

## Pulmonary Assessment

### Introduction

Focused pulmonary assessment begins with a thorough [health history](#). While doing so, carefully observe for conversational dyspnea and other symptoms. Order of examination is performed as inspection, palpation, percussion, and auscultation.

### Optimal Patient Positioning

- Initially, examine the patient in the upright position for optimal posterior examination, and then supine for anterior examination and assessment for paradoxical breathing.
- Use appropriate draping while exposing the chest, to maintain patient comfort and privacy.

### Exam methods

- Inspection
  - Inspect the color of lips, tongue, and oral mucosa.
  - Observe respiratory rate, depth, and pattern; symmetry; shape and movement of thorax; and position of trachea.
    - Remember, normal breathing is regular and occurs at a rate of 12 to 20 breaths per minute; the normal ratio of inhalation to exhalation (I:E ratio) is 1:2.
  - Observe for dyspnea, tripod positioning, retractions, accessory muscle use, chest wall deformities, and bruising.
  - When supine, observe for paradoxical breathing.
- Palpation
  - Palpate for tenderness, crepitus (the sensation of crackles or “rice crispies” under the fingertips), and step-offs (bones not lined up properly).
  - Examine for symmetrical excursion/expansion.
    - Place your thumbs at about the level of the 10th ribs and loosely grasp the chest parallel to the lateral rib cage. Ask the patient to inhale; as your thumbs move apart during inspiration, feel for the range and symmetry of the rib cage as it expands and contracts.
  - Feel for tactile fremitus (vibrations that are transmitted through the lungs to the chest wall when the patient speaks).
    - Have the patient fold their arms across the chest to displace the scapulae.
    - Use the ball of your hand or the ulnar surface on the patient’s back and ask the patient to say “ninety-nine.”
    - Assess in a ladderlike pattern and compare results bilaterally.
- Percussion
  - Percussion helps determine if the underlying structures are air, fluid, or solid filled.
  - Place the middle finger of the non-dominant hand firmly over the chest wall along the intercostal space and tap the distal interphalangeal joint with middle finger of the opposite hand. The movement of tapping should come from the wrist. Tap 2-3 times in a row.
  - Percuss the posterior lung fields, alternating, from top to bottom and comparing sides. Note the resonance and the feel of percussion.
  - Percuss the chest all around. Ask the patient to cross arms to shoulder which will wing the scapula and expose the posterior thorax. Then, have the patient keep their hands

- over head and percuss the axillae. Then move to the front and percuss the anterior chest, clavicles and supraclavicular space.
- Percuss to assess the movement of the diaphragm by identifying the lower limits of resonance during deep inspiration and deep expiration.
  - Normal findings:
    - The left anterior chest is dull due to the presence of the heart.
    - The left lower anterior chest is hyperresonant due to the air-filled stomach.
    - The right lower chest is dull due to the liver.
    - The rest of the lung fields are resonant.
    - Normal diaphragmatic excursion is 5-6 cm.
  - Auscultation
    - Be alert for audible sounds heard without a stethoscope, such as wheezing in an asthmatic patient.
    - The sitting position is the best position for auscultation. If a patient must remain recumbent, roll the patient from one side to the other to examine the back.
    - When auscultating, the patient should take deep breaths through the mouth, deeper than their usual breaths.
    - Listen in a ladder pattern over the posterior and anterior chest, using the diaphragm of the stethoscope.
      - Auscultation should occur symmetrically between the two hemithoraces so that sounds may be compared between sides. Start near the apices and move down in a ladderlike pattern until below the level of the diaphragm is reached or breath sounds are no longer appreciated. This should be performed over the anterior and posterior chest.
    - Note the presence and location of normal breath sounds:
      - *Tracheal sounds* are loud and equal in duration on inspiration and expiration; they are heard over the trachea.
      - *Bronchial sounds* are loud and longer on expiration than inspiration; they are heard over the manubrium.
      - *Bronchovesicular sounds* are of medium volume, with inspiration and expiration about equal; they are heard over the 1<sup>st</sup> and 2<sup>nd</sup> intercostal spaces between the scapulae.
      - *Vesicular sounds* are soft and longer on inspiration than expiration; they are heard over most of the lung fields.
    - Abnormal findings include [stridor, wheezes, crackles \(coarse or fine\), rhonchi, pleural friction rubs, as well as diminished or absent breath sounds](#).
    - If adventitious breath sounds are identified, assess how these sounds change as the patient speaks. Voice generated sounds can provide important clues about respiratory abnormalities. Perform examinations for [egophony, bronchophony, and whispered pectoriloquy](#).
    - Also, be alert for non-pulmonary sounds that may be heard during auscultation, such as [mediastinal crunch and pleural rubs](#).

#### PEARLS

- Fremitus is decreased when there is something blocking its transmission (mucous plug, pleural effusion, tumor, or pneumothorax); fremitus may be increased with pneumonia.
- The presence of dullness on percussion is suspicious for pneumonia or pleural effusion; generalized hyperresonance on percussion may be heard over hyperinflated lungs, as with chronic obstructive pulmonary disease (COPD) or asthma.
- The presence of crepitus is concerning for subcutaneous emphysema or fractures.
- Stridor is heard more prominently in the anterior neck and usually represents airway obstruction.
- Absent breath sounds in patients with asthma is concerning for extreme bronchospasm.
- The presence of [egophony, bronchophony, and pectoriloquy](#) is concerning for pneumonia due to the transmission of sound through consolidated tissue.
- Diminished bibasilar breath sounds is common in patients who are supine in a hospital bed. If able, sit patients upright on the edge of the bed for a more accurate assessment.

#### Reference

Bickley, L. S., Szilagyi, P. G., Hoffman, R. M., & Soriano, R. P. (2021). *Bate's Guide to Physical Examination and History Taking* (13<sup>th</sup> ed.). Wolters Kluwer Health: Philadelphia.