Adult Pulmonary Disease

Learning Objectives

1. Discuss the diagnostic and therapeutic approaches to common types of pneumonia.
2. Explain the common approaches to diagnosis and treatment of chronic obstructive lung disease (COPD) and chronic bronchitis.
3. Manage a patient with TB skin test conversion.

Community Acquired Pneumonia (CAP)

- Sixth most common cause of death in the United States
- Leading cause of death from infection
- 4 million cases occur annually and 20% require hospitalization
- Mortality rate is 1-5% for those treated as outpatients
  - Up to 25% for those requiring hospitalization
  - Up to 50% when ICU is needed

Pneumonia

- Identification of specific pathogen is difficult
  - None is identified in one third to one half of patients even with the most rigorous work-ups
- Initial treatment is usually empiric

Hospital Admission Decision

- Tools for identifying patients with CAP who may be candidates for outpatient treatment vs hospitalization (Level I)
- Severity-of-illness score
  - CURB-65 criteria
    - Confusion, uremia, respiratory rate, BP, age 65 or greater
  - Prognostic model
    - PSI (Pneumonia severity index)
      - Stratifies pts into 5 mortality risk classes

CURB-65 Severity Scores for CAP

<table>
<thead>
<tr>
<th>Clinical Factors</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confusion</td>
<td>1</td>
</tr>
<tr>
<td>Blood urea nitrogen (BUN) &gt;19mg/dl</td>
<td>1</td>
</tr>
<tr>
<td>Respiratory Rate &gt;30 Breaths/min</td>
<td>1</td>
</tr>
<tr>
<td>SBP &lt;90mm Hg</td>
<td>1</td>
</tr>
<tr>
<td>DBP &lt;60mg Hg</td>
<td>1</td>
</tr>
<tr>
<td>Age &gt;65</td>
<td>1</td>
</tr>
<tr>
<td>Total Points</td>
<td>?</td>
</tr>
</tbody>
</table>
1. A 12 yo wm presents to the ED with a fever of 103.0 °F, productive cough for the past 3 days. He also happens to be a type 1 diabetic and his parents smoke in the home and car.

What is the most likely pathogen causing his illness?

A. Staph aureus
B. Mycoplasma pneumoniae
C. Strep pneumoniae
D. Chlamydia pneumoniae

Community Acquired Pneumonia (CAP)

Most common pathogens
- Streptococcus pneumoniae 20-70%
- Mycoplasma pneumoniae 1-40%
- Chlamydia pneumoniae 4-10%
- Hemophilus influenza 3-10%
- Legionella 2-10%
- Moraxella catarrhalis 1-5 %
- Virus & anaerobes 2-15%

Modifying Factors

Pediatric patients
- Age 4 mo to 4 yrs
  - Most common pathogen
    - RSV
  - Peak incidence
    - 2-7 mo of age
- Age 5-15 yrs
  - Most common pathogen
    - Mycoplasma pneumoniae
  - Treat with a macrolide

Community Acquired Pneumonia (CAP)

Less common pathogens
- Staphylococcus
- Gram negatives
- Pneumocystis
- Mycobacterium pneumoniae

CURB-65

Severity Scores for CAP

<table>
<thead>
<tr>
<th>CURB-65 Score</th>
<th>Death %</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.6</td>
<td>Low risk; consider home treatment</td>
</tr>
<tr>
<td>1</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6.8</td>
<td>short inpatient hosp or closely supervised outpatient treatment</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
<td>Severe pneumonia; hospitalize, consider ICU</td>
</tr>
<tr>
<td>4 or 5</td>
<td>27.8</td>
<td></td>
</tr>
</tbody>
</table>
### Modifying Factors

Increased risk for drug resistant pneumococci (DRSP)

- Age >65 (OR=3.8)
- \( \beta \)-lactam Tx in last 3 mo (OR=2.8)
- Etoh abuse (OR=5.2)
- Immunosuppressive illness
- Multiple medical comorbidities
- Exposure to children in a day care center

### CAP Diagnosis/Work-up

- **Thorough history and physical**
  - Constellation of suggestive clinical features
    - Cough 90%
    - Sputum production 66%
    - Dyspnea 66%
    - Pleuritic chest pain 50%
    - Fever
    - Malaise
  - Smoking history
    - h/o comorbidities
      - Chronic heart, lung, liver or renal disease
      - DM
      - Alcoholism
      - Malignancies
      - Asplenia
      - Immunosuppression
      - Previous antibiotics within 3 mo

- **CXR**
  - Demonstrable infiltrate
  - False negative (repeat in 24-48 hrs if suspect clinically)
    - Dehydration
    - Elderly patients

- **CBC**
  - Sputum for gram stain and culture (SOR B)
    - Neither sensitive nor specific
    - May be useful to exclude Staph aureus or gram negative rods
  - Blood cultures (x2) (SOR A)
    - For most pts requiring hospitalization
    - Especially for severe CAP
    - Positive in 5-14% of cases
    - S. pneumoniae accounts for 2/3 of positive cultures

### CAP Diagnosis/Work-up

- **Vital signs and Mental status**
  - Screening with pulse oximetry

- **Physical findings**
  - Examination of lungs
    - Rales
    - Bronchial breath sounds
  - NP swab for influenza A & B (when in proper season)
    - Rapid testing is indicated if the Dx is uncertain

### 2. 45 yr old wm with a 4 day history of productive cough, fever up to 102.3 F and a CXR showing a LLL infiltrate.

The antibiotic of choice for outpatient treatment is?

A. Macrolide
B. Doxycycline
C. Quinolone if recent antibiotic use
D. \( \beta \)-lactam if post influenza
3. 85 yr old bf presents from the NH with a 2 day h/o increased confusion and poor po intake. She has had a productive cough for about 6 days and had been started on amoxicillin/clavulanate 2 days ago without improvement.

**VS:** BP 85/50, RR 30, T 100.8, HR 120 and a 

**CXR:** bilateral LL infiltrates.

**True statements include all of the following except?**

A. The pt should be hospitalized for IV antibiotics

B. A fluoroquinolone would be an appropriate choice

C. She has a DRSP and should be started immediately on vancomycin

D. Continuing her augmentin and adding azithromycin would be appropriate

---

**Treatment**

- **Outpatient initial empiric therapy**
  - Previously healthy
  - No risk for DRSP infection
    - Macrolides **Level I**
      - Azithromycin
      - Clarithromycin
      - Erythromycin
    - Doxycycline **Level III**

---

**Treatment**

- **Inpatient (Non-ICU)**
  - Antipseudomonal Quinolone (IV or PO) **(Level I)**
  - β-lactam (IV or IM)
    - Cefotaxime, ceftriaxone and ampicillin/sublactam
    - Ertapenem for selected pts
  - Macrolide (IV or PO) (eryth, clarith, azithro)
    - Doxycycline maybe substituted **(Level III)**
  - β-lactam (IV or IM) plus
  - Doxycycline
  - Tigecycline (IV)
  - Or (if <65 and no risk factors for DRSP)
    - Macrolide monotherapy (IV or PO)

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**Treatment**

- **Inpatient (ICU)**
  - Macrolide (IV) (erythromycin, azithromycin) **(Level II)**
  - Plus either a
    - β-lactam (IV)
      - Cefotaxime, ceftriaxone and ampicillin/sublactam
    - Or
    - Anti-pneumococcal/Anti-psuedomonal β-lactam (IV)
      - (piperacillin/tazobactam, cefepime, imipenem, or meropenem)
    - Or
    - Anti-pseudomonal Quinolone (IV) (Levofloxacin, Moxifloxacin) **(Level I)**
      - Plus either a
        - β-lactam (IV)
        - Or
        - Anti-pneumococcal/Anti-psuedomonal β-lactam (IV)
Treatment

- Inpatient (ICU) cont.
  - Anti-pneumococcal, anti-pseudomonal β-lactam (IV)
    - Plus
  - Aminoglycoside (IV) (gentamicin, tobramycin, amikacin)
    - Plus either a
  - Anti-pneumococcal Quinolone (IV)
    - Or
  - Macrolide (IV),
- If PCN allergy substitute aztreonam for the β-lactam (Level III)

Treatment

- Inpatient (Non-ICU with Pseudomonal Risk)
  - Antipseudomonal β-lactam (IV)
    - Plus
  - Anti-pseudomonal Quinolone (IV or PO)
    - Or
  - Antipseudomonal β-lactam (IV)
    - Plus
  - Aminoglycoside (IV)
    - Plus either a
  - Anti-pneumococcal Quinolone (IV or PO)
    - Or a
  - Macrolide (IV or PO)

Treatment

- Nursing Home resident
  - Fluoroquinolone alone
    - Or
  - Macrolide and amoxicillin/clavulanate

Treatment Duration

- CAP pts should be treated for a
  - Minimum of 5 days (SOR A)
  - Afebrile for 48-72 hrs
  - Clinically stable
    - Normal VS and oxygenation (SOR B)
  - Switching from IV to PO (SOR B)
    - Hemodynamically stable
    - Improving clinically
    - Able to take PO and normal functioning GI tract

Tx for Drug Resistant *S. Pneumoniae* (DRSP)

- Incidence of DRSP is stabilizing
  - Resistance to PCN and Cephalosporins is decreasing
  - Resistance to Macrolides is increasing
    - >25% in some areas
- For CAP that is an MRSA infection
  - Add
    - Vancomycin or linezolid (SOR C)

Tx for Drug Resistant *S. Pneumoniae* (DRSP)

- Intermediate resistant strains
  - High-dose Amoxicillin or
  - Extended spectrum Cephalosporins
  - Fluoroquinolones are also effective
    - Emerging resistance is concerning
    - Clinical failures to Cipro and Levo, but NOT to Moxi or Gemi
Tx for Drug Resistant *S. Pneumoniae* (DRSP)

- Highly resistant strains
  - Ceftriaxone IV plus Moxifloxacin
    If complete resistance to quinolones, 3rd gen cephalosporins and macrolides
  - Vancomycin plus Azithromycin IV
- Most resistant strains are included in the 23 valent pneumococcal vaccine

Prevention of CAP

- Pneumococcal polysaccharide vaccine for
  - Persons >65 yrs of age
  - Those with selected high-risk concurrent variables
- Inactivated influenza vaccine for
  - Persons >50 yr
  - Those at high risk for influenza complications
  - Household contacts of high-risk persons
  - Healthcare workers
- Intranasal live attenuated vaccine for
  - Persons 5-49 yrs of age without chronic underlying dz

4. Which of the following is NOT associated with COPD?

A. It is the 4th leading cause of death in people >45 yrs of age
B. Airway inflammation
C. Second-hand smoke
D. Fully reversible airflow obstruction

4. Which of the following is NOT associated with COPD?

- **A.** It is the 4th leading cause of death in people >45 yrs of age
- **B.** Airway inflammation
- **C.** Second-hand smoke
- **D.** Fully reversible airflow obstruction

COPD...What is it?

- Key Elements of COPD
  - Smoke exposure (primarily tobacco)
  - Airway inflammation
  - Airflow obstruction (not fully reversible)
  - 4th leading cause of death in people >45 yrs of age
  - Death rate of 41.5/100,000

COPD

- Emphysema (pathologic term)
  - Destruction of the alveolar-capillary membrane
- Chronic bronchitis (clinical term)
  - Presence of cough or sputum production for at least a 3 month duration for 2 consecutive years

*Note* Chronic bronchitis and emphysema are no longer included in the formal definition of COPD but are still used clinically.
COPD

• Diagnosis is based on
  – Signs and symptoms
  – Confirmed by spirometry

• Prevalence
  – Estimated at 3-12% (>5% USPSTF)
  – 18.9% (Tinkelman et al)
  – 30% (other studies)

5. Symptoms of COPD can include all of the following except?

A. Weight gain
B. Productive cough
C. Wheezing
D. Dyspnea

COPD

<table>
<thead>
<tr>
<th>Hallmark symptoms</th>
<th>Less commonly reported symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough (85%)</td>
<td>Fatigue</td>
</tr>
<tr>
<td>Increased sputum production (45%)</td>
<td>Edema</td>
</tr>
<tr>
<td>Dyspnea Exertional (70%)</td>
<td>Chest tightness</td>
</tr>
<tr>
<td>Wheezing (40%)</td>
<td>Weight loss</td>
</tr>
<tr>
<td>Exercise intolerance</td>
<td>Increased nocturnal awakenings</td>
</tr>
<tr>
<td></td>
<td>Decreased quality of life</td>
</tr>
</tbody>
</table>

COPD Symptoms

• Relationship between airflow obstruction and patient perception of symptoms is highly variable
• NHANES survey
  – Only 60% of pts with moderately reduced FEV1 (50-85% of predicted) complained of symptoms
• Multicenter trial suggests that dyspnea is a better predictor of mortality than spirometry

Differential Diagnosis

• Asthma
• CHF
• Bronchiectasis
• Lung cancer
• Interstitial lung disease/pulmonary fibrosis
• Sarcoidosis
• Tuberculosis
• Bronchopulmonary dysplasia
6. Risk factors for developing COPD include all of the following except?

A. Coal mining for 25 yrs
B. 50 pack year h/o smoking
C. Family history of asthma
D. Advanced age

COPD

<table>
<thead>
<tr>
<th>Primary Risk Factor</th>
<th>Other Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cigarette Smoking</td>
<td>-80% of deaths are directly attributable to smoking</td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>-12-13 times more likely to die from COPD than non-smokers</td>
<td></td>
</tr>
<tr>
<td>-25% of deaths are attributable to smoking</td>
<td></td>
</tr>
<tr>
<td>Chronic exposure to environmental or occupational pollutants</td>
<td></td>
</tr>
<tr>
<td>-25% of deaths are attributable to smoking</td>
<td></td>
</tr>
<tr>
<td>Alpha-1-antitrypsin deficiency</td>
<td></td>
</tr>
<tr>
<td>Childhood history of recurrent respiratory infections</td>
<td></td>
</tr>
<tr>
<td>Secondhand smoke exposure</td>
<td></td>
</tr>
<tr>
<td>Secondhand smoke exposure</td>
<td></td>
</tr>
<tr>
<td>Infections</td>
<td></td>
</tr>
<tr>
<td>Family h/o COPD</td>
<td></td>
</tr>
</tbody>
</table>

COPD Pathophysiology

- Chronic airway irritation → inflammation → increased mucus production → decreased mucociliary function → increased coughing and sputum production “smoker’s cough”
- Continued airway irritation → scarring within the airways → progressive airway obstruction → dyspnea → prompting medical attention
- This also predisposes patients to respiratory infections
  - Another reason to seek medical attention

Physical Findings

- “Normal” in many patients
- Abnormal findings
  - Lung hyperinflation
    - Widened anteroposterior chest diameter
    - Hyperresonance on percussion
    - Diminished breath sounds
  - Persistent pulmonary damage may lead to increased right sided heart pressure → cor pulmonale
    - Accentuated second heart sound
    - Peripheral edema
    - JVD
    - Hepatomegaly

Physical Findings

- Abnormal findings
  - Increased work of breathing
    - Use of accessory respiratory muscles
    - Paradoxical abdominal movement
    - Increased expiratory time
  - Pursed lip breathing
  - Wheezing (variable)
  - Cachexia
  - Cyanosis
Physical Findings

- Abnormal findings
  - Chronic weight loss (independent predictor of mortality)
    - BMI should be monitored
  - Clubbing (rare) should prompt search for other causes including:
    - Cancer
    - Pulmonary fibrosis
    - Bronchiectasis

7. All of the following recommendations would be made for a patient who smokes except?

- A. Annual CXR
- B. Spirometry if symptomatic no matter what their age
- C. Spirometry if >45 yrs of age
- D. Yearly influenza vaccination

8. A 62 yo wf presents with progressive cough, increased sputum production and SOB over the past 5-10 yrs, now to the point that she can not walk the length of her living room without stopping to rest. She has smoked 1-2 ppd for nearly 40 yrs, has a BMI of 36, always feels fatigued to the point that she rarely leaves the house. You suspect that she has severe COPD.

You would expect her spirometry to show?

- A. FEV1/FVC >0.7, FEV1 50-79% predicted
- B. FEV1/FVC >0.7, FEV1 30-49% predicted
- C. FEV1/FVC <0.7, FEV1 30-49% predicted
- D. FEV1/FVC <0.7, FEV1 <30% predicted

Diagnostic Testing

- Spirometry is the key test (underused by primary care providers)
  - Recommended for all smokers ≥45 yrs of age
  - Particularly those presenting with symptoms
- Key features
  - FEV1
    - Volume of air expired in one second after a full inspiration
  - FVC
    - Maximum volume of air exhaled after a full inspiration
  - Used to track disease progression over time
Diagnostic Testing

A post-bronchodilator FEV1/FVC < 0.7 associated with an FEV1 < 80% of predicted value is Diagnostic of airflow limitation and Confirms COPD

COPD Staging (Based on Spirometry)

<table>
<thead>
<tr>
<th>Stage</th>
<th>GOLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (at risk)</td>
<td>Smokers with sx s</td>
</tr>
<tr>
<td></td>
<td>FEV1/FVC &gt; 0.7</td>
</tr>
<tr>
<td></td>
<td>FEV1 &gt; 80% predicted</td>
</tr>
<tr>
<td>I (mild)</td>
<td>FEV1/FVC &lt; 0.7</td>
</tr>
<tr>
<td></td>
<td>FEV1 &gt; 80% predicted</td>
</tr>
<tr>
<td>II (moderate)</td>
<td>FEV1/FVC &lt; 0.7</td>
</tr>
<tr>
<td></td>
<td>FEV1 50-79% predicted</td>
</tr>
<tr>
<td>III (severe)</td>
<td>FEV1/FVC &lt; 0.7</td>
</tr>
<tr>
<td></td>
<td>FEV1 30-49% predicted</td>
</tr>
<tr>
<td>IV (very severe)</td>
<td>FEV1/FVC &lt; 0.7</td>
</tr>
<tr>
<td></td>
<td>FEV1 &lt;30% predicted</td>
</tr>
</tbody>
</table>

COPD Staging (Based on Spirometry)

<table>
<thead>
<tr>
<th>Stage</th>
<th>ATS/ERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (at risk)</td>
<td>Smokers with sx s</td>
</tr>
<tr>
<td></td>
<td>FEV1/FVC &gt; 0.7</td>
</tr>
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<td></td>
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<td>III (severe)</td>
<td>FEV1/FVC &lt; 0.7</td>
</tr>
<tr>
<td></td>
<td>FEV1 &lt;30% predicted</td>
</tr>
</tbody>
</table>

COPD (Evidence-Based Recommendations)

- COPD should be suspected in persons presenting with cough, dyspnea, or increased sputum production (esp. with a h/o smoking) (SOR C)
- Joint ATS/ERS guidelines recommend screening for alpha-1-antitrypsin deficiency in symptomatic adults who have persistent obstruction on PFTs and in asymptomatic adults with a persistent obstruction on PFTs who smoke or have a h/o occupational exposure (SOR C)
- Spirometry confirms a COPD diagnosis (SOR C)
- Spirometry should be performed in pts ≥45 who smoke and have a persistent cough (SOR C)

COPD Management
• Modify risk factors if possible
  – Stop smoking!
  • ASK about tobacco use at every visit
  • ADVISE all users to stop
  • ASSESS users’ willingness to make an attempt to quit
  • ASSIST users’ efforts to quit
  • ARRANGE follow-up
* Tobacco cessation and O2 Rx are the only interventions proven to prolong survival of patients with COPD*

COPD Management
• Establish severity (spirometry)
• Assess need for Pharm and non-Pharm Rx
• Education plan based on pt’s specific needs
• Encourage exercise
• Immunization status monitoring
  – Pneumococcal
  – Influenza (yearly)
• Other behavioral changes

COPD Management
• Mild disease
  – Short acting Beta agonist q 2-6 hrs prn (SOR B)
• Moderate disease
  – Long acting beta agonist or ipratropium and short or long acting beta agonist (SOR B)
  – If not effective, trial of inhaled steroids, continue only if effective (SOR B)
  – Theophylline (SOR D)

COPD Management
• Severe disease
  – Oxygen
  – Pulmonary rehab
  – All previously mentioned meds
    • Theophylline in severe disease (SOR C)
  – Lung volume reduction surgery
  – Transplant

9. A 75 yo white male with a h/o COPD is complaining of a 3 day h/o rhinorrhea, increased coughing productive of light yellow sputum, wheezing, and O2 sats on RA of 91%.
Which of the medications will be the least effective for him?
A. Systemic steroids
B. Antibiotics
C. Short-acting bronchodilators
D. Inhaled steroids
### Classification of COPD Exacerbations by Severity

<table>
<thead>
<tr>
<th>Severity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>Can be controlled with an increase in dosage of regular medications</td>
</tr>
<tr>
<td>Moderate</td>
<td>Requires treatment with systemic corticosteroids or antibiotics</td>
</tr>
<tr>
<td>Severe</td>
<td>Requires hospitalization or evaluation in the emergency department</td>
</tr>
</tbody>
</table>


### Symptoms of COPD Exacerbation

<table>
<thead>
<tr>
<th>Body System</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac</td>
<td>Chest tightness, Tachycardia</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>Decreased exercise tolerance</td>
</tr>
<tr>
<td>Psychiatric</td>
<td>Confusion, Depression, Insomnia, Sleepiness</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>Change in volume, color, or tenacity of sputum, Cough, Dyspnea, Tachypnea, Wheezing</td>
</tr>
<tr>
<td>Systemic</td>
<td>Fatigue, Fever, Malaise</td>
</tr>
</tbody>
</table>


### Factors That Increase Risk of Severe COPD Exacerbations

- Altered mental status
- At least three exacerbations in the previous 12 months
- Body mass index of 20 kg per m² or less
- Marked increase in symptoms or change in vital signs
- Medical comorbidities (especially cardiac ischemia, congestive heart failure, pneumonia, diabetes mellitus, or renal or hepatic failure)
- Poor physical activity levels
- Poor social support
- Severe baseline COPD (FEV/FVC ratio less than 0.70 and FEV₁ less than 50 percent of predicted)
- Under utilization of home oxygen therapy

FEV₁ = forced expiratory volume in one second, FVC = forced vital capacity


### Diagnostic Evaluation of Patients with Suspected COPD Exacerbation

<table>
<thead>
<tr>
<th>Test</th>
<th>Potential Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform Routinely</td>
<td>Hypoxemia</td>
</tr>
<tr>
<td>Pulse oximetry</td>
<td>Hypercarbia, Hypoxemia, Respiratory acidosis</td>
</tr>
<tr>
<td>Arterial blood gas measurement</td>
<td>Hypercarbia</td>
</tr>
<tr>
<td>Complete blood count</td>
<td>Anemia, Leukocytosis, Polycythemia</td>
</tr>
<tr>
<td>Chest radiography</td>
<td>Altered source of dyspnea</td>
</tr>
<tr>
<td>Cardiac enzyme measurement</td>
<td>Cardiac ischemia (myocardial infarction is underdiagnosed in patients with COPD)</td>
</tr>
</tbody>
</table>


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Acute COPD Exacerbations

- Oxymetric evaluation is mandatory (SOR D)
  - O2 sats 80-90% on RA
    - Titration with O2 to 90% with little concern for hypercapnia
- ABG evaluation (SOR D)
  - O2 sats <80% on presentation
  - Admission if pH <7.32
    - Secondary to risk of respiratory failure
- Home O2 may be needed if sats <90% with ambulation and outpatient management decided

Acute COPD Exacerbations Therapeutic Options

- Bronchodilators (inhaled)
  - Albuterol is preferred (rapid onset) (SOR A)
  - Ipratropium produces additive bronchodilation (allows lower doses of albuterol) next choice (SOR A)
  - Levalbuterol (Xopenex) if no improvement with ipratropium or bronchospasm worsens (SOR C)
- Steroids (systemic) (SOR A)
  - 30-60mg daily for 10-14 days
  - Longer duration needs tapering
  - No need to stop inhaled steroids (may minimize systemic dose needed)

Acute COPD Exacerbations Therapeutic Options

- Antibiotics
  - Not needed if “clearly” post viral
  - Warranted if a prolonged illness with purulent sputum, even in mild cases
    - ¼ of patients have high concentrations of bacteria in the lower airways
      - S. pneumoniae, H. influenzae, M. catarrhalis, M. pneumoniae
  - Use of antibiotics in moderate or severe exacerbations reduces the risk of Rx failure and death

Acute COPD Exacerbations Therapeutic Options

- Methylxanthines (parenteral)
  - Theophylline
    - Not routinely recommended
    - Less effective
    - More potential adverse effects
- Others lack adequate evidence for routine use
  - Mucolytics
  - Nitric oxide
  - Chest physiotherapy
  - Antitussives
  - Morphine

Management of Stable COPD

- Therapy is determined by severity of symptoms
- Step Therapy
  - Step 1 associated with Mild COPD
  - Step 2 associated with Moderate COPD
  - Step 3 associated with Severe COPD
  - Step 4 associated with Very Severe COPD
- See ICSI Health Care Guideline: Chronic Obstructive Pulmonary Disease
Pharmacologic Approach for Managing Stable COPD

<table>
<thead>
<tr>
<th>Step</th>
<th>Positive Response</th>
<th>Negative Response</th>
<th>PHARMACEUTICAL INTERVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>Taper off or discontinue oral corticosteroids and prescribe or continue inhaled corticosteroids</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>Discontinue corticosteroids and consider theophylline as adjunctive therapy with inhaled bronchodilators (β2 agonists and/or anticholinergic)</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
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</tr>
<tr>
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</tr>
</tbody>
</table>

10. A 49 yo African American female with diabetes who is scheduled to start working as a HUC in the ICU had a PPD placed 48 hours ago. She has never been tested previously, but her mother moved in with her a year ago and had a sister who died of TB as a child. What is considered a positive test in this patient?

A. Redness >10mm in diameter
B. Induration and redness >5mm in diameter
C. Induration >10mm in diameter
D. Induration >10mm and redness >15mm

Testing for M. Tuberculosis Infection

- Mantoux tuberculin skin test (TST)
  - Skin test that produces delayed-type hypersensitivity reaction in persons with M. tuberculosis infection

- QuantiFERON® -TB test and QuantiFERON® -Gold
  - Blood test that measures and compares amount of interferon-gamma (IFN-γ) released by blood cells in response to antigens
QuantiFERON®-GOLD (QFT-G)

- CDC recommends that QFT-G can be used in all circumstances in which the TST is currently used, including contact investigations.
- Can be used in place of / in addition to the TST.
- A positive QFT-G should prompt the same evaluation and management as a positive TST.
- No reason exists to follow a positive QFT-G with a TST.

Reading a TST

- Measure reaction in 48 to 72 hours.
- Measure induration, not erythema.
- Record reaction in millimeters, not “negative” or “positive”.
- Ensure trained health care professional measures and interprets the TST.
  - Positive TST reactions can be measured accurately for up to 7 days.
  - Negative reactions can be read accurately for only 72 hours.

TB Skin Testing

- >5 mm is considered positive if:
  - HIV sero-positive
  - Recent TB direct contact
  - CXR shows prior inactive TB
  - Immunosuppressed patients
    - Prednisone > 15mg/day
    - Organ transplant recipients

TB Skin Testing

- >10 mm is considered positive if:
  - Diabetic
  - Renal failure
  - Cancer
  - Immigrant <5 yrs
  - High prevalence area
  - Long term care facility
    - Resident or employee
  - Inmate
  - IV drug user
  - Children <4 yrs of age
  - Mycobacteriology lab personnel

TB Skin Testing

- >15 mm is considered positive:
  - Any person with no known risk factors
    - even if prior BCG vaccination

Two-Step Skin Testing

- Testing of persons who will periodically receive TSTs (e.g., health-care workers or residents of long-term–care facilities) to reduce the likelihood of mistaking a boosted reaction for a new infection.
Two-Step Skin Testing

• If an initial TST result is classified as negative, a second test is repeated 1–3 weeks later.
• If the reaction to the second TST is positive, it probably represents a boosted reaction, indicating that the infection was most likely in the past and not recent.
• If the second TST is also negative, the person is classified as not being infected.

Positive - TST or QFT-G

• Check CXR for active disease
  – Negative
    • INH Rx for 6-9 months (9 mo is preferred)
    • Use directly observed therapy (DOT) for intermittent regimen
    • Rifampin Rx daily for 4 months
    • Consider adding Pyridoxine
    • Check liver transaminases every month

Positive - TST or QFT-G

• Check CXR for active disease
  – Positive
    • 10 drugs are currently approved
    • First line agents form the Core of Rx:
      – Isoniazid (INH)
      – Rifampin (RIF)
      – Ethambutol (EMB)
      – Pyrazinamide (PZA)
    • Typically treated with several drugs for 6-12 mo

Positive - TST or QFT-G

• Treatment continued:
  – Initial phase of 2 mo
  – Continuation phase of either 4 or 7 mo
• Treatment completion is determined by the number of doses ingested over a given period of time.
  – Basic TB regimens are broadly applicable, modifications should be made for:
    • HIV infection
    • Drug resistance
    • Pregnancy
    • Children

Active TB Preferred Rx Regimen

• Initial phase
  – INH, RIF, PZA, EMB x 8 wks (56 doses)
  • EMB can be discontinued if TB is susceptible to first line drugs
• Continuation phase
  – INH and RIF for 16 wks (126 doses)
  Or
  – Twice wkly for 18 wks (36 doses)

Answers

1. B
2. A
3. C
4. D
5. A
6. C
7. A
8. C
9. B
10. C
Pneumonia Guidelines

- Infectious Diseases Society of America/American Thoracic Society Consensus Guidelines on the Management of Community-Acquired Pneumonia in Adults
  Clinical Infectious Diseases 2007;44:S27-S72

- Evidence based guidelines
  - Graded scientific evidence
  - Strength of recommendations

COPD Websites

- Institute of Clinical Systems Improvement Web site: http://www.icsi.org/chronic_obstructive_pulmonary_disease_2286.html
- U.S. Department of Veterans Affairs Web site: http://www.healthquality.va.gov/Chronic_Obstructive_Pulmonary_Disease_COPD.asp