Objectives Respiratory System

- Discuss anatomy & Philology of respiratory system
- Specify landmarks of thorax / underlying structures
- State component of health hx
- Describe techniques of inspection, percussion, auscultation and palpation
- Distinguish tones of hyperresonance, resonance, tympany, dullness & flatness
- Compare characteristics of normal breath sounds
- Compare characteristics of abnormal /adventitious breath sounds
- Compare characteristics of sounds produced by vocal fremitus
- Distinguish the assessment findings that are frequently associated with common lung conditions
- Identify causes of abnormal lung sounds
Structure and Function
Position and Surface Landmarks

- Thoracic cage—borders
- Anterior thoracic landmarks
  - Suprasternal notch
  - Sternum
  - Manubriosternal angle
  - Costal angle
- Posterior thoracic landmarks
  - Vertebra prominens
  - Spinous processes
  - Inferior border of scapula
  - Twelfth rib

Location finding in the lung

- Sternal angel best guide anteriorly
- First 7 rips of costal cartilage articulate with sternum
- 8th, 9th, 10th, ribs articulate with costal cartilage just above them
- 11th, and 12th rip are flouting rip
- Land mark posteriorly:
  - 12th rip.
  - inferior angel of the scapula lies at the level of the 7th ribs.
- Spinous process C7 is the most prominent process
- Second ICS at the level of Spinous process T1.
Anterior Thoracic Cage

Clavicle
2nd intercostal space
Costal cartilage
Dome of the diaphragm
7th intercostal space
Costal margin

Suprasternal notch
Manubrium of sternum
Manubriosternal angle (angle of Louis)
Costochondral junction
Body of sternum
Xiphoid process
Costal angle

Posterior Thoracic Cage

Vertebra prominens C7
Spinous process of T3
Clavicle
Scapula
 Inferior angle of scapula
nose
pharynx
larynx
nasopharynx
clopharynx
laryngopharynx
epiglottis
trachea
bronchus
bronchiole
oblique fissure
cervical
thoracic
lumbar
sacrum
 coccyx
Line at the chest

- Mid sternal line
- Mid clavicular line
- Anterior auxiliary line
- Mid auxiliary line
- Posterior auxiliary line
- Scapular line
- Vertebral line

Reference Lines (Anterior)
Reference Lines (Posterior)

Reference Lines (Lateral)
Lung fisher and lobes

• Aneriorly:
  • Apex of each lung rises about 2-4 cm above the inner third of the clavicle
  • The lower border of the lung cross the 6th rib at the midclavicular line and 8th rib in the mid auxiliary line

Posteriorly
  • The lower border of the lung lies at about the level of T10 spinous process

Right lung divided into upper, middle, and lower lobes
Left lung divided into upper and lower lobes

Supracavicular: above the clavicle
Infraclavicular: below the clavicle
Interscapular: between the scapula
Infrascapular: below the scapula
Structures of the Respiratory System

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The trachea and major bronchi

- The trachea bifurcates into its mainstem bronchus at the level of the sternal angles anteriorly and on the T4 spinous posteriorly.

pleura

- Visceral pleura: serous membrane that covers the outer service of the lung
- Parietal pleura: serous membrane that line the inner rib cage of the upper surface of diaphragm

Function of the pleura: smooth the opposing service and lubricant by plural fluid to allow the ling to move easily with the rib cage

Pleural space: potential space between visceral and parietal pleura.
Breathing

• The dome shaped diaphragm is the primary muscle of inspiration
• Muscle in the rib cage of the neck expand the thoracic during inspiration
• In supine position: thorax movement slight and abdominal movement easy to see
• Sitting position: thorax movement become more prominent
• Accessory muscle: sternomastoed

Inspiration & Expiration

MUSCLES OF INSPIRATION
- Sternoleidomastoid
- Scalenes
- External intercostals
- Diaphragm

MUSCLES OF EXPIRATION
- Internal intercostals
- External oblique
- Internal oblique
- Transversus abdominis
- Rectus abdominis

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Changes with age

- The chest wall become stiffer and harder to move

- Skeletal changes may produce kyphosis, this produce barrel chest
Health history

- Chest pain
- Dyspnya
- Wheezing
- Cough, sputum
- Blood- streaked sputum (hemoptysis)

Breathing Patterns
- Eupnea: normal, quiet breathing
- Apnea: absence of breathing
- Labored: increased work of breathing
- Paradoxical: chest wall moves in on inspiration & out on expiration

Technique of Examination of the Respiratory System

Inspection:
- Respiratory rate, depth, rhythm, and effort of breathing
- Color of cyanoses
- Supracalviculer retracio
- Strider: a chiefly inspiratory wheezes
- Shape of the finger nail
- Position of the trachia
- Shape of the chest:
  Normal: interior posterior diameter : transverse diameter = 1:2
Normal Adult

Thoracic Configuration

- Barrel Chest
- Pectus Carinatum (pigeon chest)
- Pectus Excavatum (funnel chest)
- Kyphosis
- Scoliosis
- Kyphoscoliosis
- Trauma
Barrel Chest

- Increased AP diameters.
- Normal in children.

Pectus Carinatum

- Pectus Carinatum (pigeon chest): The sternum is displaced anteriorly, increase the AP diameter.
Pectus Excavatum

- Pectus Excavatum (funnel chest): characterized by a depression in the lower portion in the sternum.

Kyphosis

- Kyphosis is a curving of the spine that causes a bowing of the back, which leads to a hunchback or slouching posture.
Scoliosis

- Scoliosis is a disorder that causes an abnormal curve of the spine
- is a side-to-side curvature of the spine

Kyphoscoliosis

- Abnormal spinal curvature and vertebral rotation deform the chest
Palpation

- palpation of Skin and Subcutaneous Tissues
- Vocal & Tactile Fremitus
- Thoracic Expansion

Skin & Subcutaneous Tissues

- Pain
- Masses
- Subcutaneous Emphysema: air in the subcutaneous space resulting in a crackling sound and sensation when palpated
Vocal & Tactile Fremitus

- Resonance transmitted through chest by speech when assessed, referred to as *tactile* fremitus.
- Patient instructed to repeatedly say, "ninety-nine."
- Fremituse decrease with: COPD, pleura effusion, fibroses and tumor.
- Fremituse increase: labor pneumonia.
- Fremituse more prominent inner scapular and more prominent left side than right side.

Abnormal Tactile Fremitus

**Increased**
- Pneumonia
- Lung tumor
- Atelectasis

**Decreased**
- Unilateral
  - Pneumothorax
  - Pleural Effusion
- COPD
- Muscular or obese chest wall
Tactile Fremitus - Palpate

Thoracic Expansion

- Assess for amount and symmetry of chest wall movement
Chest Expansion - Palpate

Percussion

- Assesses resonance of structures inside the thorax
- Done by tapping fingers over intercostal spaces
- Help to determine whether underlying tissue is air-filled, fluid-filled or solid
- Dullness replaces the resonance when fluid or a solid tissue replaces air containing lung
- Dullness appears in labor pneumonia (alveoli filled with fluid and blood cells), pleural effusion, fibrous tissue or trauma
- Hyperresonance: emphysema, asthma
- Diaphragmatic dullness normal 5-6 cm
Percussion Sounds

- Hyperresonance: heard over a hollow structure
- Resonance: heard over air-filled structure
- Dullness: heard over a solid organ
- Flatness: heard over bone

Percussion Technique

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Sequence to Percussion

Expected Percussion Findings
Expected Percussion Findings

Figure 18-16 Expected percussion notes: Posterior chest.
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Diaphragmatic Excursion - Percussion

Figure 18-17A Diaphragmatic excursion.

Figure 18-17B Diaphragmatic excursion.
Auscultation

• The Stethoscope
  - Breath Sounds
    • Normal Sounds
    • Abnormal (Adventitious) Sounds
    • Voice sound

Sequence for Auscultation
Breath Sounds

Normal Sounds (**when heard in normal areas**)
- Tracheal
- Bronchial
- Vesicular
- Bronchovesicular

Breathing sound decreased when air flow is deceased as in obstructive lung disease or muscle weakness

<table>
<thead>
<tr>
<th>Characteristic of breathing sound</th>
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<tbody>
<tr>
<td><strong>Duration of sound</strong></td>
</tr>
<tr>
<td>Vesicular</td>
</tr>
<tr>
<td>Broncho-vesicular</td>
</tr>
<tr>
<td>Bronchial</td>
</tr>
<tr>
<td>Tracheal</td>
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</tbody>
</table>
Abnormal (Adventitious) Sounds

- Pleural Friction Rub
- Stridor
- Crackele (rales)
- Ronchi sound (secretion in large airway).
- Weezes

Bronchial

- Abnormal when heard over lung tissue
- Indicates an underlying density
  - Pneumonia with consolidation
  - Large tumor
  - NOT a pleural effusion
Crackles

- **Coarse**
  - Low-pitched, sounds like the bubbling of air through liquid
  - May be heard on inspiration and/or expiration (usually expiration)
  - Caused by: Secretions in the airways or fluid or secretion in the lung
  - May clear after suctioning or coughing
  - Abnormality of the lung as pneumonia, fibrosis, early congestive heart failure and bronchites

Wheeze

- Continuous sound with a musical quality
- May be heard on inspiration and/or expiration (usually expiration only)
- Caused by narrowing of airway lumen (i.e. mucus, edema, bronchospasm or foreign body), heard also in asthma and COPD
Stridor

- High-pitched wheeze-like sound
- May be heard on inspiration and/or expiration (usually inspiration)
- Caused by narrowing of subglottic area (i.e. inflammation, edema or foreign body)
- More dangerous in children & infants due to smaller airway size

• If any abnormal sound detected should describe loudness, number, and timing in respiratory cycle

• Clearing crackles, weezese or rhonchi by cough suggested that secretion caused them
Voice Sounds (spoken or whispered sound)

- Egophany
- Bronchophony
- Whispered Pectoriloquy

- Increased transmitted voice sound suggested that air-filled lung has become air less
- Normal should be heard muffled and indistinct

- Bronchophony
  - Auscultate while patient repeats, “99, 99…”
  - Sounds are heard more clearly over consolidation

- Egophony: E heard A

- Whispered Pectoriloquy
  - Auscultate while patient repeated whispers, “1-2-3” or “99-99-99”
  - Sounds are heard more clearly over consolidation
Normal Lung

Atelectasis

Note: diaphragm elevates to fill in space left by shrunken section.

TABLE 18-8 Assessment of common respiratory conditions: Normal lung.


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Lobar Pneumonia

TABLE 18-8 Assessment of common respiratory conditions: Lobar pneumonia.

Bronchitis

TABLE 18-8 Assessment of common respiratory conditions: Bronchitis.
**Emphysema**

TABLE 18-8 Assessment of common respiratory conditions: Emphysema.

**Asthma**

TABLE 18-8 Assessment of common respiratory conditions: Asthma.
Pleural Effusion

TABLE 18-8 Assessment of common respiratory conditions: Pleural effusion (fluid) or thickening.

Congestive Heart Failure (CHF)

TABLE 18-8 Assessment of common respiratory conditions: Congestive heart failure.
Pneumothorax

Air in pleural space due to:
- rupture in lung wall
- leak in chest wall

Lung collapse

Tuberculosis (TB)

1. Initial complex
2. Calcified “Ghon lesion”
3. Progression to cavitation
4. Extensive disease with cavitation

Enlarged lymph nodes
Pulmonary Embolism (PE)

Acute Respiratory Distress Syndrome (ARDS)
Questions?