Examination of the Thorax and Lungs
Thorax and Lungs: Function

- **Thorax**
  - bony structures --> protective, expandable cage
  - muscles --> increase intrathoracic space

- **Lungs**
  - movement of air
  - gas exchange
The Thorax: Anatomy
Bones and Cartilage

• Anterior
  – sternum
  – manubrium
  – xiphoid process
  – costal cartilages

• Lateral
  – 12 pairs of ribs
    • all connected to thoracic vertebrae
    • upper 7 connected to sternum by costal cartilages anteriorly

• Posterior
  – 12 thoracic vertebrae
The Thorax
The Thorax: Anatomy
Musculature

- **Diaphragm**
  - contracts and moves downward during inspiration
  - increases intrathoracic space

- **Accessory muscles**
  - sternocleidomastoid
  - trapezius

- **Intercostals**
  - **External**
    - increase anteroposterior diameter during inspiration
  - **Internal**
    - decrease the transverse diameter during expiration
The Thorax: Anatomy

Interior

• Right Pleural Cavity
  – lined with parietal and visceral pleurae
  – contains right lung which has 3 lobes

• Left Pleural Cavity
  – lined with parietal and visceral pleurae
  – contains left lung with has 2 lobes

• Mediastinum
  – situated between the lungs
  – contains all of the thoracic viscera except the lungs
The Respiratory Tract
The last cillum on a smoker's lung
Visualizing the Lungs from the Surface
Thoracic Landmarks
Thoracic Landmarks (cont.)
Thorax and Lung Anatomy: Variations

- Infants and Children
  - chest of newborn generally round . . . assumes adult proportions by 2 years
  - chest wall is thin, more yielding, & prominent

- Pregnant Women
  - chest expansion increases, lung length decreases, and diaphragm rises
  - deeper breathing & slightly increased rate of respiration

- Older Adults
  - barrel chest look
  - chest wall may stiffen and expansion is decreased
  - underventilation of alveoli and decreased exercise tolerance
  - mucous membranes become drier . . . bacterial growth may occur from retained mucous
Thorax and Lung Assessment: History Review

- Present Problem
  - coughing
  - shortness of breath
  - chest pain

- Past Medical History
  - thoracic trauma or surgery
  - use of oxygen
  - chronic pulmonary diseases
  - other systemic disorders
  - testing

- Family History
  - tuberculosis, cystic fibrosis, emphysema
  - allergy, asthma, atopic derm.
  - malignancy

- Personal & Social History
  - work related exposures
  - use of protective devices
  - home environment, hobbies
  - exercise tolerance
  - travel history
History Variations

• Infants and Children
  – low birth weight or assisted ventilation
  – coughing or possible aspiration
  – difficult feeding
  – apneic episodes
  – sibling crib death
  – recurrent spitting up, recurrent pneumonia

• Older Adults
  – exposure and frequency of respiratory infections
  – effects of weather and activity on respiratory status
  – difficulty swallowing
  – immobilization or marked sedentary habits
  – influenza and pneumonia vaccines
Examination of the Thorax & Lungs: Inspection

- Size and shape
  - anteroposterior : transverse
- Symmetry
  - deformities
- Color
  - skin, nails, lips
- Superficial venous patterns
- Prominence of ribs
- Breath odor
Chest Configurations

A. Normal Adult

B. Barrel Chest

1:2 ratio

C. Pectus Carinatum

D. Pectus Excavatum

Protrusion

Depression

2x
Examination of the Thorax & Lungs: Inspection

• Evaluate respirations for:
  – Rate
  – Rhythm or pattern

• Inspect chest movement with breathing for:
  – Symmetry
  – Bulging/Retractions
  – Use of accessory muscles

• Note any audible sounds with respiration
  – wheezes
  – stridor
Patterns of Respiration

1. Eupnea (normal)

2. Tachypnea

3. Bradypnea

4. Apnea

5. Cheyne-Stokes

6. Biot's

7. Apneustic

8. Agonal

9. Shallow

10. Hyperpnea

11. Air trapping

12. Kussmaul's

13. Sighing
Examination of the Thorax & Lungs: Palpation

- Palpate the chest for the following:
  - Symmetry
  - Tenderness
  - Pulsations
  - Sensations such as crepitus, grating vibrations
  - Thoracic expansion
  - Tactile fremitus
  - Position of the trachea
Examination of the Thorax & Lungs: Percussion

• Percuss for:
  – Tone, comparing all areas bilaterally
    • **resonance** - loud, low pitch -> normal lung
    • **hyperresonance** - very loud, very low pitch -> COPD, pneumothorax
    • **dullness** - medium intensity and pitch -> pneumonia, pleural effusions
  – Diaphragmatic excursion
Examination of the Thorax & Lungs: Auscultation

- Breath sounds
- Adventitious (unexpected) sounds
- Vocal resonance
## Breath Sounds

### Table 14-2 Characteristics of Normal Breath Sounds

<table>
<thead>
<tr>
<th>BREATH SOUND</th>
<th>PITCH</th>
<th>INTENSITY</th>
<th>QUALITY</th>
<th>RELATIVE DURATION OF INSPIRATORY AND EXPIRATORY PHASES</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronchial</td>
<td>High</td>
<td>Loud</td>
<td>Blowing/hollow</td>
<td>I &lt; E</td>
<td>Trachea</td>
</tr>
<tr>
<td>Bronchovesicular</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Combination of bronchial and vesicular</td>
<td>I = E</td>
<td>Between scapula, first and second ICS lateral to the sternum</td>
</tr>
<tr>
<td>Vesicular</td>
<td>Low</td>
<td>Soft</td>
<td>Gentle rustling/breezy</td>
<td>I &gt; E</td>
<td>Peripheral lung</td>
</tr>
</tbody>
</table>
Auscultation Technique

- Patient sitting, breathing slowly and deeply through mouth
- Avoid hyperventilation!
- Use diaphragm of stethoscope
- Diaphragm placed firmly on the skin
- Listen to anterior, posterior and lateral
Adventitious Sounds

• **Discontinuous**
  - Fine crackles
  - Coarse crackles

• **Continuous**
  - Rhonchi (sonorous wheeze)
  - Wheeze (sibilant wheeze)
  - Pleural friction rub
  - Stridor
Vocal Resonance

- Bronchophony
- Whispered pectoriloquy
- Egophony
Examination of the Thorax & Lungs: Web Resources

• To hear breath sounds:
  – The R.A.L.E. Repository
    • http://www.RALE.ca/
  – RC-WEB
    • http://www.hsc.missouri.edu/~shrp/rtwww/rcweb/docs/sounds.html

• History and Physical Study Guides:
  • http://www.medinfo.ufl.edu/year1/bcs/clist/index.html