CLINICAL CLERK SEMINAR SERIES

SESSION 5:

APPROACH TO DYSPNEA
Approach to Dyspnea

DESCRIPTION

Dyspnea derives from Greek for "hard breathing". It is often also described as "shortness of breath". This is a subjective sensation of breathing, from mild discomfort to feelings of suffocation.

Always when managing a patient with dyspnea [or otherwise], one must quickly check the ABC’s i.e. airways, breathing, and circulation. Once satisfied with the stability of these aspects of the patient’s vitals, one may then proceed to the history and physical part of the assessment which should provide the diagnosis most cases.

During assessment, one can initiate management based on initial assessment:
1) Place all patients on supplemental oxygen, pulse oximetry, and cardiac monitor
2) Initiate therapy for suspected cause of dyspnea such as:
   - Asthma/COPD → nebulized bronchodilators and I.V. steroids
   - Congestive heart failure → diuresis, morphine, nitrates, sit upright

   • **Intubate patients if impending respiratory failure**

Think of the etiology as arising from 4 main categories: respiratory, cardiac, neuromuscular, and psychogenic and other systemic causes. The following table lists the common causes under these category in order of importance.

<table>
<thead>
<tr>
<th>Respiratory</th>
<th>Cardiovascular</th>
<th>Neuromuscular</th>
<th>Systemic</th>
<th>Psychogenic</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Asthma</td>
<td>CHF/pulmonary edema</td>
<td>Rib Fracture/ chest trauma</td>
<td>Anemia</td>
<td>Hyperventilation syndrome</td>
</tr>
<tr>
<td>COPD *if respiratory failure</td>
<td>Acute Coronary Syndrome</td>
<td>*Flail Chest</td>
<td>Acute Renal Failure</td>
<td>Psychogenic dyspnea [pseudoasthma]</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>Pericardial Disease/cardiac tamponade</td>
<td>Massive Obesity</td>
<td>Metabolic Acidosis</td>
<td>Vocal Cord Dysfunction Syndrome</td>
</tr>
<tr>
<td>*Pulmonary Embolus</td>
<td>Valvular Heart Disease</td>
<td>Kyphoscoliosis</td>
<td>Thyrotoxicosis</td>
<td><strong>Upper Airway Obstruction</strong></td>
</tr>
<tr>
<td>Lung tumor</td>
<td>Pulmonary Hypertension</td>
<td>CNS/Spinal Cord Disorders</td>
<td>Cirrhosis</td>
<td>Foreign body aspiration</td>
</tr>
<tr>
<td>*Pneumothorax</td>
<td>Arrhythmia</td>
<td>Phrenic Nerve Paralysis</td>
<td>Anaphylaxis</td>
<td>Angioedema</td>
</tr>
<tr>
<td>*aspiration</td>
<td>Intracardiac shunt</td>
<td>Myopathy and neuropathy</td>
<td>sepsis</td>
<td>Epiglottitis/ croup</td>
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</table>
History:
Ask about the onset and course of dyspnea and if it was a chronic issue. One can think of very sudden onset [minutes] and [usually] immediately life threatening conditions such as those with an * in the above table, acute, subacute, and chronic conditions. Otherwise acute [hours] causes of dyspnea include pneumonia, CHF [pulmonary edema], acute coronary syndrome, pericardial disease, valvular heart disease, acute renal failure, acidosis, thyrotoxicosis, and cirrhosis.
Subacute [days/weeks] etiologies could also include pneumonia [e.g. TB], CHF, pericardial disease, and anemia.
Chronic [recurrent/months] causes of dyspnea are COPD, CHF, Neuromuscular problems, pulmonary hypertension, anemia, and asthma.

Ask about the following associated symptoms:
Stridor,
Cough – sputum production and color
Fever and chills, sweats, lethargy,
[pleuritic?] chest pain, wheeze, chest tightness, hemoptysis, hoarseness,
Edema, weight loss/gain, orthopnea, PND, anxiety, confusion, lightheadedness,

Physical Examination:
Check for tachycardia, tachypnea, fever, and hypertension
Weight increase may signal worsening CHF
Contractions of the accessory muscles of respiration suggest severe difficulty
Retraction of the supraclavicular fossa implies tracheal stenosis
Pursed-lip breathing and a prolonged expiratory phase are signs outflow obstruction
Retraction of the intercostal muscles on inspiration is characteristic of emphysema
Percuss for dullness and hyperresonance
Auscultate for wheezes, and quality of breath sounds
Crackles suggest fluid in the airway, as occurs with bronchitis, pneumonitis, and CHF
Normal findings on lung examination do not rule out pulmonary pathology but do lessen its probability and the likelihood that it is severe
The cardiac examination should focus on signs of left-sided heart failure, detection of left-sided heart murmurs, and signs of pulmonary hypertension and its consequences (accentuated and delayed P2, RV heave, RV S3, right-sided systolic regurgitant murmur of TR, increased JVP, and peripheral edema)
Examine the abdomen for ascites and hepatopjugular reflux as well as the legs for edema

Standard workup for dyspnea:
- CXR
- EKG → assess acute coronary syndrome
- ABG → calculate A-a gradient and assess acidosis
- CBC → assess anemia and WBC for infectious processes
- Electrolytes, BUN, Creatinine, Blood Glucose → assess metabolic derangements
<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Asthma</th>
<th>COPD</th>
<th>Pulmonary Edema</th>
<th>Acute Coronary Syndrome</th>
<th>Pneumonia</th>
<th>Pulmonary Embolus</th>
<th>Pneumothorax</th>
<th>Upper Airway Obstruction</th>
<th>Cardiac Tamponade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking, Allergy, dust, animals, pollen, URTI, exercise</td>
<td>Smoking, ↓α 1-antitrypsin, occupational exposure, age</td>
<td>CAD, left heart failure, Valvulopathy, hypertension,</td>
<td>Smoking, ↑BP, DM, age, obese hyperlipidemia, Family history</td>
<td>Aspiration, age hospitalization, EtOH, immunosuppression</td>
<td>DVT, Virchow’s Triad: injury, immobilization, ↑coagulability</td>
<td>Trauma, COPD, vigorous exercise, diving, Mech. Vent.</td>
<td>Angioedema, epiglottitis, foreign body</td>
<td>Uremia, trauma neoplasm, MI, Infection, post-pericardiotoomy.</td>
<td></td>
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</table>

| Associated Symptoms | Wheeze, cough | Cough, sputum, wheeze, cyanosis | orthopnea, PND, cough, weakness, edema | Radiating chest pain, anxiety, presyncope, pallor, N/V/D | cough with dark sputum, F/C, pleuritic chest pain, anorexia | Syncope, pleuritic chest pain, hemoptysis | Sudden, sharp, pleuritic chest pain, cyanosis, Cough, stridor, dyspnea, aphonia, hoarseness | Agitation |

| Vital signs | Tachycardia, Pulsus paradoxus | Tachypnea, Cheyne-Stokes respiration, tachycardia | variable | tachypnea, tachycardia | Hypotension, cardiac arrest, tachypnea, tachycardia | Weak & rapid pulse, shock, Tachycardia | Tachycardia, Hypotension, Pulsus paradoxus |

| Inspection | Cyanosis, barrel chest, accessory muscle use | Cyanosis, barrel chest, accessory muscle use | Respiratory distress, ↑JVP, Diaphoresis, ↑JVP, cyanosis, altered mentation/consciousness | ↑JVP, signs of DVT | Respiratory distress, pallor, ↑JVP, Respiratory distress, anxiety | ↑JVP |

| Palpation | | | | | | | |

| Percussion | Hyperresonance | Hyperresonance | Dullness at base | dullness | Tracheal deviation | Inspiratory thrill over larynx | Right upper quad. tenderness |

| Auscultation | Long expiration, ↓breath sounds, wheeze | Wheeze, ↓breath sounds, | Moist rales, S3, S4, ↑P2 | Rales, S4, murmur | rales, egophony, ↓breath sounds, friction rub | S3, clear lungs | ↓asymmetric breath sounds, wheezing localized to the neck or trachea | Distant heart sounds, |

| Laboratory Findings | | | | | | | |

| Radiologic Findings | Flattened diaphragms, hyperinflation, atelectasis | ↑AP diameter Flattened diaphragms, hyperinflation | Interstit. edema, cardiomegaly, vascular redist., Kerley B lines, pleural effusions | Signs of CHF | consolidation pleural effusion, Usually normal, Hampton’s hump. V/Q scan, [CT or pulm.] angiogram to dx | Air without peripheral lung markings, mediastinal shift | Soft tissue neck radiograph | Enlarged cardiac shadow |

| Pulmonary function testing | ↓FEV1, ↓FVC, ↑TLC,RV | | | | | | |

| Other Tests | Monitor peak flows | Echocardiogram Swan-Ganz, angiogram | EKG: ST ↑or ↓, Q waves, angiogram | Thoracentesis with pleural fluid analysis | EKG: S1Q3T3, incomplete RBBB | CT, MRI, flexible bronchoscopy | EKG, echo., sample pericardial fluid |

| Therapy | B-agonists, steroids, d/c triggers, [cromolyn], anticholinergics | D/c smoking, O2 tx, bronchodilators, antibiotics, (corticosteroids) | Treat etiology, Sit pt. Up, O2, Lasix, nitrates morphine, ACE inhibition | CABG, PCI or TPA, heparin, ECASA, nitrates, B-blocker, ACE inhibition | Antibiotics, hospitalize based on prognostic criteria | O2, anticoag., Thrombolytic tx or embolectomy if massive PE | Admit with monitoring if >30% lung collapse, O2, chest tube | Fluids, inotropes to treat hypotension, pericardiocentesis |
Cases
Case 1:
A 46-year-old woman with a 14-year smoking history presents with a cough and progressive dyspnea of 6 months duration. Her symptoms have been unresponsive to antibiotic treatment.

1] What is your differential diagnosis based on history alone?

Physical exam: afebrile with a heart rate of 112, respiratory rate of 20 per min., and BP of 130/100. There were decreased breath sounds over the right chest. There was no peripheral edema, clubbing, or cyanosis

CXR: right hemidiaphragm was elevated

2] Discuss the implications of the physical exam:

3] what further investigations would you order?

ABG: RA / 7.46 / 91 / 32 / 27

4] What is the patient's acid-base status?

5] What further testing would you do to finalize diagnosis?

Case 2:

A 45 year old woman presents with acute onset of dyspnea at rest, which started three days prior and worsened by minimal effort. This was accompanied by left posterior chest pain that worsened on deep inspiration.

1] What else do you want to ask?

Px: The patient was afebrile. Heart rate was 110 bpm, respirations were 23 per minute and blood pressure was 130/90 mm Hg. Head and neck examination revealed no lymphadenopathy. The JVP was elevated to the angle of the jaw at 45° with a large V wave and a positive hepatojugular reflux. A Right ventricular heave was palpated at the left sternal border and the pulmonary component of the 2nd heart sound was felt. Auscultation revealed a right ventricular heave at the lower left sternal border and the P2 was increased. A holosystolic crescendo murmur of III/VI intensity was increased during inspiration and heard at the LLSB as well. Accessory muscles were being used for breathing. Lungs were clear. Abdominal exam revealed moderate ascites, extensive collateral circulation of the inferior vena cava type and a tender liver 6 cm below the costal margin. There was bilateral leg edema, with hyperpigmentation, varicosities and shiny, thin skin. Compression of calf muscles elicited tenderness.
2] What is your diagnosis based on the history and physical?

3] What would an investigation for a procoagulant disorder include?

Case 3:

A 56-year-old man presents at the height of a winter cold spell with a productive cough that he describes as worsening, moderately severe respiratory distress, and a tenacious, yellow sputum. His records show a history of productive cough for several months at a time over the last 3 to 4 years. The records also show 2 recent episodes (over the last 3 months) of coughing with respiratory difficulty similar to the present one, both of which had been treated with antibiotics. On the last occasion (2 months ago), he had also been given inhaled albuterol and a short (2-week), tapering course of oral prednisone, which improved his pulmonary function to the point that he felt better than he had for some time; he had not been coughing at all until a few days ago.

1) What is the most likely diagnosis for this man’s presentation?

On examination, a low-grade fever (38°C [100.4°F]) is present, and his FEV₁ is 60% of the predicted normal value. Expiration is prolonged and his breath sounds are diminished. Pulse oximetry reveals an arterial oxygen saturation of 90%. There is no evidence of any other serious co-morbidities (eg, abnormal cardiovascular findings), and he has no associated nasal symptoms.

2) What if any antibiotic would you choose for this patient?

Case 4:

A 74-year-old retired shipyard laborer with a 45+ pack-years smoking history and previous work in sandblasting and fiberglass presented with increasing dyspnea and peripheral edema.

On physical examination, he was a thin, cyanotic man in moderate pulmonary distress who was afebrile with a heart rate of 90, respiratory rate of 28, and blood pressure of 125/90. His chest showed increased A-P diameter and the breath sounds were faint with a prolonged expiration. The liver edge was 3 cm below the right costal margin. There was digital clubbing with cyanosis and marked peripheral edema.

1] What is your differential diagnosis for this man’s chronic presentation?

Fifteen months prior to this presentation, the patient had undergone pulmonary function testing with the following results:

Past investigations:

Blood gases: Room Air 100% oxygen
pO2  43 mm Hg  452 mm Hg  
pCO2 22 34  
pH  7.51  7.38

Pulmonary function tests (values shown as % of expected value):
FEV1  61%
Vital Capacity  73%
FEV1/VC 0.61 (normally >0.72)
Residual volume  175%
Total lung capacity 105%
Diffusion Cap. CO 13%

Ultrasound revealed right ventricular hypertrophy.

2] Calculate the A-a gradient and comment on the results of the Blood gas tests.

3] Interpret the pulmonary function test result

Case 5:

A 64 year old male presents with fever, shaking chills, a nonproductive cough, and pleuritic chest pain for six days; and shortness of breath, blood-tinged sputum, and confusion for one day. The patient had mild hypertension and a 150 pack/year smoking history

1] What is the differential diagnosis?

Physical exam: BP 160/70, P 130, RR 50, and T 40.2°C. He was confused, tachypneic, cyanotic, and in severe respiratory distress. Neck was supple, dullness and rales were present over the entire right lung field, and cardiac and abdominal exams were within normal limit

2] What lab tests would you order?

3] What other tests are indicated?

Lab: WBC 11,600 with 77% PMN, 20% bands; ABG RA - pH 7.43, pO2 39

CXR: consolidation of right upper, middle and lower lobes

4] What are considered poor prognostic factors in pneumococcal pneumonia?

5] What complications may you see in patients with pneumococcal pneumonia?
Answers to Cases:

Case 1

1] Bronchitis, chronic infection, tumor
2] Vitals: Stable hemodynamics, mild tachypnea
   Decreased breath sounds = decreased volume of ventilation to the right lung
   No Digital clubbing = no chronic cyanosis
3] ABG, CBC
4] Respiratory alkalosis
   Bicarb expected to be 23 – 25 if acute, 20 if chronic
   → no renal response indicates very acute so 2ary to distress/anxiety
5] Bronchoscopy
   CT chest +/- pulmonary embolus protocol [spiral CT]

Case 2:

1] Leg symptoms: pain, associated local heat and redness
   Fever, chills, night sweats, cough, sputum
   History of miscarriage, oral contraceptive use, smoking, ambulation
   Family history
2] Pulmonary Embolus

3] Levels of proteins C and S, antithrombin III, lupus anticoagulant, anticardiolipin antibodies, resistance to activated protein C [Factor V Leiden] and a CBC. Screen for occult malignancies with Fecal occult blood, thoracic and abdominal CT scans and GI series

Case 3:

1] Acute exacerbation of chronic bronchitis
2] second-generation macrolide, a second- or third-generation cephalosporin, or a fluoroquinolone

Case 4:

1] emphysema, silicosis, right sided heart failure 2nd pulmonary disease [cor pulmonale]
2] A-a gradient = 79. Hypoxia improves with oxygen significantly therefore not a shunt but likely V/Q mismatch
3] decreased FEV1 and Vital capacity with the FEV1/VC ratio <0.72 and increased RV is consistent with obstruction.

Case 5:

1] Bacterial pneumonia, bronchitis, pulmonary embolism, bronchiectasis, lung cancer
2] CBC with differential, ABG, blood cultures
3] CXR
4] Bacteremia, Type 3 pneumococci, Age (elderly), Splenectomy or functional asplenia, Multilobe involvement, Leukopenia, Jaundice, Hypotension, Extrapulmonary complications [Meningitis, Endocarditis]

5] Pulmonary: Empyema, Bronchopleural fistula, Lung abscess, Pericarditis

   Extrapulmonary: Meningitis, Endocarditis, Arthritis, Peritonitis