MODULE: THORAX AND LUNGS

OBJECTIVES:

Upon completion of this module, the student will be able to:

1. Recognize anatomic, physiologic and developmental aspects of the pediatric and adult pulmonary system.
2. Take a complete pediatric and adult respiratory history.
3. Perform a complete physical examination of the respiratory system.
4. Identify normal and abnormal breath sounds.

REQUIRED READINGS:

Bates’ guide to physical examination and history taking, Chapter 8, The Thorax and Lungs.

OPTIONAL READINGS:


PRACTICE:

Equipment Needed: Stethoscope Measuring Device Marking Pen
Define: atelectasis
bronchophony
bronchovesicular
Cheyne-Stokes
crackles (rales)
egophony
friction rub
wheezes
pectoriloquy

1. List the cardinal symptoms of the cardiopulmonary system

2. Describe the various landmarks used to locate the five lung lobes

3. State what 3 characteristics of sputum should be noted on gross inspection by a practitioner.

4. List risk factors that would be significant in a family history related to respiratory disease.

5. What changes occur with egophony, whispered pectoriloquy, tactile fremitus and percussion in each of the following conditions?
   a. consolidation
   b. COPD
   c. CHF
   d. pneumothorax

6. How do you calculate pack year history for a smoker?

7. When auscultating breath sounds, what specific things do you listen for?

8. What else is assessed besides the anterior and posterior chest of a patient with a respiratory complaint?

9. What are risk factors of lung cancer?

10. Describe the significance of crackles and wheezes.

11. Describe the characteristics of breath sounds associated with the following conditions
   pneumonia  pneumothorax
   asthma  pleurisy
   bronchitis
ASSESSMENT OF RESPIRATORY SYSTEM

I. SYMPTOM ANALYSIS OF RESPIRATORY PROBLEM

A. Cardinal symptoms of cardiopulmonary system

1. cough, expectoration
2. hemoptysis
3. dyspnea, DOE dyspnea on exertion
4. chest pain
5. cyanosis
6. edema, lower extremity pain
7. palpitations
8. dizziness, syncope
9. orthopnea
10. claudication
11. fatigue
12. fever, night sweats
13. weight loss

B. Symptom Analysis Descriptors

1. onset/characteristics/duration/precipitants/course (in chronological order)
   a. < three weeks
   b. > three weeks
   c. gradual
   d. sudden
   e. time of day
   f. past evaluation of presenting symptom-when, where, who; studies, Dx Tx, results
2. character of sputum
   a. quantity
   b. appearance
   c. odor
3. aggravating factors
   a. specific inhaled materials, dust etc.
   b. position-recumbent vs. erect
   c. exertion: quantity of exercise required to bring on symptom
   d. emotions
   e. cold weather
   f. depth of breathing
   g. movements of neck, arm, or chest
4. specific relieving factors
   a. position
   b. rest
   c. meds-bronchodilators
   d. other treatment-formal and informal
5. Significant positive and negative associated symptoms
   a. general--fever, chills, weight change, fatigue, anorexia, weakness, night sweats
   b. respiratory--cough, sputum-amount and characteristic, hemoptysis, dyspnea, wheezing, pain
   c. similar structure: mucous membranes collagen involved? (joint pain, swelling)
   d. adjacent structures: upper respiratory tract, heart, chest wall muscles ribs and abdomen
   e. function: evidence of hyposia--anxiety, restlessness, confusion, cyanosis of extremities

C. Past medical history
1. previous chronic or acute lung problems--emphysema, pneumonia, TB or + skin test, asthma, URI’s
2. heart or circulatory disease--HTN, stroke, MI, anemia, peripheral vascular disease
3. operations--chest surgery, vein stripping
4. trauma

D. Allergies--hay fever, asthma, medications, food, what is the response--skin or lungs

E. Medications
1. propanolol-guanethidine--causes airway resistance
2. birth control pills-danger or embolism
3. sedatives, tranquilizers, narcotics--suppress respirations and cough
4. bronchodilators--isuprel, epinephrine, ephedrine
5. antihistamines

F. Family history
1. lung problems--e.g. asthma, emphysema, TB
2. heart problems--HTN, MI, CVA
3. is anyone else in home or work sick?
4. smokers in family/network--extent of exposure

G. Personal profile
1. past and present occupations: mining, sandblasting, paper mills, paint or fume exposure, asbestos foundry, exhaust exposure (bus driver), office smokers
2. recreation--recent travel, woodworking, repairing equipment with resin, turpentine, paints etc.
3. residence: pollution, dust, allergens--animals, plants
4. health habits--past and present smoking history (tobacco/marijuana) obesity

H. Cultural Assessment
1. what do you think caused this problem?
2. what actions would you like to take?

II. PHYSICAL ASSESSMENT OF PULMONARY STATUS

A. General Appearance
1. overall state of health--debilitated, cachectic, muscle atrophy
2. vital signs and height/weight ratio--e.g. obesity
3. signs of respiratory distress--rate, rhythm, manner of expiration
4. signs of brain anoxia--confusion, restlessness
5. signs of emotional distress
6. color of skin--cyanosis, flushed, pallor; tongue, soft palate (o2 saturation less than 85%-- cyanotic tongue
7. finger nails; clubbing? (normal angle< 160)

B. Respiratory system
1. Inspection
   a. shape of chest (deformities)
   b. A/P diameter (with COPD)
   c. Costal angle width
   d. alignment of vertebral column (kyphoscoliosis > restricted excursion)
   e. evidence of distress (retraction, bulging interspaces, use of accessory muscles)
   f. lag (check at tracheal/suprasternal notch)
2. Palpation
   a. trachea for deviation
   b. nodes: axillary and supraclavicular
   c. symmetry of thoracic expansion:
      1. determine by placing hands on lower rib cage, thumbs mid-line, noting
symmetry of hand movements with respiration
2. asymmetry occurs with splinting 2 degree pleurisy, with fibrosis, consolidation
d. tactile tremitus
1. with palmar surface in ICS, patient says '99'
2. conditions which increase T.F.: consolidation, e.g., pneumonia
3. Conditions which decrease T.F.: anything creating sound screen such as atelectasis, pleural effusion
4. tenderness
5. placement of apical impulse

3. Percussion
a. lung density
1. patient leans forward
2. apices > bases; compare r to l; percuss in ICS
   a. normal--resonant, bilaterally equal
   b. abnormalities
   flatness--suggests massive pleural effusion, consolidation
dullness--atelectasis, consolidation, pleural effusion/thickening resonance--suggest normal lung tissue hyperresonance--suggest emphysema, pneumothorax tympany--suggests large pneumothorax
b. assess diaphragmatic excursion
   -note level of diaphragm with full inspiration and full expiration
   -measure the difference

4. Auscultation
a. method
1. patient breathes deeply, mouth open, arms, forward
2. apices > bases; compare r to l, cover chest surface systematically:
   posterior, lateral, anterior
b. types of breath sounds
1. vesicular: originate in alveoli and bronchioles--low frequency and long duration on inspiration; high pitch & short duration with expire.
2. bronchial--loud, harsh, high-pitched, of longer duration with expire than with inspire
3. bronchovesicular--between vesicular and bronchial
c. quality of breath sounds
1. normal B.S. vary loudness and intensity with depth, rate of R.
2. normally are nearly symmetrical
3. B.S. are locally decreased in presence of any factor interfering with transmission--fluid effusion, air pneumothorax, mass
d. adventitious B.S.
1. crackles (rales) discontinuous sounds suggesting movement of air through fluid. fine crackling sounds
2. wheezes (bronchi) high-pitched whistling sound lasting through much of inspiration and expiration, caused by constriction of the bronchus or by partial occlusion of the lumen by tenacious exudate.
3. pleural friction rub: sound produced by movement of the inflamed visceral and parietal pleura surfaces over each other. rough, grating, scraping. best heard during inspiration
4. egophany: E to A changes, caused by nasal quality of spoken voice heard over consolidated lung or lung compressed by fluid
5. whispered pectoriloquy: intensification of whispered sounds heard over infiltrations normal whispered sounds are heard only over the distribution of the major bronchi

C. Neck
1. jugular vein
2. tracheal deviation
3. presence or absence of nodes

D. Extremities
   1. clubbing
   2. cyanosis
   3. edema
   4. calf swelling or tenderness

E. HEENT exam--dependent on history

F. Heart exam--dependent on history

   G. Abdominal exam--dependent on history
** Branching Exam Procedure**

<table>
<thead>
<tr>
<th>COMPONENT ACTIVITIES</th>
<th>DONE</th>
<th>NOT DONE</th>
<th>COMMENTS</th>
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<tbody>
<tr>
<td><strong>NECK (sitting)</strong></td>
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<tr>
<td>1. Inspect carotid pulses</td>
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<td>2. Palpate carotid pulses-one side at a time</td>
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<tr>
<td>3. Auscultate carotid pulses</td>
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<td>4. Inspect jugular venous pulsations</td>
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<td><strong>UPPER EXTREMITIES</strong></td>
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<tr>
<td><strong>Inspection</strong></td>
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<tr>
<td>1. Both hands and arms-fingertips to shoulders</td>
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<tr>
<td>a. Inspect nails</td>
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<td>b. Inspect hands, arms</td>
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<tr>
<td><strong>Palpation</strong></td>
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<tr>
<td>1. Nails-capillary filling</td>
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<td>2. Skin temperature hands, lower arms</td>
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<td>3. Radial pulses</td>
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<td>4. <strong>Ulnar pulses</strong></td>
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<td>5. **Allen test-check patency of radial and ulnar pulses</td>
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<td>6. Brachial pulses</td>
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<td>7. Epitrochlear nodes</td>
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<td><strong>POSTERIOR CHEST</strong></td>
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<td>1. Inspect symmetry, shape, quality of respirations, chest expansion</td>
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<td>2. Estimate anteroposterior diameter</td>
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<td>3. Palpate to assess chest expansion</td>
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<td>4. Palpate for tenderness</td>
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<td>5. ** Palpate for fremitus changes</td>
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<td>6. Percuss for symmetrical note</td>
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<td>7. Auscultate all lung fields</td>
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<td>8. Auscultate for:</td>
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<td>a. ** Post-tussive crackles</td>
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<td>b. ** Egophony changes</td>
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<td>c. ** Whispered pectoriloquy</td>
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<td>d. ** Bronchophony</td>
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<td><strong>ANTERIOR CHEST</strong></td>
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<tr>
<td>1. Inspect chest and precordium for deformities, respiratory distress, heaves</td>
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<td>2. Observe quality and rate of respiration</td>
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<td>3. Palpate for tenderness, lesions</td>
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<td>4. Percuss for symmetrical note</td>
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<td>5. Auscultate all lung fields for quality of breath sounds and adventitious sounds</td>
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<td>6. Auscultate heart (diaphragm and bell), starting at the base</td>
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<td>a. State where S1 is best heard and where S2 is best heard</td>
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<td>b. Aortic second right intercostal space at right sternal border</td>
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<td>c. Pulmonic second left intercostal space at left sternal boarder</td>
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<td><strong>d. Second pulmonic area:</strong> third left intercostal space at left sternal border</td>
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<td><strong>e. Tricuspid area:</strong> fourth left intercostal space at left sternal border</td>
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<td><strong>f. Mitral (apical)</strong> fifth left intercostal space mid clavicular live apex</td>
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<td>**g. ** Use diaphragm to listen to aortic area and LSB with client leaning forward after complete exhalation for aortic murmurs</td>
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**NECK VESSELS (supine)**

**HOB elevated at 30°**

1. Inspect external and/or internal jugular venous pulsations

2. Measure and record jugular venous pressure in cm (above or below sternal angle) along with the angle of the bed

3. **Abdomino jugular test**

4. Observe timing of jugular venous pulsations—compare wave patterns with auscultated heart sounds

**HEART (supine)**

1. Inspect precordium

2. Palpate with palmar surface of hand at base of fingers
   a. Right 2nd interspace (aortic)
   b. Left 2nd interspace (pulmonic)
   c. 2nd pulmonic, 3rd left interspace
   d. 4th left interspace (tricuspid)
   e. 5th left interspace (mitral)

3. Auscultation
   a. Diaphragm
   b. Bell
   c. ** Left lateral position-listen at apex with bell

**ABDOMEN**

1. Inspect abdominal aortic pulsations

2. Auscultate for bruits using bell:
   a. Epigastrium
   b. R and L upper quadrants (renal arteries)
   c. R and L lower quadrants (iliac arteries)
   d. Femoral arteries
   e. ** Renal bruits often heard better over CVA with client sitting

3. Palpate aortic pulsations (deep palpation)

4. Palpate for lateral pulsations (R/O aneurysm)

**LOWER EXTREMITIES**

1. Inspect both legs

2. Palpation
   a. Skin temperature of legs and feet
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<td>c.</td>
<td>Femoral vein for tenderness</td>
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<td>d.</td>
<td>Femoral pulses</td>
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<td>e.</td>
<td>Popliteal pulses</td>
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<td>f.</td>
<td>Dorsalis pedis pulses</td>
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<td>g.</td>
<td>Posterior tibial pulses</td>
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<td>h.</td>
<td>Edema-palpate for 5 seconds</td>
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<tr>
<td>i.</td>
<td>Behind medial malleoli</td>
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<td>ii.</td>
<td>Dorsum of feet</td>
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<td>iii.</td>
<td>Shins</td>
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<tr>
<td>i.</td>
<td>Calf tenderness, tension</td>
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<tr>
<td>i. **</td>
<td>Have client sit up, legs dangling—look for delay in color return of venous filling or marked redness</td>
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<td>ii. **</td>
<td>Sitting, standing, squatting, Valsalva maneuver can be used to accentuate or diminish a murmur</td>
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<td>iii. **</td>
<td>Client standing—look for varicosities, inspect for redness/dischloration and palpate for tenderness or cords</td>
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