### GOALS & OUTCOMES:

1. To introduce basic examination techniques of the thorax and the pulmonary system and stress the applied physiology as well as to review the applied anatomy.
2. To introduce the use of the stethoscope

### ASSIGNMENTS DUE FOR THIS SESSION:

2. PCM Basic Examination- Details:

   **View:** [Lung Video](#) and [Thorax Video](#)

   Review the [Using Diagnostic Equipment](#) video

3. Bring your stethoscope with you to learn its use in the pulmonary exam

### ASSIGNMENTS DUE FOR NEXT WEEK:

1) Practice the skills learned on friends, family, pets, etc.

### SESSION ACTIVITIES:

1) Watch the high yield demonstration with course faculty in lecture hall as a group.

2) Examine each other in small groups guided by faculty.

### SUGGESTED TIMELINE:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
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<tbody>
<tr>
<td>Watch the high yield demonstration</td>
<td>45 minutes</td>
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<tr>
<td>Examine each other in small groups</td>
<td>60 minutes</td>
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BACKGROUND – TO BE READ BEFORE COMING TO THE SMALL GROUP

This session is a continuation of the physical exam sessions representing a collaborative effort between the two courses Patient Centered Medicine 1 and Structure of the Human Body.

Process:

1. Meet in the lecture hall for the high yield demonstration.

2. Then you will have a **assigned time** at which to report to the clinical skills center. Typically, there are **three waves of assigned times** usually 1:00 p.m., 2:00 p.m. and 3:00 p.m. Please attend at your assigned time, **and sign-in at the CSC**.

Wear loose clothing that will allow for your peers to examine you, and bring your stethoscopes. If you have issues with having your peers examine you, please let your group know. Only students who volunteer in each small group will be examined. However, it is the expectation that most students will want to help their peers learn the physical exam by volunteering to be examined.

A faculty member will be leading you through learning the physical examination on each other.

The steps of the pulmonary and thorax exams are below. Please review this before the small group. The better prepared you are, the more you will learn from this practice session.

Before and after this session, practice the skills learned on your friends, family, pets, and on willing patients whom you see with your physician and student mentors.

Session Objectives:

1. Describe the relevant anatomy as it pertains to the examination of the lungs and thorax
2. Conduct basic examination techniques of the pulmonary system
3. Use a stethoscope to examine the lungs
PULMONARY EXAMINATION STEPS

FIRST WASH YOUR HANDS.

1. **Locate and identify the sternal angle of Louis.**
   - the bony ridge joining the manubrium to the body of the sternum
   The 2\textsuperscript{nd} costal cartilages are adjacent to the sternal angle.

2. **Identify and locate the second intercostal space.**
   - inferior to the 2\textsuperscript{nd} costal cartilage, which is lateral to the sternal notch.
   This is important in helping doctors count ribs and ICS to name a location on the chest wall along with the vertical axis.

3. **Locate and identify the midsternal line.**
   - a vertical line that runs through the middle of the sternum and xiphoid process.

4. **Locate and identify the midclavicular line.**
   - a vertical line running through the midpoint of the clavicle and inferiorly.

5. **Locate and identify the anterior axillary line.**
   - a vertical line running inferiorly from the anterior axillary muscle fold

6. **Locate and identify the posterior axillary line.**
   - a vertical line running inferiorly from the posterior axillary muscle fold.

(The purpose of all the above is to help the student describe and locate findings vertically and horizontally around the thorax. Please stress this point.)

7. **Locate and identify the surface markings of the lungs, fissures, and lobes.**
   **LUNGS:** Anteriorly, the apex of each lung rises about 2 – 4 cm above the inner third of the clavicle. The lower border of the lung crosses the 6\textsuperscript{th} rib at the midclavicular line. Laterally: the lower lung border crosses the 8\textsuperscript{th} rib at the midaxillary line. Posteriorly: the lower border of the lung lies at about the level of T 10. During normal breathing, the lower border of the lung may descend about 5-6 cm as the diaphragm contracts.
   **FISSURES and LOBES:** Each lung is roughly divided in half by an oblique = major fissure. This fissure can be approximated by a line from T3 spinous process posteriorly and then runs obliquely down and around the chest to the 6\textsuperscript{th} rib in the midclavicular line.
   Posteriorly, above this line are the upper lobes, and below is the lower lobe. The right lung also is further divided by a horizontal = minor fissure. Anteriorly, this fissure runs from about the 4\textsuperscript{th} rib and then travels roughly horizontally around the chest wall to the 5\textsuperscript{th} rib in the midaxillary line. Above this fissure is RUL, and below is RML. Key teaching points: (1) The right middle lobe does not have a posterior projection. To examine the RML, you need to auscultate/percuss in the lateral and anterior chest. (2) Most of the upper lobes are best auscultated anteriorly.
8. **Test for respiratory expansion**
   Technique: First, the student should inspect the chest wall for symmetric expansion. Second, the student places their hands on the lower posterior chest wall with their thumbs at about the level of the 10th rib and parallel to the 10th rib. As the student grasps the lower chest wall, they should slide their thumbs medially so that they raise a vertical skin fold medial to their thumbs and lateral to the patient’s spine. Student should then ask the patient to take a deep breath. As the patient breathes, the student’s hands and thumbs should move laterally and equally about 2–5 inches as the chest expands. The skin fold the student created should also decrease in size as the chest wall expands. If the student starts too close to the midline over the spine, there is usually not enough loose skin available to create a skin fold.

9. **Take the patient’s respiratory rate (Ask the student for the RR/minute).**
   Ideally the student should count for 30 seconds to one minute. To only count for 15 seconds may be too short.

10. **Test for tactile fremitus**
   Purpose for examining for tactile fremitus: detects palpable vibrations transmitted through the broncho-pulmonary tree to the chest wall. In a normal patient, both right and left lungs have normal and equal/symmetric vibrations that the examiner appreciates. Increased, decreased, or absent tactile fremitus of one lung as compared to the other is abnormal. Admittedly this is a “rough” assessment tool at best, but as a scouting technique it directs the examiner’s attention to possible abnormalities and to areas where the examiner wants to pay particular attention later on in the rest of the lung exam. Technique: Ideally, the student should ask the patient to grab their opposite shoulder with their hands so as to move the scapulae laterally and increase the examinable area of the posterior lung fields.
   - Must be done on skin, not over a gown or an article of clothing
   - Student should place either the dorsal surface of their fingers or the ulnar surface of their hands and fifth fingers or the “ball” of their hand (metacarpal phalangeal joints of fingers 2-5) on patient’s posterior chest, beginning at the top of the chest first. Any of these three positions helps optimize the examiner’s appreciation of vibration through the bones of their hands/fingers.
   - Student then asks the patient to repeat a phrase such as “ninety-nine” or “one-one-one” each time the patient feels the student’s hands in a new location when they examine the patient for tactile fremitus.
   - If the student cannot appreciate the fremitus at first, they should ask the patient to speak louder or in a deeper voice.
   - The student should examine for tactile fremitus in at least three locations posteriorly (upper, middle, and lower chest wall) and then one area laterally (remember the right middle lobe has no posterior projection.) Bates also recommends 3 areas anteriorly: upper and lower parasternal areas and then in anterior axillary line

11. **Demonstrate the technique of percussion**
   Purpose of percussion: to determine if the tissues 5-7 cm deep to/underlying the percussed site are air filled (normal lung), fluid filled (pleural effusion), or solid (tumor/mass).
Technique of percussion:
- Ideally, the student should ask the patient to grab their opposite shoulders with their hands so as to move the scapulae laterally and increase the examinable area of the lung fields.
- Must be done on skin, not over a gown or an article of clothing.
- Student places the end of (from the DIP joint to the tip of the finger) their index or middle finger firmly against the patient’s posterior chest, ideally in an intercostal space and not over a rib.
- No other part of the student’s hand should be resting on the patient’s posterior chest. If they rest more of their finger or hand against the posterior chest, the student dampens the percussed sound.
- Using the other hand’s index and/or middle finger, the student quickly strikes at the finger on the chest and also withdraws the percussing finger quickly. If the percussing finger is left on the chest, this will also dampen the percussed sound.
- The action of percussion works best if the percussing hand’s wrist is already close to the chest wall and the act of percussing comes from flexion at the wrist. (Flexion of the percussing finger alone does not provide enough strength to create a percussed sound.) Also, if the percussing hand is far from the patient’s chest, it is very difficult to accurately strike the finger on the chest.
- The student should **always start at the top** of the lungs and should **always compare right side to left** at a given level. How many areas need to be percussed is debatable. Bates recommends 7 different areas posteriorly and 3 anteriorly. It is probably sufficient for the student to assess the upper, middle, and lower posterior chest wall and then lateral chest wall and also 3 areas anteriorly.

12. **State the FIVE percussion notes and their characteristics (Bates p. 225)**

<table>
<thead>
<tr>
<th></th>
<th>Intensity</th>
<th>Pitch</th>
<th>Duration</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>Flatness</td>
<td>Soft</td>
<td>High</td>
<td>Short</td>
<td>Thigh</td>
</tr>
<tr>
<td>Dullness</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Liver</td>
</tr>
<tr>
<td>Resonance</td>
<td>Loud</td>
<td>Low</td>
<td>Long</td>
<td>Normal lung</td>
</tr>
<tr>
<td>Hyperresonance</td>
<td>Very loud</td>
<td>Lower</td>
<td>Longer</td>
<td>None normally</td>
</tr>
<tr>
<td>Tympany</td>
<td>Loud</td>
<td>High*</td>
<td>Longer</td>
<td>Gastric air bubble or puffed out cheek</td>
</tr>
</tbody>
</table>

* Distinguished mainly by its musical timbre

13. **Ask the student to identify THREE types of normal breath sounds.**

- Bronchial- heard normally over the manubrium
- Bronchovesicular- heard normally between the scapulae
- Vesicular- heard normally throughout the rest of the lungs

14. **Demonstrate the technique of auscultation.**

Student should ask the patient to grab their shoulders (to move the scapulae laterally). Exam is done on skin, NOT gown. Student listens with the DIAPHRAGM of stethoscope, begins at apices, compares right to left at each level, asks patient to breath though their mouth, student should NOT move stethoscope to next position until the complete
respiratory cycle is done (inspiration and all of expiration). Student should auscultate upper, mid, lower and lateral lung fields and then 2 or 3 areas anteriorly.

15. **Ask the student to explain how to test for vocal fremitus (listening for transmitted voice sounds) and give ONE example.**
While auscultating ask patient to repeat or whisper “ninety-nine” or say “EEEEE” each time the student moves their stethoscope. Example: bronchophony- ninety-nine is heard louder and clearer than expected, egophony- “EEE” is heard as a nasal “ayy”, and whispered pectoriloquy- whispered “ninety-nine” is heard louder and clearer than expected.
These transmitted voice sounds are all abnormal and are indications of airless or consolidated lungs.

16. **Locate and count and describe the patient’s radial pulse**
*Technique = student should use finger pads (not tips), and describe beats/min, rhythm*

17. **Identify and locate the apex and base of the heart**
*Answer = base is the junction between the heart and the great vessels; lies just below sternal angle. Identify and locate the apex of the heart*
*Answer = apex is the tip of the LV; normally found in midclavicular line, about 5th intercostal space*

**WASH YOUR HANDS.**