SOCM
Physical Exam of the Thorax and Lungs
PFN: SOMPYLOQ
Hours: 2.0

Terminal Learning Objective
- Action: Communicate knowledge of “Physical Exam of the Thorax and Lungs”
- Condition: Given a lecture in a classroom environment
- Standard: Received a minimum score of 75% IAW course standards on the formative quizzes and the Physical Exam Practical Test grade sheet

References
- Essentials of Anatomy and Physiology (6th edition; 2013; Martini; Bartholomew)
Reason

As a SOF Medic your ability to understand and perform a thorax and lung physical exam is essential for the proper diagnosis and treatment of common respiratory complaints. Your objective as a provider should be, at a minimum, to conduct a brief chest and lung PE of every patient you see.

Agenda

- Define the key terms related to the physical exam of the thorax and lungs
- Communicate the exam techniques during a thorax and lungs examination
- Communicate how to record thorax and lungs exam findings

The Key Terms Related to the Physical Exam of the Thorax and Lungs
Key Terms

- **Dyspnea**: difficult or labored breathing; shortness of breath
- **Cough**: a reflex response to stimuli that irritate receptors in the larynx, trachea, or large bronchi
- **Hemoptysis**: the expectoration of blood (or of blood-stained sputum) from the bronchi, larynx, trachea, or lungs

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Key Terms

- **Paresthesia**: an abnormal or unusual sensation with no apparent physical cause
- **Flail chest**: paradoxical movement of the chest wall, resulting from a fracture of 3 or more ribs in two locations each

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Key Terms related to Anatomy and Physiology

- **Ventilation (breathing)**: physical movement of air into and out of the lungs
Key Terms

- **Respiration** (*gas exchange*): diffusion of gases either between the alveoli and pulmonary capillaries (external respiration) or between capillaries and other body tissues (internal respiration).

Key Terms

- **Tactile Fremitus**: refers to the palpable vibrations felt on the human body during phonation.
- **Lung Resonance**: on percussion the note-like sounds that are measured by intensity, pitch, and duration in order to objectively determine the lungs' volume of air.

Key Terms related to Anatomy and Physiology
Key Terms related to Anatomy and Physiology

- The carina
  - The bifurcation of the trachea into the primary bronchi
  - Located at:
    - Sternal angle anteriorly
    - T4 spinous process posteriorly

- The bifurcation of the trachea into the primary bronchi

- Located at:
  - Sternal angle anteriorly
  - T4 spinous process posteriorly
Key Terms related to Anatomy and Physiology

• Muscles of ventilation
  - The diaphragm
    - The primary muscle of inspiration
    - Works in conjunction with external intercostal muscles to perform inspiration

Key Terms related to Anatomy and Physiology

• The diaphragm
  - Origin
    - Sternal - posterior aspect of xiphoid
    - Lateral - inner aspect of ribs 4-10
    - Vertebral - anterior aspect of L1-L2 (left) and L2-L3 (right)
  - Insertion
  - Inervation
    - Phrenic N. (C3 - C5)
    - Motor and sensory
Key Terms related to Anatomy and Physiology

- Breathing (cont’d)
  - Accessory muscles
    - Sternocleidomastoid
    - Scalenus
    - Pectoralis minor
    - Internal intercostal
    - Rectus abdominis
    - Transverse thoracis

Common or Concerning Symptoms related to the PE of Thorax

- Chest Pain
- Dyspnea (Shortness of Breath)
- Wheezing
- Cough
- Hemoptysis

- Chest Pain
  - Numerous causes (e.g., pericarditis, bronchitis, pleuritis, or chest wall trauma)
    - Start with broad questions “Do you have any pain or discomfort in your chest?”
    - Start to narrow in with questions about dyspnea, coughing, and wheezing
    - Also ask questions about pain on respirations, exertion, palpitations, and edema
  - Consider also conducting a cardiovascular exam history
Common or Concerning Symptoms related to the PE of Thorax

- **Dyspnea** - Difficult or labored breathing
  - Ask about timing (e.g., at rest or during exertion)
  - How has this affected activities of daily living
  - Always consider both respiratory and cardiovascular origin

- **Wheezing**
  - High pitch, musical sound
  - Caused by a restriction of the lower airways
    - Secretions
    - Inflammation of the airway
    - Foreign body
  - Prolonged expiratory phase

- **Cough**
  - Reflex to irritation of the larynx, trachea, or large bronchi
  - Causes range from benign to lethal (e.g., inflammation of respiratory mucosa or left-sided heart failure)
  - Should investigate respiratory and possible cardiovascular causes
Common or Concerning Symptoms related to the PE of Thorax

- Hemoptysis
  - May vary from blood-streaked sputum to frank blood
  - Try to determine source of bleeding with history and physical exam

The Exam Techniques Used During a Thorax and Lungs Examination

Examination Techniques

- General techniques
  - Allow the patient to take a position of comfort
    - If conscious, then allowing to the patient to sit up, takes the pressure of the abdominal contents off the diaphragm
    - If unconscious, rolling to patient to the side allows you to examine the posterior
  - Always compare one side of the thorax with the other
  - Proceed in an orderly fashion: inspect, auscultate, palpate, and percuss (IAPP)
Examination Techniques

- Inspect the anterior and posterior thorax
  - Observe patient’s respiratory effort
    - Respiratory vital signs:
      - Rate - normally 12-20 breaths per min.
      - Rhythm - regular vs. irregular
      - Depth - deep vs. shallow
      - Effort - amount of work to breath
    - Other signs of respiratory distress
  - Inspect skin
    - Color, scars, lesions, or moles
    - Signs of trauma

Examination Techniques (cont’d)

- Inspect the anterior and posterior thorax (cont’d)
  - Inspect for skeletal symmetry and bilateral rise and fall of chest
  - Inspect musculoskeletal development
    - Inspect spinal alignment and posture
    - Atrophy
    - Signs of increased accessory muscle use

Examination Techniques

- Irregular respiratory patterns
  - Bradypnea: slow breathing
Examination Techniques

- Irregular respiratory patterns
  - Sighing respiration: characterized by periods of normal breathing punctuated by a single, deep breath or sigh

Examination Techniques

- Irregular respiratory patterns
  - Tachypnea: rapid, shallow breathing

Flail chest and respiratory distress
Irregular respiratory patterns
- **Cheyne-Stokes breathing**: characterized by periods of deep breathing, alternating with apnea

**Examination Techniques**

- Hyperpnea (**hyperventilation**): rapid deep breathing
Kussmaul breathing

Examination Techniques

• Irregular respiratory patterns
  ➢ Ataxic breathing (Biot’s breathing): breathing which is unpredictable irregular and without pattern

Examination Techniques

• Auscultate 6 fields on the anterior and posterior
  ➢ Listen to the breath sounds with the diaphragm of a stethoscope after instructing the patient to breathe deeply at a normal rate through an open mouth (head turned away)
  ➢ Listen for any adventitious sounds
  ➢ Use a pattern moving from one side to the other
  ➢ Always keep anatomy and position of the stethoscope in mind!
Examination Techniques

- Normal breath sounds
  - Vesicular:
    - Soft and low pitched; usually heard over most of both lungs
  - Bronchial:
    - Louder and higher in pitch; usually heard over the manubrium
  - Bronchovesicular:
    - Intermediate intensity and pitch
    - Usually heard over the 1st and 2nd interspaces
Adventitious (added) sounds:

- **Crackles (rales):** intermittent and brief explosive breath sounds
  - Produced by rapid opening of small airways and alveoli collapsed by fluid or exudate
  - Note:
    - Loudness, pitch, and duration
    - Number and timing in the respiratory cycle
    - Location on chest wall and persistence of the pattern
    - Any change after a cough or change in pt.’s position

Adventitious (added) sounds (cont’d):

- **Rhonchi:** coarse, low pitched, continuous sounds with a snoring-like quality
  - Produced due to secretions in the bronchial airways
  - Note:
    - Timing and location
    - If they change with deep breathing or coughing

Adventitious (added) sounds (cont’d):

- **Wheezes:** a high pitched, whistling sound
  - Produced by constriction or obstruction of the lower airways during respiration
  - Note:
    - Timing and location
    - If they change with deep breathing or coughing
Examination Techniques

- **Obstructive breathing**: impeded breathing due to restricted airways

  ![Prolonged expiration](image)

Examination Techniques

- Adventitious (added) sounds (cont’d):
  - Stridor: high pitched sound often heard without the aid of a stethoscope
    - Produced by obstruction or stenosis (narrowing) of the epiglottis or trachea
    - Note timing:
      - Inhalation
      - Exhalation

Examination Techniques

- Adventitious (added) sounds (cont’d):
  - Pleural friction rubs: harsh scratching or crinkling sound
  - Produced by inflamed visceral and parietal pleura rubbing together; also known as "pleuritis" or "pleurisy"
Examination Techniques

- Palpate (anterior and posterior” and “bilateral”) chest for:
  - Stability
  - Crepitus
  - Tenderness
    - Squeeze palms on the sternum and thoracic spine
    - Rule out fracture vs. soft tissue injury

Examination Techniques

- Palpate thoracic expansion (back)

Examination Techniques

- Palpate tactile fremitus (front and back)
Examination Techniques

- Percussion
  - Locate intercostal space to be assessed
  - Place middle finger between ribs parallel with intercostal space
  - Strike using the tip of your tapping finger, onto the DIP of the middle finger of your non-dominant hand
  - Use the lightest percussion that produces a clear note
  - Percuss symmetrically for resonance (front and back)

- Percussion (cont’d)
  - Perform from side to side to assess for asymmetry using a "ladder" pattern
  - Percussion helps establish whether the underlying tissues (5-7 cm deep) are air-filled, fluid-filled, or solid
Examination Techniques

- Percussion (cont’d)
  - Percussion notes
    - Flatness, dullness, resonance, hyperresonance, tympany
  - Estimate the extent of diaphragmatic excursion

<table>
<thead>
<tr>
<th>Relative Intensity</th>
<th>Relative Pitch</th>
<th>Relative Duration</th>
<th>Example of Location</th>
<th>Pathologic Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flatness</td>
<td>Soft</td>
<td>Short</td>
<td>Thigh</td>
<td>Large pleural effusion</td>
</tr>
<tr>
<td>Dullness</td>
<td>Medium</td>
<td>Medium</td>
<td>Liver</td>
<td>Lung pneumonia</td>
</tr>
<tr>
<td>Resonance</td>
<td>Loud</td>
<td>Long</td>
<td>Healthy lung</td>
<td>Simple Atelectasis</td>
</tr>
<tr>
<td>Hyper-resonance</td>
<td>Very loud</td>
<td>Lower</td>
<td>Longer</td>
<td>COPD, pneumothora x</td>
</tr>
<tr>
<td>Tympany</td>
<td>Loud</td>
<td>High</td>
<td>Gastric air bubble or puffed-out cheek</td>
<td>Large pneumothora x</td>
</tr>
</tbody>
</table>

*Distinguished mainly by its musical timbre.*
Special Techniques

- Clinical assessment of pulmonary function
  - Inspect AP:Lateral Ratio
    - Measure depth of chest anterior to posterior (AP) at nipple line
    - Measure width of chest at nipple line (Lateral)
    - Normal ratio is between 1.5:1 and 2:1

Special Techniques

- Clinical assessment of basic pulmonary function
  - "Walk Test"
    - 8 feet at patient’s pace
    - Repeat test
    - Note faster time
    - Norm: 3.1 seconds
    - Observe patient’s
      - Rate
      - Effort
      - Breathing sounds

Special Techniques

- Clinical assessment of pulmonary function
  - If you suspect consolidation on auscultation then:
    - Bronchophony
      - "Toy Boats"
    - Egophony
      - "EEEE...EEEEEE"
    - Whispered pectoriloquy
      - Whisper “1,2,3”
Special Techniques

- Clinical assessment of pulmonary function
  - Forced expiratory time
    - Test for COPD
    - Maximal expiratory exertion
      - Patient takes in deep breath
      - Use diaphragm of stethoscope over trachea
      - Time duration of audible expiration
      - Get 3 readings
      - Norm: Less than 5 sec.
      - Pathologic: 6 sec. or longer

Radiological Findings
Radiological Findings

Right Hemothorax

How to Record Thorax and Lungs Exam Findings

Recording Your Findings

- SF 600
  - Chest:
    - Inspection:
      - Thorax is symmetric with good expansion. No signs of trauma.
    - Auscultation:
      - Bilateral breath sounds, clear to auscultation over six fields, no adventitious sounds.
    - Palpation:
      - Chest walls intact. No grimace.
    - Percussion: Lungs are normoresonant
Questions

When I fail a test, at first I'm like:

But then I find out my best friend failed too:

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BREAK