Chapter 1: An Introduction to the Human Body
Overview

- Meaning of anatomy and physiology
- Organization of the human body and properties
- Regulation of internal environment
- Basic vocabulary
Anatomy and Physiology Defined

- Two branches of science that deal with body’s parts and function
  - **Anatomy**
    - The science of body structures and relationships
    - First studies by dissection (cutting apart)
    - Imaging techniques
  - **Physiology**
    - The science of body functions
# Table 1.1

## Selected Subspecialties of Anatomy and Physiology

<table>
<thead>
<tr>
<th>Subspecialties of Anatomy</th>
<th>Study of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embryology</td>
<td>The first eight weeks of development following fertilization of an egg (in humans). The complete development of an individual from fertilization of an egg to death. Cellular structure and functions. Microscopic structure of tissues. Surface markings of the body to understand internal anatomy through visualization and palpation (gentle touch). Structures that can be examined without using a microscope. Structure of specific systems of the body such as the nervous or respiratory systems. Specific regions of the body such as the head or chest. Body structures that can be visualized with x-rays. Structural changes (from gross to microscopic) associated with disease.</td>
</tr>
<tr>
<td>Cell biology</td>
<td></td>
</tr>
<tr>
<td>Histology</td>
<td></td>
</tr>
<tr>
<td>(his'-TOL-ô -jê; hist- = tissue)</td>
<td></td>
</tr>
<tr>
<td>Surface anatomy</td>
<td></td>
</tr>
<tr>
<td>Gross anatomy</td>
<td></td>
</tr>
<tr>
<td>Systemic anatomy</td>
<td></td>
</tr>
<tr>
<td>Regional anatomy</td>
<td></td>
</tr>
<tr>
<td>Radiographic anatomy</td>
<td></td>
</tr>
<tr>
<td>(râ-dê-ô-GRÄF-ik; radi- = ray; -graphic = to write)</td>
<td></td>
</tr>
<tr>
<td>Pathological anatomy</td>
<td></td>
</tr>
<tr>
<td>(path'-ô-LOH-î-kal; path- = disease)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subspecialties of Physiology</th>
<th>Study of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurophysiology</td>
<td>Functional properties of nerve cells.</td>
</tr>
<tr>
<td>(NEO-ô-fiz-ê-OL-ô-jê; neuro- = nerve)</td>
<td></td>
</tr>
<tr>
<td>Endocrinology</td>
<td>Hormones (chemical regulators in the blood) and how they control body functions.</td>
</tr>
<tr>
<td>(EN-ô-dô-kri-NOL-ô-jê; endo- = within; -crin = secretion)</td>
<td></td>
</tr>
<tr>
<td>Cardiovascular physiology</td>
<td>Functions of the heart and blood vessels.</td>
</tr>
<tr>
<td>(kar-dê-ô-VAS-kü-lar; cardi- = heart; -vascular = blood vessels)</td>
<td></td>
</tr>
<tr>
<td>Immunology</td>
<td>How the body defends itself against disease-causing agents.</td>
</tr>
<tr>
<td>(im-ô-u-NOL-ô-jê; immun- = not susceptible)</td>
<td></td>
</tr>
<tr>
<td>Respiratory physiology</td>
<td>Functions of the air passageways and lungs.</td>
</tr>
<tr>
<td>(RES-pir-a-to-ô-re; respira- = to breathe)</td>
<td></td>
</tr>
<tr>
<td>Renal physiology</td>
<td>Functions of the kidneys.</td>
</tr>
<tr>
<td>(RE-nal; ren- = kidney)</td>
<td></td>
</tr>
<tr>
<td>Exercise physiology</td>
<td>Changes in cell and organ functions as a result of muscular activity. Functional changes associated with disease and aging.</td>
</tr>
<tr>
<td>Pathophysiology</td>
<td></td>
</tr>
<tr>
<td>(PATH-ô-fiz-ê-ol-ô-jê)</td>
<td></td>
</tr>
</tbody>
</table>
Structure and Function

- Structure and function of the body are closely related
- Structure of a part of the body allows performance of certain functions
  - Examples:
    - Bones of the skull provide protection for the brain
    - Thin air sacs of the lungs permit movement of oxygen
Levels of Structural Organization

- Six levels of organization
Levels of structural organization

- CHEMICAL LEVEL
  - Basic level
    - **Atoms** the smallest unit of matter
      - Essential atoms for life include carbon (C), hydrogen (H), oxygen (O), nitrogen (N), phosphorus (P), calcium (Ca), and sulfur
    - **Molecules** two or more atoms joined together
      - Deoxyribonucleic acid (DNA)
      - Glucose
Levels of structural organization

- CELLULAR LEVEL
  - Molecules combine to form cells
    - Cells are the basic structural and functional units of an organism
    - Many kinds of cells in the body
    - Muscle cells, nerve cells, epithelial cells, etc.
Levels of structural organization

- TISSUE LEVEL
  - **Tissues** are groups of cells and materials surrounding them
  - Four basic types of tissues:
    - Epithelial
    - Connective
    - Muscular
    - Nervous
Levels of structural organization

- **ORGAN LEVEL**
  - Tissues are joined together to form organs
    - **Organs** are structures that are composed of two or more different types of tissues
  - Specific functions and recognizable shapes
    - Examples:
      - Heart, lungs, kidneys
      - Stomach is made of several tissues
      - Serous membrane, smooth muscle and epithelial layers for digestion
Levels of structural organization

- SYSTEM LEVEL
  - A system consists of related organs with a common function
  - Organ-system level
    - Digestive system breaks down and absorbs food
    - It includes organs such as the mouth, small and large intestines, liver, gallbladder, and pancreas
    - Eleven systems of the human body
### Table 1.2

#### The Eleven Systems of the Human Body

**Integumentary System (Chapter 1)**
- **Components:** Skin and structures associated with it, such as hair, nails, sebaceous glands, and oil glands.
- **Functions:** Protects the body, helps regulate body temperature, eliminates some wastes, helps make vitamin D, and detects sensations such as touch, pain, warmth, and cold.

**Muscular System (Chapters 6, 14)**
- **Components:** Muscles composed of skeletal muscle tissue, so-named because it is usually attached to bones.
- **Functions:** Produces body movements, such as walking, stabilizes body position (posture), generates heat.

**Skeletal System (Chapters 6–9)**
- **Components:** Bones and joints of the body and their associated cartilages.
- **Functions:** Supports and protects the body; provides a surface area for muscle attachment; aids body movement; houses cells that produce blood cells; stores minerals and lipids (fats).

**Nervous System (Chapters 12–17)**
- **Components:** Brain, spinal cord, nerves, and special sense organs, such as the eyes and ears.
- **Functions:** Generates action potentials (nerve impulses) to regulate body activities; detects changes in the body's internal and external environments, interprets the changes, and responds by causing muscular contractions or glandular secretions.
The Eleven Systems of the Human Body

ENDOCRINE SYSTEM (CHAPTER 18)
Components: Hormone-producing glands (pituitary gland, hypothalamus, pineal gland, thymus, thyroid gland, parathyroid glands, adrenal glands, pancreas, ovaries, and testes) and hormone-producing cells in several other organs.
Functions: Regulates body activities by releasing hormones, which are chemical messengers transported in blood from an endocrine gland or tissue to a target organ.

CARDIOVASCULAR SYSTEM (CHAPTERS 19–21)
Components: Blood, heart, and blood vessels.
Functions: Heart pumps blood through blood vessels; blood carries oxygen and nutrients to cells and carbon dioxide and wastes away from cells and helps regulate acid–base balance, temperature, and water content of body fluids; blood components help defend against disease and repair damaged blood vessels.

DIGESTIVE SYSTEM (CHAPTER 24)
Components: Organs of gastrointestinal tract, a long tube that includes the mouth, pharynx (throat), esophagus, stomach, small and large intestines, and anus; also includes accessory organs that assist in digestive processes, such as the salivary glands, liver, gallbladder, and pancreas.
Functions: Achieves physical and chemical breakdown of food; absorbs nutrients; eliminates solid wastes.

URINARY SYSTEM (CHAPTER 26)
Components: Kidneys, ureters, urinary bladder, and urethra.
Functions: Produces, stores, and eliminates urine; eliminates wastes and regulates volume and chemical composition of blood; helps maintain the acid–base balance of body fluids; maintains body's mineral balance; helps regulate production of red blood cells.

Table 01.02c  Tortora - PAP 12/e
Copyright © John Wiley and Sons, Inc. All rights reserved.
Table 1.2

**LYMPHATIC SYSTEM AND IMMUNITY (CHAPTER 22)**

- **Components:**
  - Lymphatic fluid (lymph) and vessels; also includes spleen, thymus, lymph nodes, and tonsils.
- **Functions:**
  - Returns proteins and fluid to blood; carries lipids from gastrointestinal tract to blood; includes structures where lymphocytes that protect against disease-causing microbes mature and proliferate.

**RESPIRATORY SYSTEM (CHAPTER 23)**

- **Components:** Lungs and air passageways such as the pharynx (throat), larynx (voice box), trachea (windpipe), and bronchial tubes leading into and out of the lungs.
- **Functions:** Transfers oxygen from inhaled air to blood and carbon dioxide from blood to exhaled air; helps regulate acid-base balance of body fluids; air flowing out of lungs through vocal cords produces sounds.

**REPRODUCTIVE SYSTEMS (CHAPTER 24)**

- **Components:** Gonads (testes in males and ovaries in females) and associated organs (uterine tubes, uterus, and vagina in females and epididymis, ductus deferens, and penis in males).
- **Functions:** Gonads produce gametes (sperm or oocytes) that unite to form a new organism; gonads also release hormones that regulate reproduction and other body processes; associated organs transport and store gametes.
Levels of structural organization

- ORGANISMAL LEVEL
  - An organism or any living individual
  - All parts of the body functioning together
Clinical Connection: Noninvasive Diagnostic Techniques

Used to assess aspects of body structure and function

- **Inspection** of the body to observe any changes
  - Palpation
    - Gently touching body surfaces with hands
  - Auscultation or
    - listening to body sounds (stethoscope)
  - Percussion
    - Tapping on the body surface with fingertips and listening to echoes
Characteristics of Living Human Organism

- Basic Life Processes
  - Distinguish living from non-living things
  - Six important life process
    - Metabolism
    - Responsiveness
    - Movement
    - Growth
    - Differentiation
    - Reproduction
Metabolism and Responsiveness

- **Metabolism**
  - Sum of all the chemical processes that occur in the body
    - **Catabolism** or the breakdown of complex chemical substances into simpler components
    - **Anabolism** or the building up of complex chemical substances from smaller, simpler components

- **Responsiveness**
  - Body’s ability to detect and respond to changes
    - Decrease in body temperature
    - Responding to sound
    - Nerve (electrical signals) and muscle cells (contracting)
Movement and Growth

- **Movement**
  - Motion of the whole body
    - Organs, cells, and tiny subcellular structures
    - Leg muscles move the body from one place to another

- **Growth**
  - Increase in body size
    - Due to an increase in existing cells, number of cells, or both
    - In bone growth materials between cells increase
Differentiation and Reproduction

- Differentiation
  - Development of a cell from an unspecialized to specialized state
    - Cells have specialized structures and functions that differ from precursor cells
    - Stem cells give rise to cells that undergo differentiation

- Reproduction
  - Formation of new cells (growth, repair, or replacement)
  - Production of a new individual
Clinical Connection: Autopsy

- Postmortem (after death) examination of the body and internal organs

- Several uses:
  - Determine the cause of death
  - Identify diseases not detected during life
  - Determine the extent of injuries and contribution to death
  - Hereditary conditions
Homeostasis

- A condition of **equilibrium** (balance) in the body’s internal environment
  - Dynamic condition
  - Narrow range is compatible with maintaining life
  - Example
    - Blood glucose levels range between 70 and 110 mg of glucose/dL of blood
    - Whole body contributes to maintain the internal environment within normal limits
Homeostasis and Body Fluids

- Maintaining the volume and composition of body fluids are important
  - **Body fluids** are defined as dilute, watery solutions containing dissolved chemicals inside or outside of the cell
  - **Intracellular Fluid (ICF)**
    - Fluid within cells
  - **Extracellular Fluid (ECF)**
    - Fluid outside cells
    - **Interstitial fluid** is ECF between cells and tissues
ECF and Body Location

- **Blood Plasma**
  - ECF within blood vessels

- **Lymph**
  - ECF within lymphatic vessels

- **Cerebrospinal fluid (CSF)**
  - ECF in the brain and spinal cord

- **Synovial fluid**
  - ECF in joints

- **Aqueous humor and vitreous body**
  - ECF in eyes
Interstitial Fluid and Body Function

- Cellular function depends on the regulation of composition of interstitial fluid
- Body’s internal environment
- Composition of interstitial fluid changes as it moves
  - Movement back and forth across capillary walls provide nutrients (glucose, oxygen, ions) to tissue cells and removes waste (carbon dioxide)
Control of Homeostasis

- Homeostasis is constantly being disrupted
  - Physical insults
    - Intense heat or lack of oxygen
  - Changes in the internal environment
    - Drop in blood glucose due to lack of food
  - Physiological stress
    - Demands of work or school
  - Disruptions
    - Mild and temporary (balance is quickly restored)
    - Intense and Prolonged (poisoning or severe infections)
Feedback System (insert figure 1.2)

- **Cycle of events**
  - Body is monitored and re-monitored
  - Each monitored variable is termed a controlled condition

- **Three Basic components**
  - Receptor
  - Control center
  - Effector
Feedback Systems

Receptor

- Body structure that monitors changes in a controlled condition
- Sends input to the control center
  - Nerve ending of the skin in response to temperature change
Feedback Systems

- Control Center
  - Brain
  - Sets the range of values to be maintained
  - Evaluates input received from receptors and generates output command
  - Nerve impulses, hormones
    - Brains acts as a control center receiving nerve impulses from skin temperature receptors
Feedback Systems

- **Effector**
  - Receives output from the control center
  - Produces a response or effect that changes the controlled condition
    - Found in nearly every organ or tissue
    - Body temperature drops the brain sends an impulse to the skeletal muscles to contract
    - Shivering to generate heat
Negative and Positive Feedback systems

- **Negative Feedback systems**
  - Reverses a change in a controlled condition
    - Regulation of blood pressure (force exerted by blood as it presses against the walls of the blood vessels)

- **Positive Feedback systems**
  - Strengthen or reinforce a change in one of the body’s controlled conditions
    - Normal child birth
Negative Feedback: Regulation of Blood Pressure (insert figure 1.3)

- External or internal stimulus increase BP
  - Baroreceptors (pressure sensitive receptors)
    - Detect higher BP
    - Send nerve impulses to brain for interpretation
    - Response sent via nerve impulse sent to heart and blood vessels
    - BP drops and homeostasis is restored
    - Drop in BP negates the original stimulus
Positive Feedback Systems: Normal Childbirth

- Uterine contractions cause vagina to open
- Stretch-sensitive receptors in cervix send impulse to brain
- Oxytocin is released into the blood
- Contractions enhanced and baby pushes farther down the uterus
- Cycle continues to the birth of the baby (no stretching)
Positive Feedback: Blood Loss

- Normal conditions, heart pumps blood under pressure to body cells (oxygen and nutrients)
- Severe blood loss
  - Blood pressure drops
  - Cells receive less oxygen and function less efficiently
  - If blood loss continues
    - Heart cells become weaker
    - Heart doesn’t pump
    - BP continues to fall
Homeostatic Imbalances

- Normal equilibrium of body processes are disrupted
  - **Moderate imbalance**
    - Disorder or abnormality of structure and function
    - Disease specific for an illness with recognizable signs and symptoms
    - **Signs** are objective changes such as a fever or swelling
    - **Symptoms** are subjective changes such as headache
  - **Severe imbalance**
    - Death
Homeostatic Imbalances: Areas of Science

- Epidemiology
  - Occurrence of diseases
  - Transmission in a community
- Pharmacology
  - Effects and uses of drugs
  - Treatment of disease
Clinical Connection: Diagnosis of Disease

- Distinguishing one disorder or disease from another
  - Signs and symptoms
  - Medical history
    - Collecting information about event
    - Present illnesses and past medical problems
  - Physical examination
    - Orderly evaluation of the body and its function
    - Noninvasive techniques and other vital signs (pulse)
Basic Anatomical Terminology

- Common language referring to body structures and their functions
- Anatomists use standard anatomical position and special vocabulary in relating body parts
Body Positions

- Descriptions of the human body assume a specific stance
- **Anatomical position**
  - Body upright
  - Standing erect facing the observer
  - Head and eyes facing forward
  - Feet are flat on the floor and forward
  - Upper limbs to the sides
  - Palms turned forward
Anatomical position

- Body is upright
- Terms for a reclining body
  - Prone position
    - Body is lying face down
  - Supine position
    - Body is lying face up
Regional Names

- Several major regions identified
  - Most principal regions
    - Head
      - Skull and face
    - Neck
      - Supports the head and attaches to trunk
    - Trunk
      - Chest, abdomen, and pelvis
    - Upper limbs
      - Attaches to trunk (shoulder, armpit, and arm)
    - Lower limbs
      - Attaches to trunk (buttock, thigh, leg, ankle, and foot
Directional Terms

- Describe the position of one body part relative to another
  - Group in pairs with opposite meaning
    - **Anterior** (front) and **posterior** (back)
  - Only make sense when used to describe a position of one structure relative to another
    - The esophagus is posterior to the trachea
    - Knee is superior to the ankle
# Directional Terms

<table>
<thead>
<tr>
<th>DIRECTIONAL TERM</th>
<th>DEFINITION</th>
<th>EXAMPLE OF USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior (soo′-PĒR-ē-or)</td>
<td>Toward the head, or the upper part of a structure.</td>
<td>The heart is superior to the liver.</td>
</tr>
<tr>
<td>(cephalic or cranial)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inferior (in′-FĒR-ē-or)</td>
<td>Away from the head, or the lower part of a structure.</td>
<td>The stomach is inferior to the lungs.</td>
</tr>
<tr>
<td>(caudal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anterior (an-TĒR-ē-or)</td>
<td>Nearer to or at the front of the body.</td>
<td>The sternum (breastbone) is anterior to the heart.</td>
</tr>
<tr>
<td>(ventral)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posterior (pos-TĒR-ē-or)</td>
<td>Nearer to or at the back of the body.</td>
<td>The esophagus is posterior to the trachea (windpipe).</td>
</tr>
<tr>
<td>(dorsal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medial (MĒ-dē-al)</td>
<td>Nearer to the midline.</td>
<td>The ulna is medial to the radius.</td>
</tr>
<tr>
<td>Lateral (LAT-er-al)</td>
<td>Farther from the midline.</td>
<td>The lungs are lateral to the heart.</td>
</tr>
<tr>
<td>Intermediate (in′-ter-MĒ-dē-at)</td>
<td>Between two structures.</td>
<td>The transverse colon is intermediate between the ascending and descending colons.</td>
</tr>
<tr>
<td>Ipsilateral (ip-si-LAT-er-al)</td>
<td>On the same side of the body as another structure.</td>
<td>The gallbladder and ascending colon are ipsilateral.</td>
</tr>
<tr>
<td>Contralateral (CON-tra-lat-er-al)</td>
<td>On the opposite side of the body from another structure.</td>
<td>The ascending and descending colons are contralateral.</td>
</tr>
<tr>
<td>Proximal (PROK-si-mal)</td>
<td>Nearer to the attachment of a limb to the trunk; nearer to the origination of a structure.</td>
<td>The humerus is proximal to the radius.</td>
</tr>
<tr>
<td>Distal (DIS-tal)</td>
<td>Farther from the attachment of a limb to the trunk; farther from the origination of a structure.</td>
<td>The phalanges are distal to the carpals.</td>
</tr>
<tr>
<td>Superficial (soo′-per-FISH-al) (external)</td>
<td>Toward or on the surface of the body.</td>
<td>The ribs are superficial to the lungs.</td>
</tr>
<tr>
<td>Deep (internal)</td>
<td>Away from the surface of the body.</td>
<td>The ribs are deep to the skin of the chest and back.</td>
</tr>
</tbody>
</table>

*Note that the terms anterior and ventral mean the same thing in humans. However, in four-legged animals ventral refers to the belly side and is therefore inferior. Similarly, the terms posterior and dorsal mean the same thing in humans, but in four-legged animals dorsal refers to the back side and is therefore superior.

¹Recall that the midline is an imaginary vertical line that divides the body into equal right and left sides.
Common Directional Terms

- **Anterior**
  - Nearer to the front of the body

- **Posterior**
  - Nearer to the back of the body

- **Superior**
  - Toward the head

- **Inferior**
  - Away from the head
Common Directional Terms

- **Proximal**
  - Nearer to the attachment of a limb to the trunk

- **Distal**
  - Farther from the attachment of a limb to the trunk

- **Lateral**
  - Farther from the midline

- **Medial**
  - Nearer to the midline
Planes and Sections

- Imaginary flat surfaces that pass through the body parts
  - **Sagittal plane**
    - A vertical plane that divides the body into right and left sides
      - **Midsagittal plane** divides body into equal right and left sides
      - **Parasagittal plane** divides body into unequal right and left sides
Planes and Sections

- **Frontal or coronal plane**
  - Divides the body or an organ into anterior (front) and posterior (back) portions

- **Transverse plane**
  - Divides the body or an organ into superior (upper) and inferior (lower) portions
  - Also called *cross-sectional* or *horizontal plane*
Planes and Sections

Figure 01.07  Tortora - PAP 12/e
Copyright © John Wiley and Sons, Inc. All rights reserved.
Planes and Sections

- **Oblique plane**
  - Passes through the body or an organ at an angle
  - Between transverse and sagittal plane
  - Between transverse and frontal plane

- **Sections**
  - Cut of the body made along a plane
Body Cavities

- Spaces within the body that help protect, separate, and support internal organs
  - Cranial cavity
  - Thoracic cavity
  - Abdominopelvic cavity
Body Cavities

<table>
<thead>
<tr>
<th>CAVITY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cranial cavity</td>
<td>Formed by cranial bones and contains brain.</td>
</tr>
<tr>
<td>Vertebral canal</td>
<td>Formed by vertebral column and contains spinal cord and the beginnings of spinal nerves.</td>
</tr>
<tr>
<td>Thoracic cavity*</td>
<td>Chest cavity; contains pleural and pericardial cavities and mediastinum.</td>
</tr>
<tr>
<td>Pleural cavity</td>
<td>Each surrounds a lung; the serous membrane of each pleural cavity is the pleura.</td>
</tr>
<tr>
<td>Pericardial cavity</td>
<td>Surrounds the heart; the serous membrane of the pericardial cavity is the pericardium.</td>
</tr>
<tr>
<td>Mediastinum</td>
<td>Anatomic region in the central portion of the thoracic cavity between the medial walls of pleural cavities; extends from sternum to vertebral column and from first rib to diaphragm; contains all the structures of the thoracic cavity other than the lungs, including, for example, the heart, thymus, esophagus, trachea, and several large blood vessels.</td>
</tr>
<tr>
<td>Abdominopelvic cavity</td>
<td>Subdivided into abdominal and pelvic cavities.</td>
</tr>
<tr>
<td>Abdominal cavity</td>
<td>Contains stomach, spleen, liver, gallbladder, small intestine, and most of large intestine; the serous membrane of the abdominal cavity is the peritoneum.</td>
</tr>
<tr>
<td>Pelvic cavity</td>
<td>Contains urinary bladder, portions of large intestine, and internal organs of reproduction.</td>
</tr>
</tbody>
</table>

* See figure 1.10 for details of the thoracic cavity
Cranial Cavity and Vertebral Canal

- Cranial cavity
  - Formed by the cranial bones
  - Protects the brain

- Vertebral canal
  - Formed by bones of vertebral column
  - Contains the spinal cord

- Meninges
  - Layers of protective tissue that line the cranial cavity and vertebral canal
Thoracic Cavity

- Also called the chest cavity

- Formed by
  - Ribs
  - Muscles of the chest
  - Sternum (breastbone)
  - Vertebral column (thoracic portion)
Thoracic Cavity

- Within the thoracic cavity
  - Pericardial cavity
    - Fluid-filled space that surround the heart
  - Pleural cavity
    - Two fluid-filled spaces that surround each lung
Thoracic Cavity

- **Mediastinum**
  - Central part of the thoracic cavity
  - Between lungs
  - Extending from the sternum to the vertebral column
  - First rib to the diaphragm

- **Diaphragm**
  - Dome shaped muscle
  - Separates the thoracic cavity from the abdominopelvic cavity
Abdominopelvic Cavity

- Extends from the diaphragm to the groin
- Encircled by the abdominal wall and bones and muscles of the pelvis
- Divided into two portions:
  - **Abdominal cavity**
    - Stomach, spleen, liver, gallbladder, small and large intestines
  - **Pelvic cavity**
    - Urinary bladder, internal organs of reproductive system, and portions of the large intestine
Thoracic and Abdominal Cavity Membranes

- **Viscera**
  - Organs of the thoracic and abdominal pelvic cavities
  - **Serous membrane** is a thin slippery membrane that covers the viscera
  - Parts of the serous membrane:
    - **Parietal layer**
      - Lines the wall of the cavities
    - **Visceral layer**
      - Covers the viscera within the cavities
Thoracic and Abdominal Cavity Membranes

(c) Sagittal section of thoracic cavity
Thoracic and Abdominal Cavity Membranes

- **Pleura**
  - Serous membrane of the pleural cavities
    - Visceral pleura clings to surface of lungs
    - Parietal pleura lines the chest wall

- **Pericardium**
  - Serous membrane of the pericardial cavity
    - Visceral pericardium covers the heart
    - Parietal pericardium lines the chest wall

- **Peritoneum**
  - Serous membrane of the abdominal cavity
    - Visceral peritoneum covers the abdominal cavity
    - Parietal peritoneum lines the abdominal wall
Thoracic and Abdominal Cavity Membranes

(c) Sagittal section of thoracic cavity
Other Cavities

- Oral (mouth) cavity
  - Tongue and teeth
- Nasal cavity
  - Nose
- Orbital cavities
  - Eyeball
- Middle ear cavities
  - Small bones of the middle ear
- Synovial cavities
  - Joints
Abdominopelvic Regions

- Abdominopelvic Regions
  - Used to describe the location of abdominal and pelvic organs
  - **Tic-Tac-Toe grid**
  - Two horizontal and two vertical lines partition the cavity
    - Subcostal line (top horizontal)
      - inferior to rib cage
    - Transtubercular line (bottom horizontal)
      - inferior to top of the hip bone
    - Midclavicular lines (two vertical lines)
      - midpoints to clavicles and medial to the nipples
Nine Abdominopelvic Regions

- Right and left hypochondriac
- Epigastric and Hypogastric (pubic)
- Right and left lumbar
- Right and left inguinal (iliac)
- Right and left inguinal (iliac)
- Umbilical

(b) Anterior view showing location of abdominopelvic regions

Figure 01.12 Tortora - PAP 12/e
Copyright © John Wiley and Sons, Inc. All rights reserved.
Quadrants

- Vertical and horizontal lines pass through the umbilicus
  - Right upper quadrant (RUQ)
  - Left upper quadrant (LUQ)
  - Right lower quadrant (RLQ)
  - Left lower quadrants (LLQ)

(c) Anterior view showing location of abdominopelvic quadrants

Figure 01.12 Tortora - PAP 12/e
Copyright © John Wiley and Sons, Inc. All rights reserved.
Medical Imaging

- Techniques and procedures used to create images of the human body
  - Allow visualization of structures inside the body
  - Diagnosis of anatomical and physiological disorders
  - Conventional radiography (X-rays) have been in use since the late 1940’s
Radiography (insert figures for each image in following slides)

- **X-rays**
  - Produce image of interior structures
  - Inexpensive and quick
  - Hollow structures appear black or gray
  - Do not pass easily through dense structure (bone)
  - At low dose, useful for soft tissue (breast)
    - Mammography (breast)
    - Bone densitometry (bone density)
Magnetic Resonance Imaging (MRI)

- High energy magnetic field
  - Protons in body fluid align with field
- Color image on a video monitor
  - 2D and 3D blueprint
- Relatively safe procedure
  - Not used on patients containing metal
- Used for differentiating normal and abnormal tissues
  - Tumors, brain abnormalities, blood flow
Computed Tomography

- Computer-Assisted radiography (CT-Scan)
  - 3-D structures
  - Visualize soft tissue in more detail than conventional radiography
  - Tissue intensities show varying degrees of gray
  - Whole-body CT scan
    - Lung and kidney cancers, coronary artery disease

Table 01.03b  Tortora - PAP 12/e
Copyright © John Wiley and Sons, Inc. All rights reserved.
Ultrasound Scanning

- High frequency sound waves
  - Sonogram
  - Noninvasive, painless, no dyes
  - Pregnancy (fetus)
Radionuclide Scanning

- Radioactive substance (radionuclide) given intravenously
- Gamma rays detected by camera
- Radionuclide image displays on video monitor
- Color intensity represents uptake
  - Single-photo-emission computerized tomography (SPECT)
    - Specialized technique used for brain, heart, lungs, and liver
Positron Emission Tomography (PET)

- Positron (positively charged particles) emitting substance injected into the body
  - Collision between positrons and negatively charged electron in body tissues
  - Gamma rays produced
  - Computer constructed a PET scan image in color
  - Used to study physiology of body structures (metabolism)
Endoscopy

- **Endoscope**
  - Lighted instrument with lens
  - Image projected onto a monitor

- **Colonoscopy**
  - Interior of colon

- **Laparoscopy**
  - Organs in abdominopelvic cavity

- **Arthroscopy**
  - Interior of joint (knee)
End of Chapter 1

Copyright 2009 John Wiley & Sons, Inc.
All rights reserved. Reproduction or translation of this work beyond that permitted in section 117 of the 1976 United States Copyright Act without express permission of the copyright owner is unlawful. Request for further information should be addressed to the Permission Department, John Wiley & Sons, Inc. The purchaser may make back-up copies for his/her own use only and not for distribution or resale. The Publishers assumes no responsibility for errors, omissions, or damages caused by the use of theses programs or from the use of the information herein.