Chest and Lungs
Examination Procedures

Order of examinations
• Perform the exams from least sensitive to most sensitive, as least to most invasive is not applicable in the thorax
  – Inspection
  – Palpation
    • Thoracic expansion
    • Tactile fremitus
  – Percussion
    • Comparing tones throughout lung fields
    • Diaphragmatic excursion
  – Auscultation
    • Comparing breath sounds throughout lung fields
    • Vocal resonance

Anatomy and Physiology: Anatomic Landmarks
• Topographic markers
  – Nipples (usually 4th intercostal space)
  – Manubriosternal junction/Angle of Louis (usually 2nd intercostal space)
  – Costal angles (bottom of lung fields)
  – Vertebra prominens (top of lung fields)
  – Clavicles (apex of lung above the clavicles)

Exam & Findings: Equipment
• Marking pencil or eyeliner (silver good for dark skin)
• Centimeter ruler/tape measure
• Stethoscope with bell/diaphragm
• Drapes

Exam & Findings: Inspection
• Chest
  – Shape/symmetry
  – Chest wall movement
  – Superficial venous patterns
  – Prominence of ribs
  – AP vs. transverse diameter
  – Sternal protrusion or invagination
  – Spinal deviation (scoliosis, pain, subluxation)

Exam & Findings: Inspection
• Skin/nails/lips
  – Cyanosis
  – Pallor
• Lips
  – Purging
• Nostrils
  – Flaring
• Digits
  – Clubbing
• Breath
  – Odor
Exam & Findings: Inspection

• Respiration
  – Rate
  – Depth
  – Rhythm
• Count while palpating pulse

Exam & Findings: Descriptors of Respiration

• Dyspnea
• Tachypnea
• Bradypnea
• Hyperpnea
• Hypopnea
• Kussmaul
• Cheyne-Stokes
• Sighing
• Air trapping
• Biot
• Ataxic
• Apnea

Exam & Findings: Inspection

• Paradoxic—occurs when a negative intrathoracic pressure is transmitted to the abdomen by a weakened diaphragm (thorax draws in and abdomen expands on inspiration)
• Causes: phrenic nerve palsy, subpulmonic effusion, pneumothorax, abdominal masses

Exam & Findings: Inspection

• Inspect for airway obstruction
  – Stridor (labored, noisy breathing heard without stethoscope)
  – Nostril flaring
  – Cough
  – Chest retraction

Exam & Findings: Palpation

• Thoracic muscles/skeleton
  – Pulsations
  – Tenderness
  – Bulges/depressions
  – Unusual movement/positions
  – Elasticity of rib cage
  – Immovability of sternum
  – Rigidity of thoracic spine
  – Crepitus
  – Friction rub

Exam & Findings: Palpation

• Perform thoracic expansion
• Perform tactile fremitus
• Evaluate position of trachea (may have already been done with a head and neck evaluation)
Exam & Findings: Percussion

• Percuss chest
  – Posterior
  – Lateral
  – Anterior (sound dulled by pectoralis muscles and breast tissue, so usually not done)
• Compare tones bilaterally
• Measure diaphragmatic excursion
  – Difference between inhalation and exhalation should measure __________

Exam & Findings: Percussion

• Percussion tone indicators for lungs
  – Resonance is expected
  – Hyperresonance indicates hyperinflation
  – Dullness indicates diminished air exchange
    • Blood, pus, tumor, edema, proteinaceous fluid

Exam & Findings: Auscultation

• Normal breath sounds
  – Vesicular—low pitched, low-intensity sounds heard over healthy tissue
  – Bronchovesicular—heard over major bronchi and are moderate in pitch and intensity
  – Bronchial/tracheal—highest in pitch and intensity, heard over the trachea
    • Bronchovesicular and bronchial sounds are abnormal if heard over peripheral lung tissue
• Abnormal breath sounds
  – Amphoric—resembles the sound of air blown across a bottle and heard in a large, stiff-walled pulmonary cavity or tension pneumothorax with fistula

Exam & Findings: Auscultation

• Adventitious breath sounds
  – Crackle—heard more often with inspiration, caused by disrupted passage of air through the small airways; sibilant=high pitched; sonorous=low-pitched
    • Fine
    • Medium
    • Coarse
  – Rhonchi—deeper, rumbling sounds in expiration, less discrete than crackles; seen more with thick mucous production
  – Wheeze—a form of rhonchus; high-pitched musical sound in inspiration and expiration; caused by high-velocity air flow through narrowed passages
  – Friction rub—occurs outside the bronchial tree; dry, cracking, grating, low-pitched sound
  – Mediastinal crunch—mediastinal emphysema

Exam & Findings: Auscultation

• Vocal resonance
  • Normally, numbers or letters spoken by the patient are heard by the examiner as very muffled and indistinct
  • Consolidation (by fluid, pus, mass) leads to:
    – Bronchophony—greater clarity and loudness of the sounds (“99” or “123”)
    – Pectoriloquy—if bronchophony is extreme, even whispered sounds can be heard with clarity (“123”)
    – Egophony—the intensity of the spoken voice is increased and the quality is nasal (“e” becomes “a”)
Increased breath sounds

- Solids and fluids transmit sound and vibration better than air
- Pneumonia, masses
- The normal vesicular sounds at the lung bases will be long and loud, rather than soft and short
- And/or bronchial or bronchovesicular sounds will be heard where vesicular sounds are normally heard

Decreased breath sounds

- Anything that causes a "blockage" between the lungs and the stethoscope will cause decreased breath sounds
- Bilaterally:
  - Adipose, muscle, breasts, bilateral pleural effusion (CHF), and hyperaeration (COPD, asthma)
- Unilaterally:
  - Obstruction in bronchus, pneumothorax, pleural effusion, pleural fibrosis, mass

Exam & Findings: Cough

- Describe
  - Moisture: dry or moist; a moist cough may be caused by infection; a dry cough has a variety of causes (cardiac, allergies, mass, HIV)
  - Onset: acute with fever is usually infection; without fever, foreign body or inhaled irritants
  - Frequency: seldom or often present (% of day)
  - Regularity: regular cough is seen with pertussis; irregular cough has variety of causes
  - Pitch/loudness: loud and high-pitched or quiet and low-pitched
  - Postural influences: does it occur after reclining or standing
  - Quality: hoarse (croup); whoop (pertussis); dry and brassy (tumor)

Exam & Findings: Sputum

- Describe
  - Color
  - Consistency
  - Odor

Anatomy and Physiology: Infants and Children

- Fetal lungs contain no air/gas exchange through placenta
- At birth lungs adapt to postnatal function
- Chest circumference same as head circumference until 2 years old
- Chest wall thin/bony structures more prominent and yielding than in adult

Anatomy and Physiology: Pregnant Women

- Mechanical/biochemical factors lead to changes in respiratory function
- Anatomic changes in chest
  - Lower ribs flare
  - Diaphragm rises above usual position
### Anatomy and Physiology: Older Adult

- Barrel chest from loss of muscle strength in thorax and loss of lung resiliency
- Skeletal changes of aging emphasize dorsal curve of thoracic spine
- Alveoli less elastic causing fatigue/dyspnea on exertion
- Decrease in vital capacity/increase in residual volume
- Mucous membranes drier

### Exam & Findings: Older Adults

- Chest expansion decreased
- Bony prominences marked
- Kyphosis with flattening of lumbar curve
- Increased AP diameter
- Hyperresonance (percussion) common

### Related History: Present Problem

- Coughing
  - Onset
  - Nature
  - Pattern
  - Severity
  - Associated symptoms
  - Efforts to treat
  - Medications

- Shortness of breath
  - Onset
  - Pattern
  - Severity
  - Associated symptoms

### Related History: Present Problem

- Chest pain
  - Onset/duration
  - Associated symptoms
  - Efforts to treat
  - Medications
Heart Examination Procedures

Anatomy and Physiology

- Cardiac cycle
  - Systole - Ventricular contraction ejects blood
  - Diastole - Ventricular relaxation/atria contraction moves blood into ventricle

Anatomy and Physiology

- Systole
  - Ventricles contract, raise pressure
  - Mitral/tricuspid valves close (1st heart sound = S1 = lub)
  - Pressure continues to rise
  - Aortic/pulmonic valves open
  - Blood ejected into arteries
  - Pressure falls
  - Aortic/pulmonic valves close (2nd heart sound = S2 = dub)
  - Mitral/tricuspid valves open
  - Blood moves from atria to ventricles (S3)

- Diastole
  - Atria contract as ventricles almost filled
  - Causes complete emptying of atria (S4)

- Cycle repeats itself
- Cycle slightly slower on right side of heart (splitting)

Exam & Findings: Equipment

- Centimeter ruler
- Stethoscope (bell/diaphragm)

Anatomy and Physiology

- Position variance
  - Body build
  - Chest configuration
  - Diaphragm level
  - Dextrocardia or situs inversus
### Exam & Findings

- **Inspection**
  - Apical impulse (PMI = point of maximum impulse): 5th intercostal space @ midclavicular line (know both terms)
- **Palpation of the precordium**
  - (2, 2, 3, 4, 5 intercostal spaces)
  - Thrill (palpable murmur—felt as a vibration)
  - Murmurs that are Grade 3 and above can often be palpated before the auscultation
- **Carotid artery palpation**

### Exam & Findings

- **Percussion**
  - Of limited value in defining borders of heart
- **Heart sound auscultation**
  - Aortic valve area 2 RICS
  - Pulmonic area 2 LICS
  - Erb’s point (Second pulmonic area) 3 LICS
  - Tricuspid area 4 LICS
  - Mitral area 5 LICS @ midclavicular line
  - Memory aid (mnemonic): A PET Monkey

### Exam & Findings

- **Auscultation**
  - Assess overall rate/rhythm
  - Frequency
  - Intensity
  - Duration
  - Pathology

### Exam & Findings: Heart

- **Heart murmurs**
  - Timing/duration
  - Pitch
  - Intensity
  - Pattern
  - Quality
  - Location/radiation
  - Respiratory phase variations

### Anatomy and Physiology: Infants/Children

- Heart assumes adult function early in fetal life
- Changes at birth
  - Ductus arteriosus/foramen ovale close
  - Right ventricle assumes pulmonary circulation
  - Left ventricle assumes systemic circulation
- Ventricle muscle mass increases over 1st year
- Heart lies more horizontally/apex higher
  - Adult heart position reached by 7 years old
Exam & Findings: Older Adults

- Slow down pace of exam as cardiac response may be slowed by demands
  - Slow down for the respiratory assessment, too
- Heart rate variable
  - Slower if increased vagal tone
  - Range from low 40s to 100+
  - Ectopic beats common
- Apical impulse harder to find with increased AP chest diameter

Anatomy and Physiology: Older Adults

- Heart size decreases
- Left ventricular wall thickens
- Valves fibrose/calcify
- Endocardium thickens
- Myocardium less elastic
- ECG changes

Anatomy and Physiology: Pregnant Women

- Heart works harder
- Cardiac/blood volume increases
- Heart shifts to more horizontal position
  - SEM (systolic ejection murmur)