia psittaci</em> (if poultry: avian influenza)</td>
</tr>
<tr>
<td>Exposure to rabbits</td>
<td><em>Francisella tularensis</em></td>
</tr>
<tr>
<td>Exposure to farm animals or parturient cats</td>
<td><em>Coxiella burnetti</em> (Q fever)</td>
</tr>
<tr>
<td>HIV infection (early)</td>
<td><em>S. pneumoniae</em>, <em>H. influenzae</em>, <em>M. tuberculosis</em></td>
</tr>
<tr>
<td>HIV infection (late)</td>
<td>The pathogens listed for early infection plus <em>Pneumocystis jirovecii</em>, <em>Cryptococcus</em>, <em>Histoplasma</em>, <em>Aspergillus</em>, atypical mycobacteria (especially <em>Mycobacterium kansasii</em>, <em>P. aeruginosa</em>, <em>H. influenzae</em>)</td>
</tr>
<tr>
<td>Hotel or cruise ship stay in previous 2 weeks</td>
<td><em>Legionella</em> species</td>
</tr>
<tr>
<td>Travel to or residence in southwestern United States</td>
<td><em>Coccidioides</em> species, <em>Hantavirus</em></td>
</tr>
<tr>
<td>Travel to or residence in Southeast and East Asia</td>
<td><em>Burkholderia pseudomallei</em>, avian influenza, SARS</td>
</tr>
<tr>
<td>Influenza active in community</td>
<td>Influenza, <em>S. pneumoniae</em>, <em>Staphylococcus aureus</em>, <em>H. influenzae</em></td>
</tr>
<tr>
<td>Cough ≥2 weeks with whoop or posttussive vomiting</td>
<td><em>Bordetella pertussis</em></td>
</tr>
<tr>
<td>Structural lung disease (e.g., bronchiectasis)</td>
<td><em>Pseudomonas aeruginosa</em>, <em>Burkholderia cepacia</em>, <em>S. aureus</em></td>
</tr>
<tr>
<td>Injection drug use</td>
<td><em>S. aureus</em>, anaerobes, <em>M. tuberculosis</em>, <em>S. pneumoniae</em></td>
</tr>
<tr>
<td>Endobronchial obstruction</td>
<td>Anaerobes, <em>S. pneumoniae</em>, <em>H. influenzae</em>, <em>S. aureus</em></td>
</tr>
<tr>
<td>In context of bioterrorism</td>
<td><em>Bacillus anthracis</em> (anthrax), <em>Yersinia pestis</em> (plague), <em>Francisella tularensis</em> (tularemia)</td>
</tr>
</tbody>
</table>

**NOTE.** CA-MRSA, community-acquired methicillin-resistant *Staphylococcus aureus*; COPD, chronic obstructive pulmonary disease; SARS, severe acute respiratory syndrome.
Case 3

A 68 year old male with a history of COPD with 4 hospitalization for COPD exacerbations presents with a 5 day history of worsening dyspnea with a productive cough and a 2 day history of fever. Temperature is 101.0°F, Blood pressure is 135/85, heart rate is 102 beats per minute, respiratory rate is 18 and oxygen saturation on room air is 91% on 2L NC. He does not currently smoke. On examination, mental status is normal, there are rales and increased vocal fremitus in the right lower lung field. Portable chest radiograph confirms a right lower lobe PNA. CT of chest shows parenchymal changes consistent with COPD but no evidence of a lung abscess. Basic metabolic panel is normal. Creatinine is 1.0 and BUN is 12. The patient is hospitalized. Which of the following empiric regimens will you starts?

A. Ceftriaxone plus Azithromycin
B. Ceftriaxone plus Levofloxacin
C. Vancomycin plus Azithromycin
D. Piperacillin/Tazobactam + Levofloxacin
E. Piperacillin/Tazobactam + Azithythromycin
**Special Coverage: Pseudomonas**

<table>
<thead>
<tr>
<th>At risk</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Structural Lung Disease</td>
<td>• Tracheal aspirate</td>
</tr>
<tr>
<td>• Repeated COPD exacerbations requiring frequent steroids and/or antibiotics</td>
<td>• Sputum</td>
</tr>
<tr>
<td></td>
<td>• Blood</td>
</tr>
</tbody>
</table>

- **Regimen 1**
  - Antipneumococcal, antipseudomonal β-lactam
  - Fluoroquinolone

- **Regimen 2**
  - Antipneumococcal, antipseudomonal β-lactam
  - Aminoglygoside
  - Azithromycin

- **Regimen 3**
  - Antipneumococcal, antipseudomonal β-lactam
  - Aminoglygoside
  - Antipneumococcal fluoroquinolone
Special Coverage: CA-MRSA

At Risk
- End-stage renal disease
- Injection drug use
- Prior Influenza
- Prior antibiotic therapy (esp FQs)

Evidence
- Tracheal aspirate
- Adequate sputum

• Add Vancomycin or linezolid
Case 4

A 52 year old female presents to your clinic for routine follow up. She informs you that her husband of 2 years was recently diagnosed with HIV. The diagnosis came after he presented with a 6 month history of weight loss and fatigue. She tested negative for HIV 6 weeks ago and again 2 weeks ago. She and her husband have not been sexually active since his diagnosis 8 weeks ago. Her husband was started on HIV therapy 4 weeks and is tolerating it well. She and her husband plan to resume sexual activity at “some point” in the future and she asks you about effective strategies to reduce her risk of acquiring HIV. Which of the following is the most effective method to reduce her risk for HIV infection?
Case 4

A. Husband’s adherence to HIV therapy 0%
B. Pre-Exposure Prophylaxis 0%
C. Post-Exposure Prophylaxis 0%
D. Condoms 0%
Case 4 Objective

• Visit HIV treatment as prevention and PreExposure prophylaxis (PrEP)
HIV Treatment is Prevention

Early Initiation of ART led to an 96% reduction in HIV transmission to uninfected partners

PreExposure Prophylaxis also reduces HIV acquisition

• iPrEX Trial:
  – Men who have sex with men
  – 44% Reduction in HIV acquisition
  – 73% reduction when reported adherence was ≥ 90%

• Partners PrEP Trial
  – Heterosexual discordant couples
  – Efficacy
    • Women 66%
    • Men 84%

Guidance for PrEP

<table>
<thead>
<tr>
<th>Detecting substantial risk of acquiring HIV infection</th>
<th>Men Who Have Sex with Men</th>
<th>Heterosexual Women and Men</th>
<th>Injection Drug Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV-positive sexual partner</td>
<td>HIV-positive sexual partner</td>
<td>HIV-positive sexual partner</td>
<td>HIV-positive injecting partner</td>
</tr>
<tr>
<td>Recent bacterial STI</td>
<td>Recent bacterial STI</td>
<td>Recent bacterial STI</td>
<td>Sharing injection equipment</td>
</tr>
<tr>
<td>High number of sex partners</td>
<td>High number of sex partners</td>
<td>High number of sex partners</td>
<td>Recent drug treatment (but currently injecting)</td>
</tr>
<tr>
<td>History of inconsistent or no condom use</td>
<td>History of inconsistent or no condom use</td>
<td>History of inconsistent or no condom use</td>
<td></td>
</tr>
<tr>
<td>Commercial sex work</td>
<td>Commercial sex work</td>
<td>Commercial sex work</td>
<td>In high-prevalence area or network</td>
</tr>
<tr>
<td></td>
<td>In high-prevalence area or network</td>
<td>In high-prevalence area or network</td>
<td></td>
</tr>
<tr>
<td>Clinically eligible</td>
<td>Documented negative HIV test result before prescribing PrEP</td>
<td>No signs/symptoms of acute HIV infection</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Normal renal function; no contraindicated medications</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Documented hepatitis B virus infection and vaccination status</td>
<td></td>
</tr>
</tbody>
</table>
HIV

Main symptoms of Acute HIV infection:
- Systemic: Fever, Weight loss
- Mouth: Sores, Thrush
- Pharyngitis
- Esophagus: Sores
- Muscles: Myalgia
- Liver and spleen: Enlargement
- Lymph nodes: Lymphadenopathy
- Gastric: Nausea, Vomiting
- Skin: Rash
- Central: Malaise, Headache, Neuropathy

Main symptoms of AIDS:
- Neurological: Encephalitis, Meningitis
- Eyes: Retinitis
- Lungs: Pneumocystis pneumonia, Tuberculosis (multiple organs), Tumors
- Skin: Tumors
- Gastrointestinal: Esophagitis, Chronic diarrhea, Tumors
A 52 year old female present to your clinic for routine follow up. She informs you that her husband of 2 years was recently diagnosed with HIV. The diagnosis came after he presented with a 6 month history of weight loss and fatigue. She tested negative for HIV 6 weeks ago and again 2 weeks ago. She and her husband have not been sexually active since his diagnosis 8 weeks ago. Her husband was started on HIV therapy 4 weeks and is tolerating it well. She and her husband plan to resume sexual activity at “some point” in the future and she asks you about effective strategies to reduce her risk of acquiring HIV. Which of the following is the most effective method to reduce her risk for HIV infection:

A. Husband’s adherence to HIV therapy
B. Pre-Exposure Prophylaxis
C. Post-Exposure Prophylaxis
D. Condoms
Case 5

A 70 year old female with Type II DM, HTN and depression presents to clinic for routine follow up. She reports adherence with all medications. She has no physical complaints. Physical examination is normal with no evidence of neuropathy. On routine laboratory work her Hemoglobin A1C is 6.8, Glucose is 118, Creatinine is 1.1. Pyuria is suggested by a positive leukocyte esterase on urinalysis. Urine culture 100,000 colony forming units of E. coli. The patient returns to clinic 1 week later to discuss her laboratory results. Again she is without any complaints. A second urine sample is collected with identical results to the first. Urine culture demonstrates >100,000 colony forming units of E. coli. Which of the following choices is the best next step in the patient’s management?
Case 5

A. Prescribe 14 days of Trimethoprim/Sulfamethoxazole 0%
B. Prescribe 3-7 days of ciprofloxacin 0%
C. Repeat urinalysis in 4 weeks, prescribe an antibiotic if bacteria are still present 0%
D. Do not repeat urinalysis for bacteriuria; do not prescribe antibiotics 0%
Case 5 Objectives

• Define asymptomatic bacteriuria

• Identify when to and when not to treat asymptomatic bacteriuria
Asymptomatic Bacteriuria

• Asymptomatic + Positive Urine Cultures

  – Women: 2 consecutive voided urine specimens with isolation of the same bacterial strain (≥10^5 CFU/ml)

  – Men: 1 clean-catch void with 1 bacterial species isolated (≥10^5 CFU/ml)

  – Women/Men: Catheterized urine specimen with 1 bacteria species isolated (≥10^2 CFU/ml)

Nicolle et al. Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. CID. 2005;40;643-654.
Asymptomatic Bacteriuria is Common

Prevalence in specific groups

• Older age: 6%-20%
• DM (women): 8%-14%
• Short-term indwelling foley catheter: acquire at a rate of 2%-7% per day
• Spinal cord injury: >50%
• Living in a longer term care facility: 15%-40%
• Long term indwelling catheter or permanent ureteric stent: 100%

Nicolle et al. Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. CID. 2005;40;643-654.
Pyuria is Common in Asymptomatic Bacteriuria

- Pyuria does no differentiate symptomatic from asymptomatic urinary infection
- In Asymptomatic Bacteriuria
  - 32% in young women
  - 30-70% of Pregnant women
  - 70 diabetic women
  - 90% elderly institutionalized patients

Nicolle et al. Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. CID. 2005;40;643-654.
To screen or not to screen?
To treat or not to treat?

• Do Not Treat (or Screen)
  – Premenopausal, nonpregnant women
  – Diabetic women
  – Older person living in the community
  – Elderly, institutionalized subjects
  – Persons with spinal cord injury
  – Catheterized patients while the catheter remains in situ

Nicolle et al. Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. CID. 2005;40;643-654.
Women with asymptomatic Bacteriuria are more likely to develop symptoms (short term)

Women with asymptomatic bacteriuria are more likely to develop symptoms (long term).

Women with bacteriuria at enrollment were more likely to have bacteriuria at follow up.
No difference with antibiotic treatment.

Long-Term Consequences of Asymptomatic Bacteriuria?

- Mortality = No
- Hypertension = No
- Chronic Kidney Disease = No
Treatment of Asymptomatic Bacteriuria in Diabetic women has no effect on development of symptomatic infection

Paradigm

Asymptomatic Bacteriuria

Symptomatic Bacteriuria

Host Factors

Alter frequency of symptomatic or asymptomatic bacteriuria

Asymptomatic and Symptomatic bacteriuria

Treatment Asymptomatic Bacteriuria

Asymptomatic Bacteriuria
To treat or not to treat?
To screen or not to screen?

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  – Older person living in the community
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Nicolle et al. Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. CID. 2005;40;643-654.
To treat or not to treat?
To screen or not to screen?

• Treat (or Screen)
  – Pregnant Women with asymptomatic bacteriuria
    • 20-30 fold risk of developing pyelonephritis during pregnancy
    • Premature delivery
    • Infants with low birth weight
  
  • Treatment reduces these risks

  – Patient undergoing traumatic urologic interventions
    • 60% of bacteriuric patients who undergo TURP become bacteremic
    • 6%-10% develop sepsis

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C. Repeat urinalysis in 4 weeks, prescribe an antibiotic if bacteria are still present
D. Do not repeat urinalysis for bacteriuria; do not prescribe antibiotics
In Summary

• Rhinosinusitis
  – Decision for Antibiotics
  – Appropriate Antibiotics

• Community Acquired Pneumonia
  – Decision for Site of Treatment
  – Appropriate Antibiotics

• HIV
  – Prevention

• Asymptomatic Bacteriuria
  – Indications for no treatment and treatment
Thanks

Breezing Up (A Fair Wind), 1873-76. Winslow Homer