

Pulmonary Physical Exam

Pulmonary Exam (Posterior)

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| Pulmonary Exam (Posterior) Arms Crossed to Move Scapulae Laterally | Inspection <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Inspect for Accessory Muscle Use and/or Intercostal/SuprACLavicular Retractions (Suggestive of Increased Work of Breathing) </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Inspect for Chest Asymmetry (Suggestive of Unilateral Volume Loss) </div> | Inspection <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Inspect for Altered Chest Wall Shape </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Increased Antero-posterior Diameter ("Barrel Chest") </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Pectus Carinatum </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Pectus Excavatum </div> | Inspection <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Inspect for Scars (Median Sternotomy, Thoracotomy, etc) </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Inspect for Tachypnea </div> |
| | Palpation <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Palpate for Symmetric Inspiratory Chest Wall Expansion </div> | | |
| | Auscultation <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Auscultate Over Trachea for Stridor </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Auscultate for Vesicular (Normal) vs Bronchial (Abnormal) Breath Sounds Over Lung Fields </div> | Auscultation <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Auscultate for Adventitious (Abnormal) Breath Sounds </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Crackles </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Pleural Rub </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Rhonchi </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Squawk (Squeak) </div> | Auscultation <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Stridor (Inspiratory > Expiratory) </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Wheezing (Expiratory > Inspiratory) </div> |
| | Percussion <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Percuss Lung Fields to Assess for Asymmetry Which Might Indicate Consolidation, Pleural Effusion, Pneumothorax, etc </div> | Percussion <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Percuss for Inspiratory Diaphragmatic Excursion </div> | |
| | Sound Transmission <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Vocal Fremitus </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Say "99" or "Toy Boat" and Auscultate </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Tactile Fremitus </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Say "99" or "Scooby Doo" and Palpate with Side/Palm of Hand </div> | Sound Transmission <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Whispered Pectoriloquy </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Say "99" or "Slytherin Wizard" and Auscultate </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Egophony </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Say "E" and Auscultate for Change to "A" </div> | |

Pulmonary Exam (Anterior)

| | |
|--|---|
| Inspection <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> As Above </div> | |
| Palpation <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> As Above </div> | Palpation <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> Palpate for Tracheal Deviation </div> |
| Auscultation <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> As Above </div> | |
| Percussion <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> As Above </div> | |
| Sound Transmission <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> As Above </div> | |

Extrapulmonary Exam

| | | | |
|----------------------------|----------|----------------------|--|
| Extrapulmonary Exam | Cachexia | Nasal Polyps | Tonsillar Enlargement/Oropharyngeal Crowding |
| | Clubbing | Peripheral Edema | |
| | Cyanosis | Pursed Lip Breathing | |

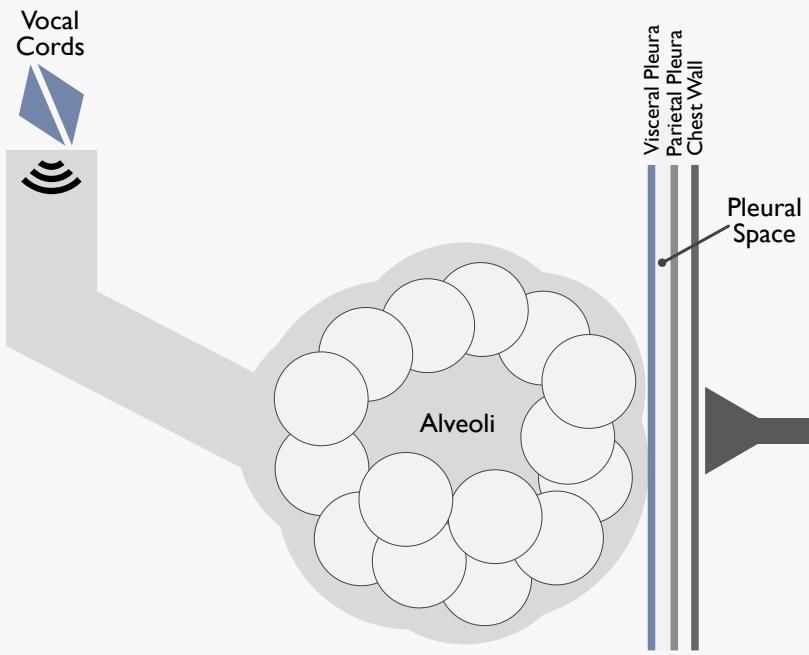
Lung Sounds

| Sound | Physiology | Auscultation Characteristics | | | Associated Clinical Disorders | Other |
|--------------------------------|--|--|---|--|---|----------------------------------|
| Normal Tracheal Breath Sounds | Due to Turbulent Pharyngeal/Glottic/Subglottic Airflow (In Addition, Intrapulmonary Lung Sounds May Be Transmitted to the Trachea) | Hollow Non-Musical | Inspiratory and Expiratory | Sounds Similar to Bronchial Breath Sounds | | |
| Normal Vesicular Breath Sounds | Due to Non-Alveolar Turbulent Airflow, Vortexes, and Other Mechanisms In Pathologic States, May Be Decreased by Diminished Sound Generation (Hypoventilation, Airway Narrowing) and/or Diminished Sound Transmission (Lung Destruction, Pleural Effusion, Pneumothorax) | Soft Non-Musical | Inspiratory and Early Expiratory | | | |
| Bronchial Breath Sounds | Due to Patent Airway Surrounded by Consolidated Lung (Pneumonia) or Pulmonary Fibrosis | Soft Non-Musical | Inspiratory and Expiratory | Sounds Similar to Tracheal Breath Sounds | Pneumonia Pulmonary Fibrosis | |
| Fine Crackles | Not Related to Secretions | Short Non-Musical Explosive | Mid-Late Inspiratory and Occasionally Expiratory Does Not Clear with Cough | Gravity-Dependent Not Transmitted to Mouth High Frequency (≥ 650 Hz) | Congestive Heart Failure Interstitial Lung Disease Pneumonia | May Precede Radiographic Changes |
| Coarse Crackles | May Be Related to Secretions Due to Intermittent Airway Opening | Short Non-Musical Explosive | Early Inspiratory and Expiratory May Clear with Cough | Transmitted to Mouth Low Frequency (350 Hz) | Chronic Bronchitis | |
| Rhonchi | Due to Rupture of Fluid Films and Abnormal Airway Collapsibility (Common with Airway Narrowing Due to Airway Edema or Bronchospasm) May Be Related to Secretions in Larger Airways | Musical Low Frequency (≤ 200 Hz, Sounds Like Snoring) | Inspiratory and/or Expiratory Often Clears with Cough | | Acute Tracheobronchitis Chronic Obstructive Pulmonary Disease | |
| Wheezes | Due to Localized Airway Narrowing (Tumor, Foreign Body, etc) or Generalized Airway Narrowing (Asthma, etc) | Musical/Polyphonic High Frequency (≥ 400 Hz) | Inspiratory and/or Expiratory | | Asthma Chronic Obstructive Pulmonary Disease | |
| Pleural Friction Rub | Due to Pleural Surface Friction | Non-Musical Explosive | Typically Biphasic Basilar-Predominant | Low Frequency (≤ 350 Hz) | Pleural Inflammation Pleural Tumor | Chest Tube |
| Squawk | Due to Distal Airways Disease | Mixed Sound with Short Musical Component (Short Wheeze) Preceded or Followed by Crackles | | Low Frequency (200-300 Hz) | Distal Airways Disease (Hypersensitivity Pneumonitis, Interstitial Lung Disease, Pneumonia) | |
| Stridor | Due to Upper Airway Obstruction | Musical High Frequency (≥ 500 Hz) | Loudest Over Anterior Neck (May Be Transmitted to the Trachea) | If Severe, May Be Heard Even without Stethoscope | Extrathoracic (Vocal Cord Lesion, etc) or Intrathoracic (Tracheobronchomalacia, etc) Upper Airway Obstruction Fixed Upper Airway Obstruction (Bilateral Vocal Cord Paralysis, etc) | |

Lung Exam Findings by Disorder

| Disorder | Breath Sounds | Crackles | Percussion | Vocal Fremitus (Say "99" or "Toy Boat" -> Auscultate) or Tactile Fremitus (Say "99" or "Scooby Doo" -> Palpate) | Whispered Pectoriloquy (Whisper "99" or "Slytherin Wizard" -> Auscultate) | Egophony (E-> A) (Say E -> Auscultate) | Tracheal Deviation | Other |
|----------|--|--|-----------------|---|---|---|---|--|
| 1 | Small Consolidation (Alveolar Filling) | Bronchovesicular/ Bronchial | Usually Present | Slightly Dull | Normal/ Increased | Variable | Present | Absent |
| | Large Consolidation (Alveolar Filling) | Bronchial | Present | Dull | Increased | Increased | Present | Absent |
| 2 | Small Pleural Effusion | Decreased | Absent | Dull | Decreased | Decreased | Absent | Absent |
| | Large Pleural Effusion | Decreased (May Be Bronchial if Atelectasis is Also Present) | Absent | Dull (Hyperresonant Above Level of Fluid) | Decreased | Absent (May Be Present If Atelectasis is Also Present) | Absent (May Be Present If Atelectasis is Also Present) | Toward Contralateral Side |
| 3 | Emphysema | Decreased/ Absent | Variable | Hyperresonant | Decreased | Decreased/ Absent | Absent | Absent |
| 4 | Pneumothorax | Decreased/ Absent | Absent | Hyperresonant | Absent | Decreased/ Absent | Absent | Toward Ipsilateral Side Coin Sound (Bell Tympany) |
| 5 | Tension Pneumothorax | Decreased/ Absent | Absent | Hyperresonant | Absent | Decreased/ Absent | Absent | Toward Contralateral Side Coin Sound (Bell Tympany) |
| | Hydropneumothorax | Absent | Absent | Hyperresonant Above Fluid Level/ Dull Below Fluid Level | Absent | Absent | Absent (May Be Present if Atelectasis is Also Present) | Toward Contralateral Side Succussion Splash/ Shifting Dullness/ Coin Sound (Bell Tympany) |
| 6 | Atelectasis with Endobronchial Obstruction | Absent | Absent | Dull | Decreased | Absent | Absent | Toward Ipsilateral Side |
| | Consolidation with Endobronchial Obstruction | Decreased/ Absent | Absent | Dull | Decreased | Decreased/ Absent | Absent | Absent |
| 7 | Pleural Thickening | Decreased | Absent | Dull | Decreased | Decreased | Absent | Absent (Toward Ipsilateral Side in Severe Cases) |
| | Thick-Walled Cavity | Bronchovesicular/ Amphoric (Hollow, Low-Pitched) | Present | Slightly Dull | Normal/ Increased | Increased | Present | Absent |

Normal



Breath Sounds

Vesicular

Egophony

Absent

Percussion

Normal Resonance

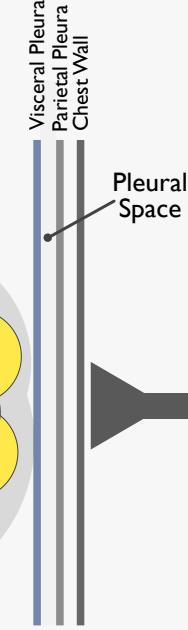
Tactile Fremitus, Vocal Fremitus, and Whispered Pectoriloquy

Normal

Vocal Cords



Pleural Space



Consolidation (Alveolar Filling)

Physics Principle

Sound Travels 4x Faster and More Efficiently Through Water (Higher Density) Than Through Air (Lower Density)

Physics Principle

Consolidated Lung Acts as a Low-Pass Frequency Filter (Stiff Barrier Attenuates High Frequencies and Allows Low Frequencies to Pass Through)

Blood

Due to

Diffuse Alveolar Hemorrhage

Pus

Due to

Pneumonia

Water

Due to

Cardiogenic Pulmonary Edema

Cells

Due to

Bronchioloalveolar Carcinoma

Proteinaceous Material

Due to

Pulmonary Alveolar Proteinosis

Breath Sounds

Bronchial

Egophony

Present

Percussion

Dull

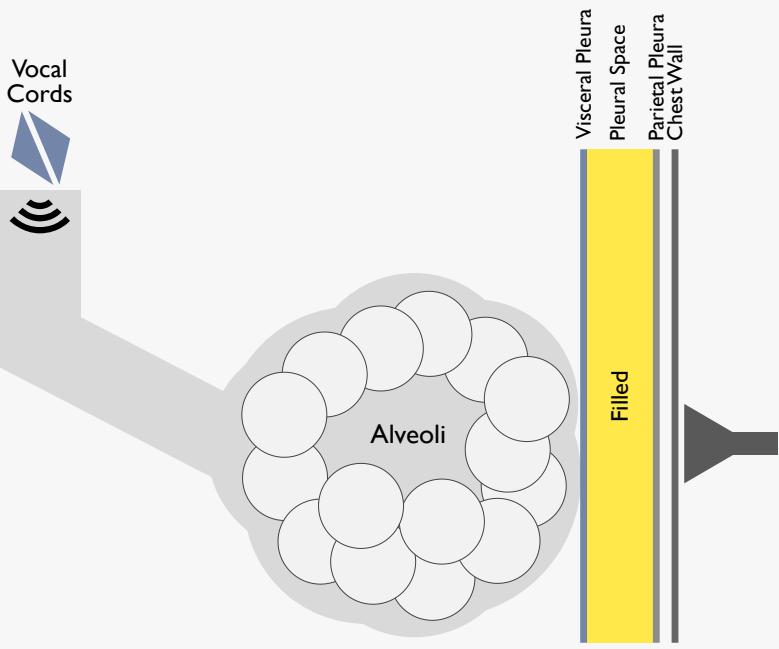
Other

Crackles

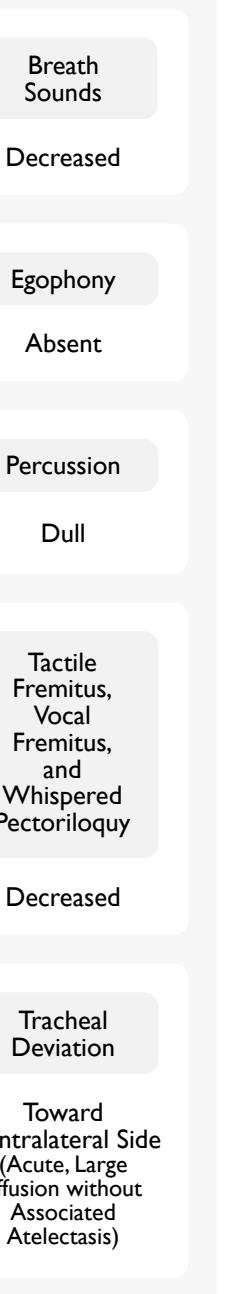
Tactile Fremitus, Vocal Fremitus, and Whispered Pectoriloquy

Increased

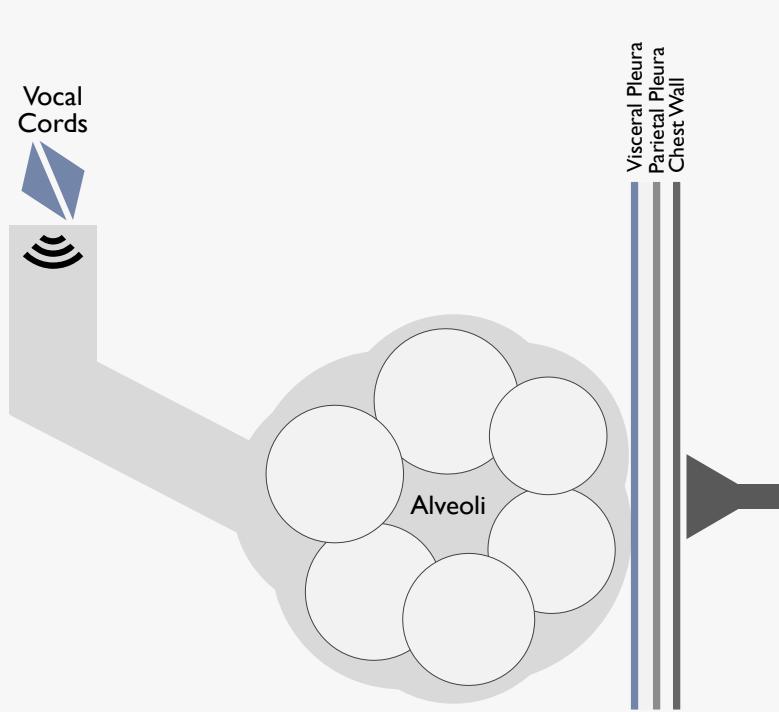
Pleural Effusion



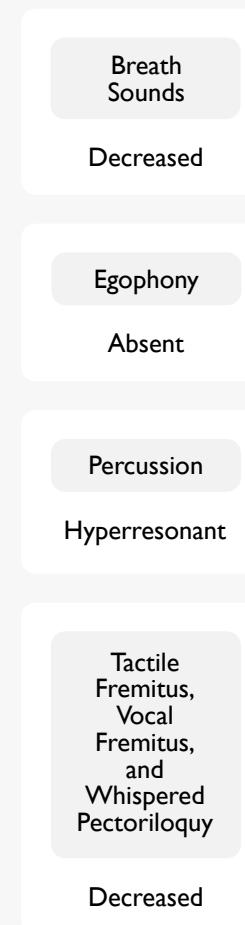
| Pleural Space Filled with | | |
|---------------------------|--------|-------------------------------|
| Blood | Due to | Hemothorax |
| Transudative Fluid | Due to | Congestive Heart Failure, etc |
| Exudative Fluid | Due to | Parapneumonic Effusion, etc |
| Pus | Due to | Empyema |
| Chyle | Due to | Chylothorax |



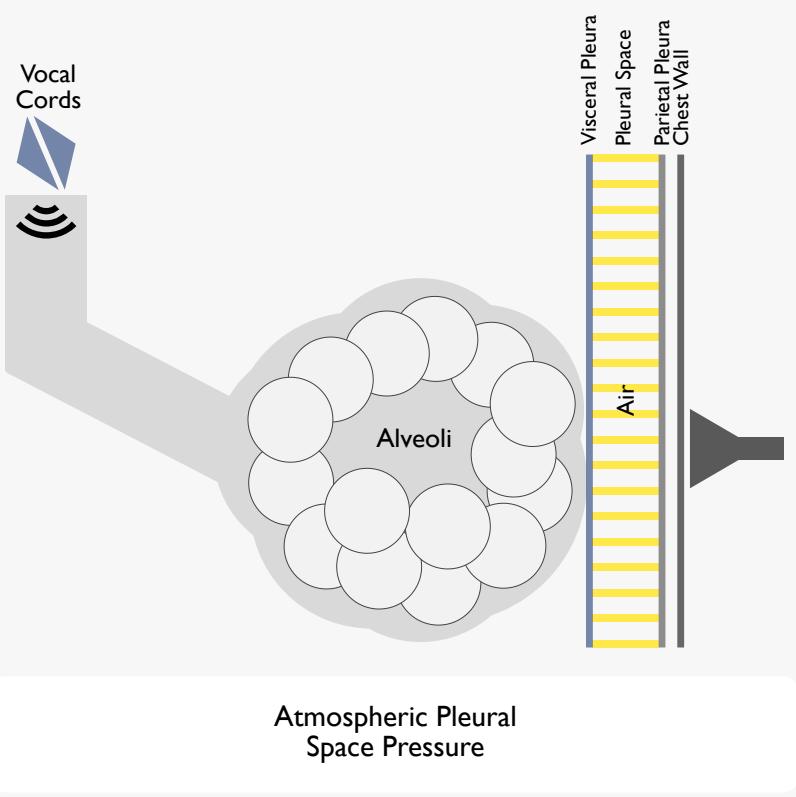
Emphysema



Emphysema Manifests Loss of Alveolar Supporting Architecture (with Decreased Density of the Lung)



Pneumothorax



Breath Sounds
Decreased

Egophony
Absent

Percussion
Hyperresonant

Tactile
Fremitus,
Vocal
Fremitus,
and
Whispered
Pectoriloquy

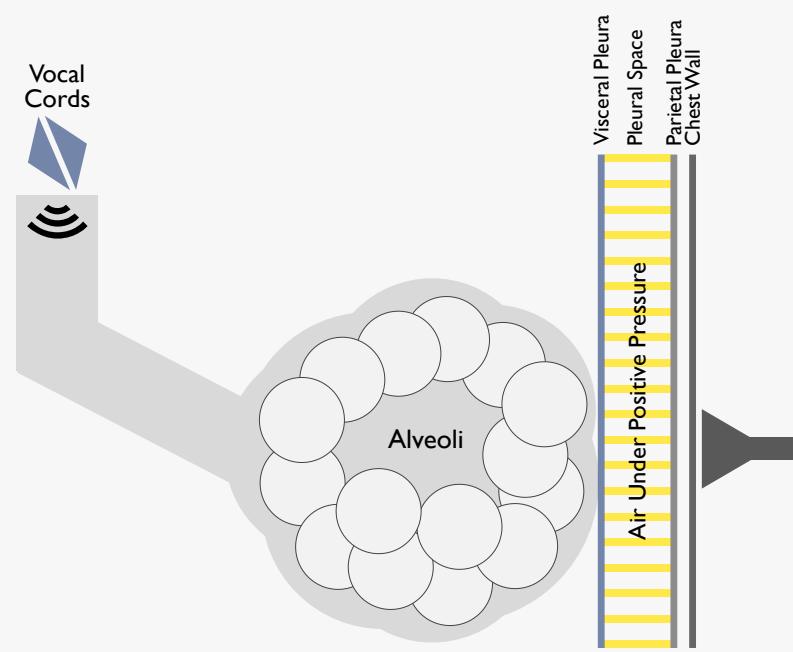
Absent

Tracheal
Deviation

Toward
Ipsilateral Side

Thoracic
Ultrasound

Absent Lung
Sliding/B-Lines



Tension Pneumothorax

Breath Sounds
Decreased

Egophony
Absent

Percussion
Hyperresonant

Tactile
Fremitus,
Vocal
Fremitus,
and
Whispered
Pectoriloquy

Absent

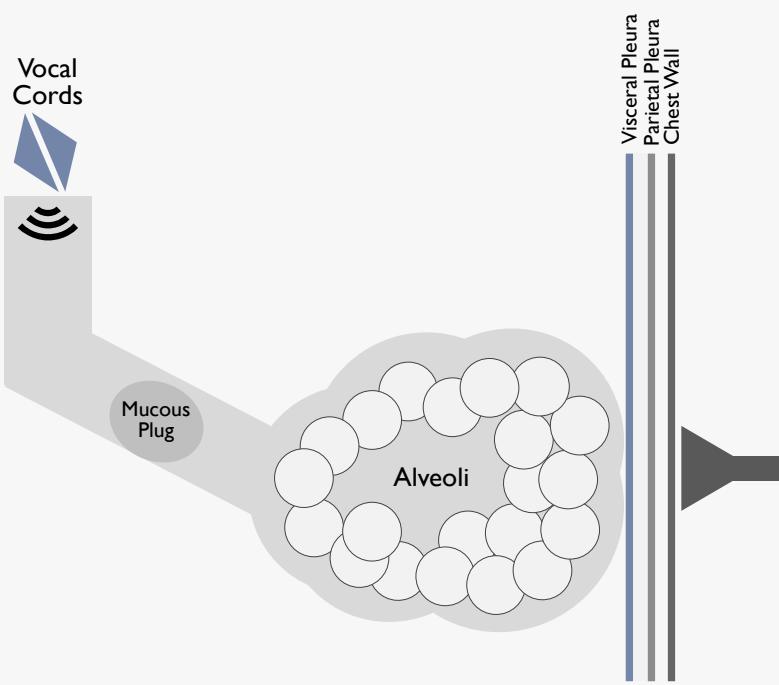
Tracheal
Deviation

Toward
Contralateral Side

Thoracic
Ultrasound

Absent Lung
Sliding/B-Lines

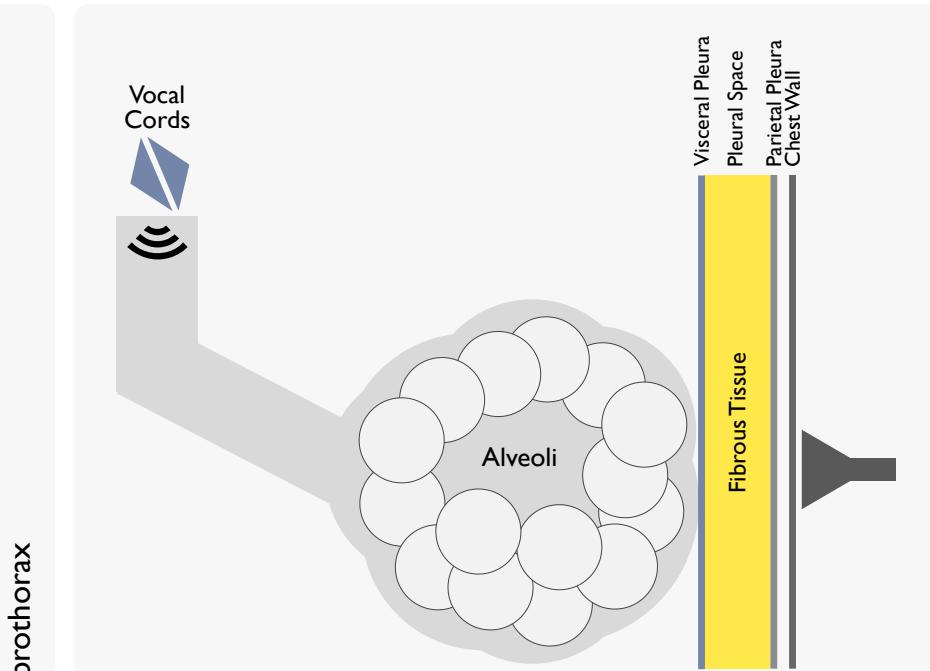
Atelectasis with Endobronchial Obstruction



Airway Obstruction Blocks Sound Transmission

- Breath Sounds
Absent
- Egophony
Absent
- Percussion
Dull
- Tactile Fremitus, Vocal Fremitus, and Whispered Pectoriloquy
Decreased
- Tracheal Deviation
Toward Ipsilateral Side

6



7

- Breath Sounds
Decreased
- Egophony
Absent
- Percussion
Dull
- Tactile Fremitus, Vocal Fremitus, and Whispered Pectoriloquy
Decreased