Chronic Obstructive Pulmonary Disease

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Scope of Problem

- Hospitalizations
- Physicians office visits
- Morbidity and Mortality
- Cost

Cost per Stage

- Stage I: $1,681
- Stage II: $5,037
- Stage III: $10,812

Percent Change in Age-Adjusted US Death Rates 1965-1998

- Coronary Heart Disease
- Stroke
- Other CV
- COPD
- Other

COPD

- A syndrome of chronic dyspnea with expiratory airflow limitation, that unlike asthma, does not fluctuate markedly.
- Refers to chronic bronchitis and emphysema

Mechanisms of Dysfunction

- Loss of elasticity and destruction of alveoli
- Narrowing of small airways as a result of inflammation and scarring
- Blocking of airway lumen by mucous secretions
Chronic Bronchitis
"Blue Bloaters"

- Inflammation of cells lining bronchial wall
- Edema
- Excessive mucous production
- Loss of ciliary transport

Emphysema
"Pink Puffers"

- Defect in pulmonary elastic tissue
- Destruction of alveoli and capillary beds
- Enlargement of distal air spaces
- Collapse of small airways on exhalation

Physiologic Differences
Bronchitis vs. Emphysema

Image not available

Emphysema

Image not available

Alveolar Damage

Image not available

Emphysema

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History: Risk Factors

- Males > Females
- Age
- Family History
- Genetic: Alpha-1 antitrypsin deficiency
  - Earlier onset of COPD
  - Increased susceptibility to smoking damage
- Smoking (including secondary smoke)
- Lower Socioeconomic Status
- Industrial air pollution
- Childhood respiratory disease or injury

Risk Factors: Geographic Location

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Symptoms

- Slowly progressive dyspnea
- Chronic cough
- Sputum production/change in production
- Headache
- Cognitive changes
- Weight loss/malnutrition
- Sleep disturbances

Physical Exam

- Inspection
  - Use of accessory muscles
  - Tachypnea
  - Punctated speech
  - Cyanosis
  - Pursed lip breathing
  - Tripod positioning
  - Barrel Chest
  - Obesity
Physical Exam

- Percussion
  - Increased resonance due to air trapping

- Auscultation
  - Prolonged expiration (3x > inspiration)
  - Rhonchi
  - Wheezing
  - Decreased breath sounds

Differential Diagnosis

- Chronic Obstructive Pulmonary Disease
- Asthma
- Congestive Heart Failure
- Bronchiectasis
- Tuberculosis
- Obliterative Bronchiolitis
- Age

Diagnostic Tests

- CXR
  - Hyperinflation of lungs
  - Flattened diaphragm
  - Increased anterior-posterior diameter
  - Narrow cardiac silhouette
  - Cardiomegaly
  - Bullae
  - Hyperlucent
Diagnostic Tests

- CT scan
- Pulmonary Function Tests
- Arterial Blood Gases
- ECG
- Sleep studies
- Complete blood count

Pulmonary Function Tests

- FEV₁
- FVC
- FEV₁/FVC
- DLCO
**Pulmonary Function Test**

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**Staging**

<table>
<thead>
<tr>
<th>FEV1/FVC (%)</th>
<th>FEV1 (% predicted)</th>
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<tbody>
<tr>
<td>I &lt;70%</td>
<td>&gt; 80%</td>
</tr>
<tr>
<td>II &lt;70%</td>
<td>&lt;80 and ≥60%</td>
</tr>
<tr>
<td>III &lt;70%</td>
<td>&lt;50 and ≥30%</td>
</tr>
<tr>
<td>IV &lt;70%</td>
<td>&lt;30%</td>
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**V-Q Scan**

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**Staging**

- I Mild
  - Productive Cough
  - Physical Activity
- II Moderate
  - Episodic Acute Bronchitis,
  - Occ. Exacerbations
- III Mod. Severe
  - Dyspnea with Activity
- IV Severe
  - Dyspnea: Mild Activity

**Potential Complications**

- Unmanaged CPOD
  - Infection
  - Blood gas abnormalities
  - Respiratory Failure
  - Pneumothorax
  - Pneumonia
  - Cor Pulmonale
  - Myocardial Infarction
  - Right Ventricular Hypertrophy
  - Cognitive Deficits

**Long Term Complications**

- Difficulty maintaining ideal body weight
  - Obesity due to steroids
  - Malnutrition
- Sleep disturbances
  - Due to secretion clearance
  - Nocturnal desaturation
- Iatrogenic complications: osteoporosis
- Psychosocial Problems: Anxiety, Panic
Long Term Complications

- Lung Cancer: relative risk increases as FEV1 decreases
- Resectability is directly related to severity of COPD
- COPD patients with chronic sputum production are usually colonized with bacteria, increasing complications from lung reducing surgeries; also with diminished air flow from obstructive disease resulting in decreased clearance of secretions

Treatment Goals

- Maintain near normal pulmonary function
- Maintain normal activity
- Prevent chronic symptoms
- Prevent recurrent exacerbations
- Avoid adverse effects of medications

Treatment

- Prevention
  - Smoking Cessation
- Early Detection
- Asymptomatic
  - Pneumovax vaccine every 5 years
  - Haemophilus Influenza vaccine yearly

Treatment - Symptomatic

I. $\beta_2$-agonist prn (short acting)
II. Ipratropium + $\beta_2$-agonist prn
III. Above + longer bronchodilator
    Pulmonary Rehab
IV. Above + inhaled steroids, oxygen

Treatment

- $\beta_2$-agonists: bronchodilation
  - Long-acting: 8-12 hour duration
    - Formoterol fumarate
      - Two puffs twice daily (DPI, 12 mg/puff)
    - Salmeterol xinofoate
      - Two puffs twice daily (DPI, 50mg/inhalation)
  - Short-acting: 3-6 hour duration
    - Metaproteronol (Alupent)
      - 2-3 puffs every 3 hours
    - Albuterol (Proventil, Ventolin)
      - Two puffs every 4 hours (MDI, 90 mg/puff)
      - 1 ml (5 mg) in 2-3ml saline for nebulizer
    - Terbutaline
      - Two puffs every 4-6 hours (MDI 200µg/puff)

- Anticholinergics
  - Short-Acting: 4-6 hour duration
    - Atropine sulfate
      - Nebulized 1% solution
    - Ipratropium bromide (Atrovent)
      - Two puffs q 4 hours (MDI, 16 mg/puff)
  - Long-acting
    - Tiotropium bromide
      - >24 hour duration
      - One inhalation daily (DPI, 18 µg/puff)
**Treatment**

- **Methylxanthines**: for severe exacerbations
  - Provides bronchodilation, immunomodulation and bronchoprotection
  - Theophylline oral, aminophylline intravenous
- **Leukotriene Modifiers**
  - Singular
  - Alcoide
- **Cromolyn Sodium**

**Corticosteroids**: long term prevention of symptoms; anti-inflammatory

- Inhaled: reduces need for oral corticosteroids
  - Beclomethasone
  - Flunisolide
  - Budesonide
- Systemic: for short-term burst and long term
  - Methprednisolone
  - Prednisolone
  - Prednisone: 40 mg/day for 2 weeks, then taper

**Smoking Cessation**

- Transdermal nicotine patch
- Nicotine-containing gum
- Bupropion hydrochloride (Zyban)

**Supportive Care**

- **Antitussives**
  - Guaifenesin
  - Dextromethorphan
- **Magnesium sulfate**
- **Antibiotics**
  - Septra or doxycycline PO 100 BID
  - Augmentin 250mg PO TID x 10 days
  - Ceftriaxone 400 mg PO QD x 10 days
  - Biaxin 500 mg PO BID x 10 days
  - Zithromax 250 mg (2 tabs day one, 1 tab days 2-5)
  - Floxin 400 mg PO BID

**Nutritional Support**

- Goal: maintenance of body weight and prevention of protein breakdown
- **Daily protein intake**
  - 1.5 mg/kg of body weight
Treatment of Acute Exacerbations

- Oxygen
  - Maintain PaO₂ of 55-60 mm Hg
  - Maintain oxyhemoglobin saturation 88-90%
- Non-invasive ventilation (NIPPV)
- Mechanical Ventilation
  - Acute ventilatory failure
  - Noninvasive positive pressure delivered via face mask may be alternative

Surgical Considerations

- Non-thoracic surgery
- Lung resection
- Lung volume reduction surgery
- Lung transplantation

Symptom Management

- Dyspnea
- Anxiety and Panic
- Emotional Support

Thank You

- Yale Comprehensive Cancer Center
- Nevada Cancer Institute
- Zachary & Ali