Common Pulmonary Problems

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Family Medicine Board Review Course, 2012

Asthma COPD
ILD Cancer, Nodules
Obstructive Sleep Apnea
Pulmonary Hypertension

Obstructive Sleep Apnea
Mr. Nap
56 year old obese man complaining of daytime somnolence. Difficulty concentrating at work, falls asleep during meetings. Wife notes loud snoring at night and episodes of interrupted breathing.

Obstructive Sleep Apnea
- Repeated episodes of apnea during sleep
- Caused by episodic airway obstruction

Sequelae
Neurocognitive
- Excessive daytime sleepiness
- Decreased cognitive performance
- Increased automobile accidents
- Decreased quality of life
- Mood disturbance

Sequelae
Cardiac
- Systemic hypertension
- Pulmonary hypertension
- Coronary artery disease
- Cerebrovascular disease
- Arrhythmias
Physical Exam
- Obesity
- Crowded pharynx (Friedman Tongue Position)
- Systemic hypertension
- Nasal obstruction
- Neck circumference > 17”
- Lower extremity edema

Diagnostic Testing
- Polysomnography: “Sleep Study”
  - Gold standard
  - Apnea-hypopnea index
    | Apnea-Hypopnea Index | Severity |
    |----------------------|----------|
    | <5                   | Normal   |
    | 5-15                 | Mild     |
    | 15-30                | Moderate |
    | >30                  | Severe   |

Treatment
Behavior Modification:
- Weight loss
- Positioning
- Tobacco cessation
- Avoid sedative hypnotics

Diagnostic Testing
- Split night polysomnography
  - Most common test
  - Diagnostic study for 2-3hr, then titrate and monitor effects of CPAP (therapeutic)
Continuous Positive Airway Pressure
- Most effective treatment
- Should be offered to anyone with AHI>15 or AHI>5 and sequelae

Oral Appliances
- Reduce night-time awakenings, hypoxia
- Improve neurocognitive function, reduce sleepiness, improve QOL
- No evidence of impact on mortality
- Less effective than CPAP
- Can be offered to patients with mild-moderate OSA who do not want CPAP

Surgery
- Effective if an obstructing lesion is present
  - Tonsilar hypertrophy
  - Uvulopalatopharyngoplasty (UPPP) for other patients
- Scant evidence of efficacy
- Cure achieved in a minority of patients

Mr. Nap
- Polysomnography showed an AHI of 21.
  - During the test, CPAP was administered and improved the AHI to normal at a pressure of 5 mm Hg
  - You prescribe CPAP and on follow up, the patient’s daytime sleepiness has resolved
Asthma COPD

Ms. Wheeze

34 year old woman complains of episodic shortness of breath and wheezing, particularly severe when she visits her neighbor, who has a dog.

Has episodes of dyspnea 3-4 times a week, and wakes at night coughing twice a week.

She was hospitalized on multiple occasions for respiratory issues as a child.

No smoking history.

Asthma

Increased secretions Bronchial constriction
Caused by bronchial inflammation
Increased secretions
Bronchial constriction

New guidelines 2011

- Assess asthma severity
- Assess and monitor asthma control
- Use inhaled corticosteroids
- Use written asthma action plans
- Schedule follow-up visits
- Control environmental exposures
Assessing Asthma Severity

<table>
<thead>
<tr>
<th></th>
<th>Mild Intermittent</th>
<th>Mild Persistent</th>
<th>Moderate Persistent</th>
<th>Severe Persistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>≤ 2 per week</td>
<td>&gt; 2 per week</td>
<td>daily symptoms</td>
<td>continual symptoms</td>
</tr>
<tr>
<td>Nighttime symptoms</td>
<td>≤ 2 per month</td>
<td>&gt; 2 per month</td>
<td>&gt; 1 per week</td>
<td>frequent</td>
</tr>
<tr>
<td>Lung function</td>
<td>≤ 80% predicted</td>
<td>≤ 80% predicted</td>
<td>&gt; 60% - 80%</td>
<td>≤ 60%</td>
</tr>
<tr>
<td>FEV1 or PEFR</td>
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</tbody>
</table>

Albuterol PRN

- Low dose inhaled steroid
- ↑ steroid or Add LABA
- LABA + mod dose steroid

Assess Control

Assess control

Step 1: Persistent Asthma: Daily Medication
- Consult with asthma specialist if step 4 care or higher is required.
- Consider consultation at step 3.

Step 2: Persistent Asthma: Daily Medication
- Consider consultation for patients with severe asthma.

Step 3: Persistent Asthma: Daily Medication
- Consider consultation for patients with moderate persistent asthma.

Step 4: Persistent Asthma: Daily Medication
- Consider consultation for patients with mild persistent asthma.

Step 5: Persistent Asthma: Daily Medication
- Consult with asthma specialist if step 4 care or higher is required.
- Consider consultation at step 3.

Step 6: Persistent Asthma: Daily Medication
- Consult with asthma specialist if step 4 care or higher is required.
- Consider consultation at step 3.

Assess control

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Assess control

Each step: Patient education, environmental control, and management of comorbidities.

Quick Relief Medication for All Patients
- SABA as needed for symptoms.
- Intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed.
- Short course of oral corticosteroids may be needed.
- Use of SABA 2-4 days a week for symptoms may help prevent exacerbation and the need to step up treatment.

My Asthma Action Plan

Age: 35 years

<table>
<thead>
<tr>
<th>Step 1: SABA PRN</th>
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</thead>
<tbody>
<tr>
<td>Step 2: Medium dose ICS + LABA</td>
</tr>
<tr>
<td>Step 3: High dose ICS + LABA</td>
</tr>
<tr>
<td>Step 4: LABA + mod dose steroid</td>
</tr>
<tr>
<td>Step 5: LABA + mod dose steroid</td>
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<td>Step 6: LABA + mod dose steroid</td>
</tr>
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Assess control

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Step 6: Persistent Asthma: Daily Medication
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- Consider consultation at step 3.
Ms. Wheeze
- You diagnose mild persistent asthma and prescribe
  - Albuterol PRN
  - Low dose inhaled steroid
  - Avoidance of dogs and other triggers
- On follow up, the patient reports dyspneic episodes once or twice a month, no nighttime awakening

Mr. Hack
72 year old man complaining of 2 years of progressively worsening dyspnea and cough productive of white sputum.
50 pack year smoking history.
On exam, diffuse expiratory wheeze is heard.

Chronic Obstructive Pulmonary Disease

Risk Factors
- Tobacco
- Particulate air pollutants
- Indoor wood burning stoves or open fires
- Occupational chemicals
- \( \alpha_1 \)-antitrypsin deficiency (<1%)
## Diagnosis and Severity

<table>
<thead>
<tr>
<th></th>
<th>FEV1/FVC</th>
<th>FEV1</th>
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<tbody>
<tr>
<td>Mild</td>
<td>&lt;70%</td>
<td>≥ 80%</td>
</tr>
<tr>
<td>Moderate</td>
<td>&lt;70%</td>
<td>50% ≤FEV1&lt;80%</td>
</tr>
<tr>
<td>Severe</td>
<td>&lt;70%</td>
<td>30% ≤FEV1&lt;50%</td>
</tr>
<tr>
<td>Very Severe</td>
<td>&lt;70%</td>
<td>&lt;30%</td>
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</table>

With emphysema, will see a greater ↓ in DLCO

## Treatment of acute exacerbation

- **O₂**
- Albuterol
- Ipratropium
- Antibiotics when increased sputum
  - Doxycycline
  - Azithromycin
- Systemic steroids

## Mr. Hack

PFTs show an FEV1/FVC of 64%, and an FEV1 of 53%.

You diagnose the patient with moderate COPD.

You discuss smoking cessation with the patient, who enrolls in a smoking cessation group.

You initiate albuterol PRN and tiotropium daily.

You provide a pneumococcal and flu vaccine.

On his return visit, the patient notes much improved dyspnea and the ability to walk to the grocery store without difficulty.
Ms. Pant

58 year old woman presents with 3 years of slowly progressive dyspnea on exertion and 1 year of nonproductive cough. She tires easily, and is able to walk only 1.5 blocks before resting. Exam reveals dry rales throughout bilateral lung fields and clubbing of the digits.

Interstitial lung disease

- Heterogeneous group of diseases
- Characterized by interstitial tissue destruction
- Categorized by cause

Categories of interstitial lung disease

- Environmental/Occupational exposure
- Autoimmune disorders
  - polymyositis/dermatomyositis
  - rheumatoid arthritis,
  - systemic lupus erythematosus
  - scleroderma
  - mixed connective tissue disease
- Drug induced, particularly antineoplastic
- Idiopathic
Presentation
- Progressive dyspnea on exertion
- Non-productive cough
- Fatigue, malaise
- History of occupational exposure
- Time course is variable, depending on diagnosis

Exam
- Dry crackle or “velcro rales”
- May be best heard in the posterior axillary line or bases
- Signs of cor pulmonale may be present in advanced cases
  - Accentuated S2
  - Right sided heave
  - Clubbing may be present

Diagnostic testing
- Plain chest radiograph variable, but in most cases
  - reduced lung volumes
  - bilateral reticular or reticulonodular opacities
Diagnostic Testing

- **Spirometry: Restrictive Pattern**
  - Reduced TLC
  - Reduced FVC
  - Normal FEV1/FVC
- **HRCT sensitive and specific**
  - can be diagnostic or guide biopsy
- **Biopsy diagnostic**
  - not always recommended for mild, non-progressive disease

Treatment

- **Avoid exposures**
- **Tobacco cessation**
- **Corticosteroids for some**
- **Immunosuppressive and cytotoxic therapy for some**
- **O₂ and Bronchodilators**

Ms. Pant

Spirometry shows FVC of 46% predicted and FEV1/FVC of normal.
You obtain a HRCT, which shows reticular abnormalities with traction bronchiectasis and baseline reticular and branching reticular pattern consistent with Usual Interstitial Pneumonia, a type of idiopathic ILD.

Mr. Spot

49 yo man requires chest x-ray for a physical exam for work. No cough, dyspnea, or chest pain.

Chest radiograph shows 1 cm nodule in right upper lobe with central calcification

ppd negative

No prior films for comparison
Solitary pulmonary nodules

Solitary mass <3cm surrounded by normal lung tissue

<table>
<thead>
<tr>
<th>Age</th>
<th>Size</th>
<th>Appearance</th>
<th>Interval change</th>
<th>Smoking</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk</td>
<td>&lt;30 yo</td>
<td>&lt;2.5cm “popcorn” appearance</td>
<td>No growth over 2 years</td>
<td>No smoking history</td>
<td>Upper lobe location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Diffuse, laminar or central calcification”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Risk</td>
<td>&gt;30 yo</td>
<td>&gt;2.5cm Spiculated</td>
<td>Growth on serial imaging</td>
<td>Smoking history</td>
<td>Prior history of cancer</td>
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Management

- If low risk, repeat CXR or CT q3-6 months to assess for change.
- If unchanged for 2 years, likely benign
- If more than one high risk feature, follow up CT chest

CT findings

- If highly suspicious, evaluate for resectability and consider wedge resection/lobectomy
- If benign, repeat imaging q3-6 months for 2 years
- If indeterminate, CT guided biopsy vs PET scan

Mr. Spot Continued

- Has a history of smoking and, because he is 49 years old, has 2 high risk features.
- You order a CT scan, but the patient does not follow up and is lost to care.
- Two years later, he returns complaining of fatigue, weight loss and occasional hemoptysis
Risk Factors
- Tobacco
- 2nd hand smoke
- Dose response
- Radon
- Asbestos
- COPD, pulmonary fibrosis, TB
- Family history

Screening?
- Screening of high risk individuals NOT helpful
- CT
- CXR
- PET
- Sputum cytology

Diagnosis
- Biopsy
- Four types:
  - Small-cell carcinoma
  - Adenocarcinoma
  - Squamous cell carcinoma
  - Large-cell carcinoma

Small Cell Lung Cancer
- SCLC is considered systemic from the outset
- TNM staging not used
- Surgery not an option

Non-small cell lung cancer (NSCLC)
Limited SCLC
- Confined to one half of the chest and ipsilateral supraclavicular nodes
- Treatment: Combination Radiation and Chemotherapy
  - 80-90% Response
  - 50-60% Remission
  - 30-40% 2-yr Survival
  - 10-15% 5-yr Survival
  - Median Survival 15-18 months

Extensive SCLC
- Disease spreading beyond one hemithorax
- Treatment: Chemotherapy only
  - 60-80% Response
  - 20-30% Remission
  - <10% 2-yr Survival
  - Rare 5-yr Survival
  - Median survival 9-10 months

Non small cell lung cancers
- Adenocarcinoma
- Squamous cell carcinoma
- Large cell carcinoma

- Treatment similar for all three

Non small cell lung cancers
Determine TNM stage
- Chest and liver CT and, if resectable, PET scan to look for metastases
- Brain MRI
- Bone scan

- If no metastases, and resectable, surgical cure may be possible
Mr. Spot

- A CT shows that the nodule has grown to 3cm.
- Percutaneous biopsy shows NSCLC, and TNM staging shows that the tumor is stage 2.
- The patient has the tumor resected and begins chemotherapy.

Mr. Nap is back

Though his night-time awakening and daytime fatigue have improved, Mr. Nap begins complaining of dyspnea on exertion and new onset lower extremity edema.

On exam, his vital signs are normal but he is found to have a pronounced pulmonic component of S2. He has jugular venous distension and 1+ edema to the ankles bilaterally.

Pulmonary Hypertension

Mean pulmonary artery pressure >25
WHO Categories

I. Pulmonary Artery Hypertension
   - HIV
   - Portal Hypertension
   - Connective tissue disease
   - Medications: anorexigens, amphetamines, cocaine, chemotherapeutics
   - Genetic idiopathic PAH

II. Left heart disease

III. Lung disease or hypoxemia

IV. Thromboembolic disease

V. Unclear mechanism
   - Myeloprolifertive disorders
   - Sarcoidosis
   - Unknown cause

Symptoms
- Dyspnea
- Fatigue, Lethargy
- Lightheadedness, syncope
- Less common: Cough, hemoptysis, hoarseness
- Right sided CHF symptoms

Physical exam
- Loud P₂
- Murmur of TR
- Parasternal lift
- JVD
- Signs of right heart failure
- Clear lungs
Studies

- **CXR**: Enlarged proximal pulmonary vessels, distal pruning
- **ECG**: Right sided hypertrophy or right atrial enlargement
- **Echo**: Estimate PA pressure. Assess for shunts, valvular disease, left or right sided failure or hypertrophy

Studies

- **Right Heart Catheterization**: Confirm diagnosis. Measure pressures, RV fxn, shunts. Test responsiveness to vasodilators

Seeking a cause

- **PFTs**: Identify obstructive/restrictive lung disease
- **High Resolution CT (HRCT)**: Identify interstitial lung disease
- **Polysomnography**
- **VQ scan/CT Angiogram**: R/O chronic PE

Seeking a cause

- **Selected labs**: ANA, RF, ESR. LFTs, hepatitis serologies. HIV antibody. Drugs—cocaine, anorexigens
Management

- Treat underlying cause
- Anticoagulation
- Diuretics
- Digoxin
- Supplemental oxygen
- Exercise
- Vasodilators—select cases
- Lung transplantation

Mr. Nap

- An EKG in clinic shows RVH and RAD
- An echocardiogram estimates his PAP to be 49
- You refer to a cardiologist, who performs right heart catheterization. PA pressure is 60.
- PFTs show restrictive pattern consistent with Obesity Hypoventilation Syndrome, and ABG is 7.37/51/59
- The patient is started on continuous oxygen therapy
Ms. Clot
45 year old obese woman s/p knee replacement surgery 3 weeks ago presents to the emergency room with sudden onset pleuritic chest pain and shortness of breath. She denies calf pain or swelling.
HR: 117, BP 126/77, T: 37.2, RR: 28, O2 sat: 88%
Pulmonary exam is normal and CXR is unremarkable.

Pulmonary Embolism
- 250,000 cases/year
- Up to 15% mortality
- No perfect test

Risk Factors
- Advancing age
- Obesity
- Tobacco use
- Cancer
- Hypercoagulability
- Pregnancy
- Estrogen therapy
- Nephrotic syndrome
- Prior thromboembolism

Risk Factors
- Stasis
- Immobilization
- Surgery
- Paralysis
- Stroke
- Vascular injury
- Trauma
- Venous catheterization
### Well’s Criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Score</th>
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</thead>
<tbody>
<tr>
<td>DVT signs or symptoms</td>
<td>3</td>
</tr>
<tr>
<td>HR &gt; 100</td>
<td>1.5</td>
</tr>
<tr>
<td>Immobilization/Surgery within 4 weeks</td>
<td>1.5</td>
</tr>
<tr>
<td>Previous DVT or PE</td>
<td>1.5</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>1</td>
</tr>
<tr>
<td>Active malignancy</td>
<td>1</td>
</tr>
<tr>
<td>Alternative diagnosis less likely</td>
<td>3</td>
</tr>
<tr>
<td>Low &lt; 2</td>
<td>Moderate 2-6</td>
</tr>
<tr>
<td>Moderate 2-6</td>
<td>High &gt; 6</td>
</tr>
</tbody>
</table>

### Diagnostic tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Specificity</th>
<th>Sensitivity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Dimer</td>
<td>Low</td>
<td>High</td>
<td>Only useful in low Well’s score; rules out DVT/PE if low Well’s score</td>
</tr>
<tr>
<td>Lower Extremity Doppler U/S</td>
<td>High</td>
<td>Low sensitivity</td>
<td>Does not rule out PE</td>
</tr>
<tr>
<td>VQ scan</td>
<td>&gt; 60%</td>
<td>Nondiagnostic</td>
<td>If clearly positive or negative, can be useful</td>
</tr>
<tr>
<td>CT angiogram</td>
<td>Sensitivity 66-93%</td>
<td>Specificity 89-98%</td>
<td>Better detection for larger PEs</td>
</tr>
</tbody>
</table>

### EKG

- S1
- Q3
- T3

### Treatment

- Low molecular weight heparin
- Unfractionated heparin
- Continue until therapeutic on warfarin
- Carfarin
  - Start first day
  - Goal INR 2.0-3.0
  - Duration 3-6 months if provoked
  - 3 months to indefinite if unprovoked
  - Lifelong if recurrent
Other treatments

- **Thrombolysis**
- Hypotension
- Severe hypoxia
- Extensive clot burden on imaging
- Right ventricular dysfunction
- Free floating clot
- PFO

Ms. Clot

Given her pulse and recent surgery, in addition to the absence of a more likely diagnosis, the patient’s well’s score is 6, indicating a moderate risk of PE.

A CT shows a pulmonary embolism. A heparin drip is started along with 5mg warfarin daily.