Asthma General Information

- Very common
  - 18.7 million adults (1 in 12 adults)
  - 7 Million Children (1 in 11 Children)
- Accounts for 1.9 million ED visits yearly (almost 2% of all ED visits) / 20% admitted / 10-20% relapse in 2 weeks
- Prevalence and mortality increasing

Asthma General Information

- Asthma prevalence has increased from 7.3% in 2001 to 8.4% in 2010, with a higher prevalence among children than adults
- Yet, healthcare visits for asthma declined in primary care offices, while emergency department visits and hospitalization rates were stable
Asthma Definition
- A disease of the airways with the following characteristics
  - Episodic, at least partially reversible obstruction to airflow
  - Airway inflammation
  - Increased airway responsiveness to a variety of stimuli
  - Alternative diagnoses excluded

Asthma Pathophysiology
- Early (minutes) -- bronchospasm; sympathetic and cholinergic control
- Late (hours to days) -- airway inflammation / bronchial hyperresponsiveness / microvascular leakage / airway edema / tenacious secretions / mucus plugging

Intervention
- The best strategy for management of acute exacerbations of asthma is early recognition & intervention before attacks become severe and potentially life threatening.
- Goals of acute therapy are reversal of bronchospasm and reversal of inflammation
- Goal of late therapy is to modulate immune response
Asthma Patient History

- Patients may present with wheezing, SOB, chest tightness and/or cough
- Cough common in kids (especially at night)
- To assess severity, ask about:
  - Duration of episode; severity
  - Use of steroids, beta-agonists
  - Associated symptoms (fever, chest pain)
  - History of hospitalization, intubation and ED visits
  - Age at onset of asthma
  - Other potentially complicating illnesses (e.g. diabetes, heart disease)

Asthma Examination

- Examine for and document
  - Speech pattern (full sentences?)
  - Wheezes / air movement / inspiratory to expiratory ratio
  - Silent chest = no air movement
  - Respiratory rate
  - Retractions / accessory muscle use
  - Diaphoresis -- if present, indicates severe disease
  - Cyanosis -- rare, but a sign of severe disease
  - Mental status -- combative or somnolent very concerning for impending respiratory failure

Classifying Asthma Severity

<table>
<thead>
<tr>
<th>Symptoms and signs</th>
<th>Initial PEF (or FEV1)</th>
<th>Clinical Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>SOB with activity</td>
<td>PEF ≥ 70%</td>
</tr>
<tr>
<td>Moderate</td>
<td>SOB limits usual activity</td>
<td>PEF 40-69%</td>
</tr>
<tr>
<td>Severe</td>
<td>SOB at rest; cannot converse</td>
<td>PEF ≤ 40%</td>
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<tr>
<td>Life-threatening</td>
<td></td>
<td>PEF &lt; 25%</td>
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</tbody>
</table>
Additional Severity questions
• How many exacerbations this year (ER or urgent care visits)?
• How many bursts of corticosteroids in last 6-12 months?
• How often is patient using their rescue inhaler?

NHLBI Asthma Guidelines
• Great resource -- National Heart Lung and Blood Institute publishes guidelines that are updated regularly
• http://www.nhlbi.nih.gov/guidelines/asthma/
• Divides chronic asthma into categories -- all patients with persistent symptoms need controller therapy (inhaled steroids)
• Provides recommendations on treating severe exacerbations

<table>
<thead>
<tr>
<th></th>
<th>Symptoms</th>
<th>Nighttime Symptoms</th>
<th>Lung Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe Persistent</td>
<td>• Continual symptoms</td>
<td>Frequent</td>
<td>FEV1 or PEF ≤ 60% predicted</td>
</tr>
<tr>
<td></td>
<td>• Limits activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Frequent exacerbations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate Persistent</td>
<td>• Daily symptoms</td>
<td>≥ 1 time a week</td>
<td>FEV1 or PEF &gt; 60% and &lt; 80% predicted</td>
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<tr>
<td></td>
<td>• Daily beta-agonist use</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Exacerbations affect activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Exacerbations &gt; 2/week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild Persistent (RULE OF TWOs)</td>
<td>• Symptoms &gt; 2 times a week but &lt; 1 time a day</td>
<td>&gt; 2 times a month</td>
<td>FEV1 or PEF &gt; 80% predicted</td>
</tr>
<tr>
<td></td>
<td>• Asymptomatic between exacerbations</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Exacerbations may affect activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild Intermittent</td>
<td>• Symptoms ≤ 2 per week</td>
<td>≤ 2 times a month</td>
<td>FEV1 or PEF &gt; 80% predicted</td>
</tr>
<tr>
<td></td>
<td>• Asymptomatic between exacerbations</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Exacerbations brief</td>
<td></td>
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</tr>
</tbody>
</table>
Asthma Evaluation

- Pulse oximetry in all patients
- Measurement of pulmonary function (FEV1, PEF) recommended -- can use to follow response to therapy
- ABG rarely indicated -- consider if severe or if PEF ≤ 25% predicted after initial treatment
- CXR is rarely useful; consider if rales, fever, unequal breath sounds (pneumothorax risk)
- Labs are rarely useful unless other medical problems or other specific indications / if on theophylline, measure level

General Asthma Treatment

- Oxygen for most patients
- Mild to moderate exacerbations can be treated with inhaled and oral medications
- Severely ill patients need IV access, monitoring, multiple concurrent breathing treatments, close observation and admission (often ICU)
- NHLBI recommends all patients receive serial measurements of lung function to assess treatment effect

Albuterol Beta-Agonist Treatment

- Short-acting inhaled beta-agonists (albuterol most commonly) is first-line therapy for all patients
- Nebulized albuterol -- 2.5-5mg via nebulizer
  - Continuous if patient moderately / severely ill
  - Intermittent (every 20 minutes to 1-4 hours) if patient mild
Albuterol Beta-Agonist Treatment
- Hand held nebulizer equivalent to metered dose inhaler plus spacers
- Dose -- 4-8 puffs every 20 minutes for three doses / higher than used for chronic, stable disease / mild to moderate exacerbations
- More cost effective, more rapid onset and fewer side effects than nebulizers

Other Beta-Agonists in Asthma Treatment
- Levalbuterol
  - 1.25-2.5mg every 20 minutes for 3 doses / more expensive than albuterol / no clear benefit except perhaps in children (where it is used most commonly)
- Epinephrine 1:1000 (1 mg/mL)
  - 0.3-0.5 mg every 20 minutes doses (0.01 mg/kg up to 0.3-0.5mg every 20 minutes for 3 doses in children)
  - Terbutaline also an option subcutaneously

Anticholinergic Treatment of Asthma
- Synergistic with beta-agonists in acute asthma with no additive side effects
- Do not use as sole first-line agent
- NHLBI recommends use in severe exacerbations
- Associated with lower admission rates and greater improvement in PEF / FEV1
- Ipratropium 0.5mg every 20 minutes for 3 doses, then as needed (children 0.25-0.5mg for 3 doses)
  - Add to same nebulizer as albuterol
  - Can use 4-8 puffs via MDI and spacer instead in mild to moderate exacerbations
Systemic Steroids in Asthma Treatment

- Underutilized, use reduces rate of relapse, may decrease need for admission
- Oral as effective as parenteral (IV or IM)
- Specific steroid used unimportant
- Doses over 40mg/day (prednisone equivalent) at discharge appear equally effective
- Taper unnecessary in most patients; use 40-60mg daily for 5-10 days
- Start inhaled corticosteroids (ICS) early (in ED)

Inhaled Steroids in Asthma Treatment

- Inhaled corticosteroids cause vasoconstriction and decrease inflammation
- Can and should be started in the ED in most asthmatics
- Current evidence equivocal regarding replacing systemic steroids with ICS in ED
- Should be prescribed at discharge in all patients with persistent asthma
- Are very expensive, can patient afford them?

Magnesium Treatment of Asthma

- Indicated in patients with impending respiratory failure or who are still severe after 1 hour of treatment
- Dose is 2gm IV over 20 minutes in adults (2.5-7.5mg/kg up to 2 grams in children)
- Short half-life (< 30 minutes)
- Use appears to decrease admission rates in severe asthmatics
- Minimal adverse effects if normal renal function
Heliox Treatment of Asthma
- Low density / may improve gas exchange / data conflicting
- May decrease need for intubation, hasten extubation and decrease peak pressures
- Comes in various helium/oxygen concentrations (80:20, 70:30, 60:40)
- Can be used to nebulize medications
- NHLBI -- reserve for use in severe asthmatics unresponsive to initial treatments

Drugs Not Indicated in Asthma
- Methylxanthines (e.g., aminophylline), a weak bronchodilator, narrow therapeutic range, high adverse effect profile
- Antibiotics -- not routinely indicated / only if evidence of bacterial infection
- Aggressive hydration -- of no proven benefit
- Mucolytics -- of no proven benefit
- Sedation -- potential harmful effect (respiratory depression)

Asthma-Induced Respiratory Failure
- IV beta-agonists
  - Unproven / not isoproterenol (cardiotoxic) / if epinephrine, use extreme care
- Leukotriene inhibitors (e.g., montelukast)
  - Possibly useful in impending respiratory failure / intravenous works faster / oral takes 90 minutes for effect
- Noninvasive ventilation
  - Data limited and conflicting, but may be effective in severe exacerbations with impending respiratory failure
- Ketamine
  - Poorly studied / potentially useful due to bronchodilatory properties
Asthma Disposition

- Discharge if pulmonary function returned to ≥ 70% of baseline and able to walk without significant shortness of breath
  - Oral steroids for 3-10 days and start ICS immediately
  - VERY important to teach concept of “controller” versus “rescue medication” to patients
- Admit moderate to severe patients to hospital (monitored setting if severe)
- Consider observation units for improving but not yet able to go home

Asthma Discharge Medications

- Depending on severity -- oral prednisone (40mg/day) for 3-10 days - no taper needed
- Start inhaled corticosteroids (ICS) if not on them
  - Fluticasone (Flovent) / Budesonide (Pulmicort)
  - Mometasone (Asmanex) Beclomethasone (Qvar)
  - Various types (dry powder, aerosol) and doses / all are expensive (about $120-$150)
  - Get familiar with one and its starting dose
- Rescue short acting beta-adrenergics
  - E.g., albuterol metered dose inhaler (about $50)

Chronic Obstructive Pulmonary Disease
COPD Overview

- Technically speaking, COPD is composed of three unique disease processes:
  - Asthma
  - Chronic bronchitis
  - Emphysema

COPD Overview

- Emphysema’s pathophysiology is a combination of bronchospasm, inflammation and lung destruction; usually not completely reversible (which is unlike asthma)
- Often due to chronic lung injury (e.g., smoking)
- Occurs later in life than asthma (usually)
- Diagnosis made by spirometry
- Global Initiative for Chronic Obstructive Lung Disease Guidelines are an excellent resource for treatment ([http://www.goldcopd.org/](http://www.goldcopd.org/))

COPD Presentation

- Often symptomatic at baseline with periodic exacerbations that bring patient to the ED
- Patients present with dyspnea, chronic cough and/or chronic sputum production
- May have fever (consider pneumonia), chest pain (consider acute coronary syndrome)
- Comorbid conditions common (e.g. heart disease, diabetes); affect treatment and disposition
COPD Examination

- Check vital signs, especially respiratory rate
- Lung sounds may vary between rhonchi, wheezing or minimal air movement
- If diaphoretic, accessory muscle use, agitation, somnolence - suspect severe exacerbation
- May have signs of right heart failure (peripheral edema, distended neck veins) if longstanding COPD with pulmonary hypertension

COPD Examination

- Patients with right-sided heart failure due to COPD have polycythemia (causes cyanosis) and peripheral edema ("blue bloater") / large heart with no obvious hyperinflation
- Others without right sided heart failure and polycythemia ("pink puffer") / small heart with hyperinflation

COPD Assessment

- Chest x-ray (check for pneumonia, CHF, pneumothorax)
- ECG for cardiac problems
- ABG / VBG to check for hypercarbia (use pH to assess acuity - low pH with high PaCO2 suggests acute CO2 retention)
- Pulse oximetry - useful to know baseline, but if low in a symptomatic patient, consider as a measure of illness and treat
COPD Treatment

- Oxygen to keep O2 sat 88-92%; watch closely for signs of CO2 retention (somnolence)
- Short-acting beta-agonists with or without short-acting anticholinergics - doses as in asthma
- Systemic corticosteroids shorten recovery time, improve lung function, reduce relapse, decrease length of hospital stay - doses as in asthma

COPD Treatment

- Antibiotics somewhat controversial -- use in
  - All patients with mechanical ventilation
  - Patients with all three cardinal symptoms (increased dyspnea, increased sputum volume and increased sputum purulence)
  - Patients with increased sputum purulence and one other cardinal symptom
- Use effective, inexpensive antibiotics
  - Trimethoprim-sulfamethoxazole 2 tabs PO twice daily x 10 days; clarithromycin 500mg PO twice daily for 7 days; doxycycline 100mg PO twice daily for 10 days
- More expensive: Quinolones - such as Levaquin, Avelox used to be first line for COPD? These cover better for pseudomonas or anaerobes which smokers tend to have due to the chronic bronchitis nature

COPD Disposition

- Consider hospitalization in patients with:
  - Marked increase in baseline symptoms, severe underlying COPD, inadequate response to treatment, serious comorbidities, frequent exacerbations, older age or insufficient home support
- Can discharge if none of the above
  - Discharge meds should include inhaled long-acting beta-agonists, oral / inhaled corticosteroids, antibiotics if indicated