Chapter 1

Foundations

An Introduction to Anatomy

Lecture Presentation by
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Southeast Community College
Introduction

• Anatomy
  • The study of external structures
  • The study of internal structures
  • The study of the relationship between body parts
  • The careful observation of the human body
  • Provides clues about physiological functions
Introduction

• Physiology
  • The study of how the body functions
  • The study of mechanisms in the body
Introduction

• Relationship of Anatomy to Physiological Function
  • The anatomical structure of the nasal cavity provides the physiological warming of the inhaled air
  • The anatomical structure of the muscular portion of the heart allows for the physiological pumping action
Microscopic Anatomy

- Microscopic Anatomy
  - The study of structures that cannot be seen without magnification
    - **Cytology**—study of cells
    - **Histology**—study of tissues
Gross Anatomy

• Macroscopic Anatomy
  • The study of structures that can be seen without magnification
    • **Surface anatomy**: refers to the superficial anatomical markings
    • **Regional anatomy**: refers to all structures in a specific area of the body, (head, neck, or trunk) whether they are superficial or deep
    • **Systemic anatomy**: The study of the organ systems of the body (digestive system, cardiovascular system, etc.)
Figure 1.1 The Study of Anatomy at Different Scales

<table>
<thead>
<tr>
<th>Size</th>
<th>meters (m)</th>
<th>millimeters (mm)</th>
<th>micrometers (μm)</th>
<th>nanometers (nm)</th>
</tr>
</thead>
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<td>10–120nm</td>
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<td>11nm</td>
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<td>10^34</td>
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<td></td>
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<td>10^36</td>
</tr>
</tbody>
</table>

Approximate Magnification (Reduction) Factor
From actual to artwork on this page
(x .15) (x .12) (x .6) (x 20) (x 83) x 10^3 x 10^6 x 10^9 x 10^12 x 10^15 x 10^18 x 10^21 x 10^24 x 10^27 x 10^30 x 10^33 x 10^36
Other Perspectives on Anatomy

- **Developmental Anatomy**:  
  - Examines structural changes over time  
- **Embryology**:  
  - The study of early developmental stages

- **Comparative Anatomy**:  
  - Considers anatomical similarities and differences in different types of animals

- **Clinical Anatomy**:  
  - Focuses on pathological changes during illness
All vertebrates share a basic pattern of anatomical organization that differs from that of other animals.

The similarities between vertebrates are most apparent when comparing embryos at comparable stages of development.

The similarities are less obvious when comparing adult vertebrates.
Other Perspectives on Anatomy

• Surgical Anatomy:
  • Studies anatomical landmarks important for surgical procedures

• Radiographic Anatomy:
  • The study of anatomical structures with the use of x-rays or ultrasound scans on an intact body

• Cross-sectional Anatomy:
  • The use of radiographic techniques (CT, MRI, and spiral scans) to look at cross sections of the body
Levels of Organization

- Chemical/Molecular (simple)
- Cell
- Tissue
- Organ
- Organ System
- Organism (complex)

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Chemical or Molecular Levels

- Cells interact to form molecules.
- Molecules join to form complex contractile protein fibers.
- Contractile protein fibers are structures within a heart muscle cell.
- Interlocking heart muscle cells form cardiac muscle tissue.
- Cardiac muscle tissue constitutes the bulk of the walls of the heart.
- The heart is a complex three-dimensional organ.
- The cardiovascular system includes the heart, the blood and blood vessels.
- All of the organ systems must work together for a person to remain alive and healthy.

Organism Level

- The cardiovascular system includes the heart, the blood and blood vessels.
- All of the organ systems must work together for a person to remain alive and healthy.
Levels of Organization

• **Chemical/Molecular**
  • Over a dozen different elements in the body
  • Four of them make up 99 percent of the body
    • Hydrogen, oxygen, carbon, and nitrogen
  • Major classes of compounds
    • Water
    • Carbohydrates
    • Proteins
    • Lipids
Elemental composition of the body. Trace elements include silicon, fluorine, copper, manganese, zinc, selenium, cobalt, molybdenum, cadmium, chromium, tin, aluminum, and boron.

Molecular composition of the body.
Levels of Organization

- **Cell**
  - The smallest living unit in the body
    - Consists of organelles

- **Tissue**
  - Many cells and some surrounding material
    - Such as: epithelial, muscular, neural, and connective tissue

- **Organ**
  - Combination of tissues
    - For example: the heart consists of all the above-mentioned tissues
Levels of Organization

• Organ System
  • Combination of various organs make up a specific system
  • For example: the stomach, small intestine, large intestine, liver, gallbladder, and pancreas make up the digestive system
  • The heart and blood vessels make up the cardiovascular system
• Humans are composed of 11 organ systems
<table>
<thead>
<tr>
<th>ORGAN SYSTEM</th>
<th>MAJOR FUNCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integumentary system</td>
<td>Protection from environmental hazards; temperature control</td>
</tr>
<tr>
<td>Skeletal system</td>
<td>Support, protection of soft tissues; mineral storage; blood formation</td>
</tr>
<tr>
<td>Muscular system</td>
<td>Locomotion, support, heat production</td>
</tr>
<tr>
<td>Nervous system</td>
<td>Directing immediate responses to stimuli, usually by coordinating the activities of other organ systems</td>
</tr>
<tr>
<td>Endocrine system</td>
<td>Directing long-term changes in the activities of other organ systems</td>
</tr>
<tr>
<td>Cardiovascular system</td>
<td>Internal transport of cells and dissolved materials, including nutrients, wastes, and gases</td>
</tr>
<tr>
<td>ORGAN SYSTEM</td>
<td>MAJOR FUNCTIONS</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Lymphatic system</td>
<td>Defense against infection and disease</td>
</tr>
<tr>
<td>Respiratory system</td>
<td>Delivery of air to sites where gas exchange can occur between the air and circulating blood</td>
</tr>
<tr>
<td>Digestive system</td>
<td>Processing of food and absorption of organic nutrients, minerals, vitamins, and water</td>
</tr>
<tr>
<td>Urinary system</td>
<td>Elimination of excess water, salts, and waste products; control of pH</td>
</tr>
<tr>
<td>Reproductive system</td>
<td>Production of sex cells and hormones</td>
</tr>
</tbody>
</table>
An Introduction to Organ Systems

• Responsiveness (Irritability)
  • The ability to respond to changes

• Adaptability
  • The ability to make adjustments to environmental changes

• Growth
  • The increase in size of an organism

• Differentiation
  • Becoming specialized to perform particular functions
An Introduction to Organ Systems

• Reproduction
  • The production of new generations of the same organism

• Movement
  • Internal movement
    • The movement of food or blood
  • External movement
    • Walking

• Metabolism
  • All the chemical reactions in the body
  • **Anabolism**: the synthesis of complex molecules
  • **Catabolism**: the breakdown of complex molecules
An Introduction to Organ Systems

- **Absorption**
  - The process of bringing chemicals into the body

- **Respiration**
  - The absorption, transport, and use of oxygen by cells

- **Digestion** (a type of catabolism)
  - The processes of catabolism that make nutrients small enough to be absorbed

- **Excretion**
  - The removal of wastes
The Integumentary System

Protects against environmental hazards; helps control body temperature

<table>
<thead>
<tr>
<th>Organ/Component</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Skin</strong></td>
<td></td>
</tr>
<tr>
<td>Epidermis</td>
<td>Covers surface; protects deeper tissues</td>
</tr>
<tr>
<td>Dermis</td>
<td>Nourishes epidermis; provides strength; contains glands</td>
</tr>
<tr>
<td><strong>Hair Follicles</strong></td>
<td></td>
</tr>
<tr>
<td>Hairs</td>
<td>Produce hair; innervation provides sensation</td>
</tr>
<tr>
<td>Sebaceous glands</td>
<td>Provide protection for head; secrete lipid coating that lubricates hair shaft and epidermis</td>
</tr>
<tr>
<td><strong>Sweat Glands</strong></td>
<td>Produce perspiration for evaporative cooling</td>
</tr>
<tr>
<td><strong>Nails</strong></td>
<td>Protect and stiffen distal tips of digits</td>
</tr>
<tr>
<td><strong>Sensory Receptors</strong></td>
<td>Provide sensations of touch, pressure, temperature, pain</td>
</tr>
<tr>
<td><strong>Subcutaneous Layer</strong></td>
<td>Stores lipids; attaches skin to deeper structures and insulates against heat loss</td>
</tr>
</tbody>
</table>
The Skeletal System

Provides support; protects tissues; stores minerals; forms blood cells

**AXIAL SKELETON**
- Skull
- Vertebrae
- Sacrum
- Ribs
- Sternum
- Supporting bones (scapula and clavicle)
- Upper limb bones
- Pelvis (supporting bones plus sacrum)
- Lower limb bones

**APPENDICULAR SKELETON**
- Upper limb bones
- Appendicular skeleton (limbs and supporting bones and ligaments)

**Organ/Component**

<table>
<thead>
<tr>
<th>Bone Marrow</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary site of blood cell production (red marrow); storage of energy reserves in fat cells (yellow marrow)</td>
<td></td>
</tr>
</tbody>
</table>

**Bones, Cartilages, and Joints**

- Axial skeleton (skull, vertebrae, sacrum, coccyx, sternum, ribs, supporting cartilages and ligaments)
- Appendicular skeleton (limbs and supporting bones and ligaments)

Support; protect soft tissues; bones store minerals
Protects brain, spinal cord, sense organs, and soft tissues of thoracic cavity; supports the body weight over lower limbs

Provides internal support and positioning of the limbs; supports and moves axial skeleton
## The Muscular System

Allows for locomotion; provides support; produces heat

### Organ/Component | Primary Functions
--- | ---
**Skeletal Muscles**  
Axial muscles  
Appendicular muscles | Provide skeletal movement; control entrances to digestive and respiratory tracts and exits to digestive and urinary tracts; produce heat; support skeleton; protect soft tissues  
Support and position axial skeleton  
Support, move, and brace limbs

**Tendons, Aponeuroses** | Harness forces of contraction to perform specific tasks
The Nervous System

Directs immediate responses to stimuli, usually by coordinating the activities of other organ systems.

<table>
<thead>
<tr>
<th>Organ/Component</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Central Nervous System (CNS)</strong></td>
<td>Acts as control center for nervous system; processes information; provides short-term control over activities of other systems</td>
</tr>
<tr>
<td>Brain</td>
<td>Performs complex integrative functions; controls both voluntary and autonomic activities</td>
</tr>
<tr>
<td>Spinal cord</td>
<td>Relays information to and from brain; performs less-complex integrative activities</td>
</tr>
<tr>
<td>Special senses</td>
<td>Provide sensory input to the brain relating to sight, hearing, smell, taste, and equilibrium</td>
</tr>
<tr>
<td><strong>Peripheral Nervous System (PNS)</strong></td>
<td>Links CNS with other systems and with sense organs</td>
</tr>
</tbody>
</table>
The Endocrine System

Directs long-term changes in activities of other organ systems

<table>
<thead>
<tr>
<th>Organ/Component</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pineal Gland</td>
<td>May control timing of reproduction and set day-night rhythms</td>
</tr>
<tr>
<td>Pituitary Gland</td>
<td>Controls other endocrine glands; regulates growth and fluid balance</td>
</tr>
<tr>
<td>Thyroid Gland</td>
<td>Controls tissue metabolic rate; regulates calcium levels</td>
</tr>
<tr>
<td>Parathyroid Glands</td>
<td>Regulate calcium levels (with thyroid)</td>
</tr>
<tr>
<td>Thymus</td>
<td>Controls maturation of lymphocytes</td>
</tr>
<tr>
<td>Suprarenal Glands</td>
<td>Adjust water balance, tissue metabolism, cardiovascular and respiratory activity</td>
</tr>
<tr>
<td>Kidneys</td>
<td>Control red blood cell production and elevate blood pressure</td>
</tr>
<tr>
<td>Pancreas</td>
<td>Regulates blood glucose levels</td>
</tr>
<tr>
<td>Gonads</td>
<td>Support male sexual characteristics and reproductive functions</td>
</tr>
<tr>
<td>Testes</td>
<td>Support male sexual characteristics and reproductive functions</td>
</tr>
<tr>
<td>Ovaries</td>
<td>Support female sexual characteristics and reproductive functions</td>
</tr>
</tbody>
</table>

Pineal gland, Pituitary gland, Thyroid and parathyroid glands, Suprarenal gland, Pancreas, Ovary in female, Testis in male.
The Cardiovascular System

Transports cells and dissolved materials, including nutrients, wastes, and gases.

<table>
<thead>
<tr>
<th>Organ/Component</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart</td>
<td>Propels blood; maintains blood pressure</td>
</tr>
<tr>
<td><strong>Blood Vessels</strong></td>
<td></td>
</tr>
<tr>
<td>Arteries</td>
<td>Distribute blood around the body</td>
</tr>
<tr>
<td>Capillaries</td>
<td>Carry blood from the heart to capillaries</td>
</tr>
<tr>
<td>Veins</td>
<td>Permit diffusion between blood and interstitial fluids</td>
</tr>
<tr>
<td></td>
<td>Return blood from capillaries to the heart</td>
</tr>
<tr>
<td><strong>Blood</strong></td>
<td>Transports oxygen, carbon dioxide, and blood cells; delivers nutrients and hormones; removes waste products; assists in temperature regulation and defense against disease</td>
</tr>
</tbody>
</table>

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The Lymphatic System

DEFENDS AGAINST INFECTION AND DISEASE; RETURNS TISSUE FLUID TO THE BLOODSTREAM

<table>
<thead>
<tr>
<th>Organ/Component</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lymphatic Vessels</td>
<td>Carry lymph (water and proteins) and lymphocytes from peripheral tissues to veins of the cardiovascular system</td>
</tr>
<tr>
<td>Lymph Nodes</td>
<td>Monitor the composition of lymph; engulf pathogens; stimulate immune response</td>
</tr>
<tr>
<td>Spleen</td>
<td>Monitors circulating blood; engulfs pathogens and recycles red blood cells; stimulates immune response</td>
</tr>
<tr>
<td>Thymus</td>
<td>Controls development and maintenance of one class of lymphocytes (T cells)</td>
</tr>
</tbody>
</table>
The Respiratory System

Delivers air to sites where gas exchange can occur between the air and circulating blood; produces sound

- **Nasal Cavities and Paranasal Sinuses**
  - Nasal cavity
  - Sinus
  - **Primary Functions**: Filter, warm, humidify air; detect smells

- **Pharynx**
  - **Primary Functions**: Conducts air to larynx, a chamber shared with the digestive tract

- **Larynx**
  - **Primary Functions**: Protects opening to trachea and contains vocal cords

- **Trachea**
  - **Primary Functions**: Filters air, traps particles in mucus, conducts air to lungs; cartilages keep airway open

- **Bronchi**
  - **Primary Functions**: Same functions as trachea; diameter decreases as branching occurs

- **Lungs**
  - **Primary Functions**: Responsible for air movement during movement of ribs and diaphragm; include airways and alveoli

- **Alveoli**
  - **Primary Functions**: Blind pockets at the end of the smallest branches of the bronchioles; sites of gas exchange between air and blood
## The Digestive System

The Digestive System processes food and absorbs nutrients.

### Organ/Component | Primary Functions
--- | ---
**Oral Cavity** | Receptacle for food; works with associated structures (teeth, tongue) to break up food and pass food and liquids to pharynx
**Salivary Glands** | Provide buffers and lubrication; produce enzymes that begin digestion
**Pharynx** | Conducts solid food and liquids to esophagus; chamber shared with respiratory tract
**Esophagus** | Delivers food to stomach
**Stomach** | Secretes acids and enzymes
**Small Intestine** | Secretes digestive enzymes, buffers, and hormones; absorbs nutrients
**Liver** | Secretes bile; regulates nutrient composition of blood
**Gallbladder** | Stores and concentrates bile for release into small intestine
**Pancreas** | Secretes digestive enzymes and buffers; contains endocrine cells
**Large Intestine** | Removes water from fecal material; stores wastes
The Urinary System

Eliminates excess water, salts, and waste products

<table>
<thead>
<tr>
<th>Organ/Component</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidneys</td>
<td>Form and concentrate urine; regulate blood pH and ion concentrations; perform endocrine functions</td>
</tr>
<tr>
<td>Ureters</td>
<td>Conduct urine from kidneys to urinary bladder</td>
</tr>
<tr>
<td>Urinary Bladder</td>
<td>Stores urine for eventual elimination</td>
</tr>
<tr>
<td>Urethra</td>
<td>Conducts urine to exterior</td>
</tr>
</tbody>
</table>

Kidney
Ureter
Urinary bladder
Urethra

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### The Male Reproductive System

<table>
<thead>
<tr>
<th>Organ/Component</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Testes</strong></td>
<td>Produce sperm and hormones</td>
</tr>
<tr>
<td><strong>Accessory Organs</strong></td>
<td></td>
</tr>
<tr>
<td>Epididymis</td>
<td>Acts as site of sperm maturation</td>
</tr>
<tr>
<td>Ductus deferens (sperm duct)</td>
<td>Conducts sperm from the epididymis and merges with the duct of the seminal gland</td>
</tr>
<tr>
<td>Seminal glands</td>
<td>Secrete fluid that makes up much of the volume of semen</td>
</tr>
<tr>
<td>Prostate gland</td>
<td>Secretes fluid and enzymes</td>
</tr>
<tr>
<td>Urethra</td>
<td>Conducts semen to exterior</td>
</tr>
<tr>
<td><strong>External Genitalia</strong></td>
<td></td>
</tr>
<tr>
<td>Penis</td>
<td>Contains erectile tissue; deposits sperm in vagina of female; produces pleasurable</td>
</tr>
<tr>
<td>Scrotum</td>
<td>sensations during sexual activities</td>
</tr>
<tr>
<td></td>
<td>Surrounded the testes and controls their temperature</td>
</tr>
</tbody>
</table>
### The Female Reproductive System

Produces sex cells and hormones; supports embryonic development from fertilization to birth

<table>
<thead>
<tr>
<th>Organ/Component</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovaries</td>
<td>Produce oocytes and hormones</td>
</tr>
<tr>
<td>Uterine Tubes</td>
<td>Deliver oocyte or embryo to uterus; normal site of fertilization</td>
</tr>
<tr>
<td>Uterus</td>
<td>Site of embryonic development and exchange between maternal and fetal bloodstreams</td>
</tr>
<tr>
<td>Vagina</td>
<td>Site of sperm deposition; acts as a birth canal during delivery; provides passageway for fluids during menstruation</td>
</tr>
<tr>
<td>External Genitalia</td>
<td>Contains erectile tissue; provides pleasurable sensations during sexual activities</td>
</tr>
<tr>
<td>Mammary Glands</td>
<td>Contain glands that lubricate entrance to vagina</td>
</tr>
<tr>
<td>Mammary Glands</td>
<td>Produce milk that nourishes newborn infant</td>
</tr>
</tbody>
</table>
The Language of Anatomy

• **Introduction**
  • Used for communication purposes
  • Used to give precise information
  • Latin and Greek words for the basis of numerous anatomical terms
The Language of Anatomy

• Superficial Anatomy
  • The anatomical terms in this chapter will be used in the rest of the chapters of this text
  • The terms are typically derived from Latin or Greek
The Language of Anatomy

• **Anatomical Landmarks**
  
  • Anatomical position
    
    • Standing with the feet flat on the floor
    • The hands are at the side
    • The palms are facing forward
    • All discussion of the human body is in reference to the anatomical position
      
      • **Supine**: lying down (face up) in the anatomical position
      • **Prone**: lying down (face down) in the anatomical position
Figure 1.8a Anatomical Landmarks

- Frons or forehead (frontal)
- Nasus or nose (nasal)
- Oculus or eye (orbital or ocular)
- Auris or ear (otic)
- Bucca or cheek (buccal)
- Cervix or neck (cervical)
- Cranium or skull (cranial)
- Facies or face (facial)
- Oris or mouth (oral)
- Mentis or chin (mental)
- Axilla or armpit (axillary)
- Brachium or arm (brachial)
- Antecubitis or front of elbow (antecubital)
- Antebrachium or forearm (antebrachial)
- Carpus or wrist (carpal)
- Palma or palm (palmar)
- Pollex or thumb
- Digits or fingers (digital)
- Patella or kneecap (patellar)
- Crus or leg (crural)
- Tarsus or ankle (tarsal)
- Digits or toes (digital)
- Hallux or great toe
- Thorax or thorax, chest (thoracic)
- Mamma or breast (mammary)
- Abdomen (abdominal)
- Umbilicus or navel (umbilical)
- Pelvis (pelvic)
- Manus or hand (manual)
- Inguen or groin (inguinal)
- Pubis (pubic)
- Femur or thigh (femoral)
- Abdomen (abdominal)
- Mammary or breast
- Thoracic or thorax
- Cephalon or head (cephalic)
- Anterior view in the anatomical position
Figure 1.8b Anatomical Landmarks

- **Cephalon** or head (cephalic)
- **Cervicis** or neck (cervical)
- **Upper limb**
  - Shoulder (acromial)
  - Dorsum or back (dorsal)
  - Olecranon or back of elbow (olecranal)
  - Lumbus or loin (lumbar)
- **Lower limb**
  - Gluteus or buttck (gluteal)
  - Popliteus or back of knee (popliteal)
  - Sura or calf (sural)
  - Calcaneus or heel of foot (calcaneal)
  - Planta or sole of foot (plantar)

**Posterior view in the anatomical position**
The Language of Anatomy

• Anatomical Regions
  • There are a variety of regions of the body that will be discussed.
    • Anatomical areas (regions)
    • Abdominopelvic regions
    • Abdominopelvic quadrants
    • Directional regions
    • Planes and sectional regions
    • Body cavity regions
The Language of Anatomy

- Anatomical Areas (Regions)
  - Head and neck region
    - Frons
    - Nasus
    - Oculus
    - Auris
    - Bucca
    - Cervicis
    - Mentis
    - Oris
    - Occipitalis
Figure 1.8a Anatomical Landmarks (1 of 2)

- **Frons** or forehead (frontal)
- **Nasus** or nose (nasal)
- **Oculus** or eye (orbital or ocular)
- **Auris** or ear (otic)
- **Bucca** or cheek (buccal)
- **Cervicis** or neck (cervical)
- **Cranium** or skull (cranial)
- **Facies** or face (facial)
- **Oris** or mouth (oral)
- **Mentis** or chin (mental)
- **Axilla** or armpit (axillary)
- **Brachium** or arm (brachial)
- **Antecubitis** or front of elbow (antecubital)
- **Antebrachium** or forearm (antebrachial)
- **Thoracis** or thorax, chest (thoracic)
- **Mamma** or breast (mammary)
- **Abdomen** (abdominal)
- **Umbilicus** or navel (umbilical)
- **Pelvis** (pelvic)

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The Language of Anatomy

- Anatomical Areas (Regions)
  - Torso region
    - Thoracis
    - Mamma
    - Abdomen
    - Umbilicus
    - Pelvis
    - Dorsum
    - Lumbus
Figure 1.8a Anatomical Landmarks (1 of 2)

- **Frons** or forehead (frontal)
- **Nasus** or nose (nasal)
- **Oculus** or eye (orbital or ocular)
- **Auris** or ear (otic)
- **Bucca** or cheek (buccal)
- **Cervicis** or neck (cervical)
- **Thoracis** or thorax, chest (thoracic)
- **Mamma** or breast (mammary)
- **Abdomen** (abdominal)
- **Umbilicus** or navel (umbilical)
- **Pelvis** (pelvic)

**Head and Face**
- **Cephalon** or head (cephalic)
- **Facies** or face (facial)
- **Oris** or mouth (oral)
- **Mentis** or chin (mental)

**Upper Limbs**
- **Axilla** or armpit (axillary)
- **Brachium** or arm (brachial)
- **Antecubitis** or front of elbow (antecubital)
- **Antebrachium** or forearm (antebrahcial)

**Trunk and Abdomen**
- **Thoracis** or thorax, chest (thoracic)
- **Mamma** or breast (mammary)
- **Abdomen** (abdominal)
- **Umbilicus** or navel (umbilical)
- **Pelvis** (pelvic)

**Anterior view in the anatomical position**
Figure 1.8b Anatomical Landmarks (1 of 2)

- **Cephalon** or head (cephalic)
- **Cervicis** or neck (cervical)
- **Shoulder** (acromial)
- **Dorsum** or back (dorsal)
- **Olecranon** or back of elbow (olecranal)
- **Lumbus** or loin (lumbar)

Posterior view in the anatomical position
The Language of Anatomy

• Anatomical Areas (Regions)
  • The arm and hand
    • Brachium
    • Antecubitis
    • Antebrachium
    • Carpus
    • Palma
    • Pollex
    • Axilla
    • Olecranon (cubitis)
Figure 1.8b Anatomical Landmarks (1 of 2)

- **Cephalon** or head (cephalic)
- **Cervicis** or neck (cervical)
- **Shoulder** (acromial)
- **Dorsum** or back (dorsal)
- **Olecranon** or back of elbow (olecranal)
- **Lumbus** or loin (lumbar)

**Posterior view in the anatomical position**
The Language of Anatomy

• Anatomical Areas (Regions)
  • The leg and foot
    • Inguen    Hallux
    • Pubis     Gluteus
    • Femur     Popliteus
    • Patella   Sura
    • Crus      Calcaneus
    • Tarsus    Planta
Figure 1.8a Anatomical Landmarks (2 of 2)

Anterior view in the anatomical position

- Carpus or wrist (carpal)
- Palma or palm (palmar)
- Pollex or thumb
- Digits or fingers (digital)
- Patella or kneecap (patellar)
- Crus or leg (crural)
- Tarsus or ankle (tarsal)
- Digits or toes (digital)
- Hallux or great toe
- Manus or hand (manual)
- Inguen or groin (inguinal)
- Pubis (pubic)
- Femur or thigh (femoral)
- Pes or foot (pedal)
Gluteus or buttock (gluteal)

Popliteus or back of knee (popliteal)

Sura or calf (sural)

Calcaneus or heel of foot (calcaneal)

Planta or sole of foot (plantar)

**Posterior view in the anatomical position**
The Language of Anatomy

• Anatomical Regions
  • Abdominopelvic regions and quadrants
    • Anatomists and clinicians use specialized regional terms to indicate a specific area of concern within the abdomen or the pelvic regions of the body.
    • The abdomen and pelvic regions can be subdivided into four regions (abdominopelvic quadrants)
    • The abdomen and pelvic regions can be subdivided into nine regions (abdominopelvic regions)
The Language of Anatomy

• Anatomical Regions
  • Abdominopelvic quadrants
    • Right upper quadrant (RUQ)
    • Left upper quadrant (LUQ)
    • Right lower quadrant (RLQ)
    • Left lower quadrant (LLQ)
Abdominopelvic quadrants divide the area into four sections. These terms, or their abbreviations, are most often used in clinical discussions.
The Language of Anatomy

• Anatomical Regions
  • Abdominopelvic regions
    • Epigastric
    • Right hypochondriac
    • Left hypochondriac
    • Umbilical
    • Right lumbar
    • Left lumbar
    • Hypogastric
    • Right inguinal
    • Left inguinal
More precise anatomical descriptions are provided by reference to the appropriate abdominopelvic region.
The Language of Anatomy

• Anatomical Regions
  • Abdominopelvic quadrants
    • Select organs found within the abdominopelvic quadrants
      • **RUQ:** Most of the liver, gallbladder
      • **LUQ:** Most of the stomach, spleen
      • **RLQ:** cecum, appendix, right ureter, right ovary, right spermatic cord
      • **LLQ:** left ureter, left ovary, left spermatic cord
Quadrants or regions are useful because there is a known relationship between superficial anatomical landmarks and underlying organs.
The Language of Anatomy

• Anatomical Regions
  • Abdominopelvic regions
    • Select organs found within the abdominopelvic regions
      • Epigastric: left lobe of liver
      • Right hypochondriac: right lobe of liver, liver fundus
      • Left hypochondriac: stomach fundus, spleen
Quadrants or regions are useful because there is a known relationship between superficial anatomical landmarks and underlying organs.
The Language of Anatomy

• Anatomical Regions
  • Abdominopelvic regions
    • Select organs found within the abdominopelvic regions
      • Umbilical: small intestine, transverse colon
      • Right lumbar: ascending colon
      • Left lumbar: descending colon
Quadrants or regions are useful because there is a known relationship between superficial anatomical landmarks and underlying organs.
The Language of Anatomy

- **Anatomical Regions**
  - Abdominopelvic regions
    - Select organs found within the abdominopelvic regions
      - Hypogastric: urinary bladder, appendix (position varies), major portion of the small intestine
      - Right inguinal: cecum, appendix (position varies)
      - Left inguinal: sigmoid colon
Quadrants or regions are useful because there is a known relationship between superficial anatomical landmarks and underlying organs.
The Language of Anatomy

• **Anatomical Directions**

  • The most common directional terms used are:
    • Superior  Inferior
    • Anterior   Posterior
    • Medial     Lateral
    • Deep      Superficial
    • Proximal  Distal
Figure 1.10a Directional References

Superior: Above; at a higher level (in human body, toward the head)

Right

Superior
Above; at a higher level (in human body, toward the head)

Left

Proximal
Toward an attached base
“The shoulder is proximal to the wrist.”

Lateral
Away from the midline

Medial
Toward the midline

Proximal
Toward an attached base
“The fingers are distal to the wrist.”

Distal
Away from an attached base

Inferior: Below; at a lower level; toward the feet

Anterior view

Proximal
Toward an attached base

Distal
Away from an attached base

Superficial
At, near, or relatively close to the body surface
The skin is superficial to underlying structures.

Deep
Toward the interior of the body; farther from the surface
The bone of the thigh is deep to the surrounding skeletal muscles.

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**Superficial**
At, near, or relatively close to the body surface
The skin is superficial to underlying structures.

**Deep**
Toward the interior of the body; farther from the surface
The bone of the thigh is deep to the surrounding skeletal muscles.

**Cranial or Cephalic**
Toward the head
“The cranial, or cephalic, border of the pelvis is superior to the thigh.”

**Posterior or Dorsal**
Posterior: The back; behind
Dorsal: The back (equivalent to posterior when referring to human body)
“The scapula (shoulder blade) is located posterior to the rib cage.”

**Anterior or Ventral**
Anterior: The front; before
Ventral: The belly side (equivalent to anterior when referring to human body)
“The navel is on the anterior (or ventral) surface of the trunk.”

**Caudal**
Toward the tail (coccyx in humans)
“The hips are caudal to the waist.”

**Inferior**
Toward the lower part of the body

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The Language of Anatomy

• **Sectional Anatomy**
  • Planes and sections
    • There are many different ways to dissect a piece of tissue for further study. These are referred to as dissectional cuts or dissectional planes.
      • **Sagittal cut** (midsagittal and parasagittal)
      • **Transverse cut**
      • **Frontal cut**
      • **Oblique cut**
The Language of Anatomy

• Sectional Anatomy
  • **Sagittal cut**: separating left and right
    • **Midsagittal**: separating left and right equally
    • **Parasagittal**: separating left and right unequally
  • **Transverse cut**: separating superior and inferior
  • **Frontal cut**: separating anterior and posterior
  • **Oblique cut**: separating the tissue at an angle
Figure 1.11 Planes of Section

**Frontal or coronal plane**
A frontal, or coronal, section separates anterior and posterior portions of the body; coronal usually refers to sections passing through the skull.

Plane is oriented parallel to long axis
Directional term: frontally or coronally

**Sagittal plane**
A sagittal section separates right and left portions. You examine a sagittal section, but you section sagittally.

In a midsagittal section, the plane passes through the midline, dividing the body in half and separating right and left sides.

A parasagittal section misses the midline, separating right and left portions of unequal size.

Plane is oriented parallel to long axis
Directional term: Sagittally

**Transverse, horizontal, or cross-sectional plane**
A transverse, or horizontal, section separates superior and inferior portions of the body; sections typically pass through head and trunk regions.

Plane is oriented perpendicular to long axis
Directional term: transversely or horizontally
The Language of Anatomy

• Anatomical Regions
  • Sectional anatomy: body cavities
    • If you remove an organ from the body, you will leave a cavity
    • The body cavities are studied in this manner
      • Posterior cavity
      • Anterior cavity (ventral cavity)
The Language of Anatomy

• Anatomical Regions
  • Sectional anatomy: body cavities
    • Posterior cavity
      • Cranial cavity: consists of the brain
      • Spinal cavity: consists of the spinal cord
Lateral view of the subdivisions of the ventral body cavities.

- **Thoracic cavity**
  - Pleural cavity
  - Pericardial cavity
  - Diaphragm

- **Abdominopelvic cavity**
  - Peritoneal cavity
  - Abdominal cavity
  - Pelvic cavity

The heart projects into the pericardial cavity like a fist pushed into a balloon.
The Language of Anatomy

• Anatomical Regions
  • Sectional anatomy: body cavities
    • Anterior cavity
      • Thoracic cavity
      • Abdominal cavity
    • Pelvic cavity

\[\text{Abdominopelvic cavity}\]
Figure 1.13a Body Cavities

Ventral Body Cavity (Coelom)
- Provides protection; allows organ movement; lining prevents friction.

Thoracic Cavity
- Surrounded by chest wall and diaphragm
- Subdivided into
  - Left Pleural Cavity: Surrounds left lung
  - Right Pleural Cavity: Surrounds right lung

Mediastinum
- Contains the trachea, esophagus, and major vessels
- Also contains Pericardial Cavity: Surrounds heart

Abdominal Cavity
- Contains many digestive glands and organs

Pelvic Cavity
- Contains urinary bladder, reproductive organs, last portion of digestive tract

Anterior view of the ventral body cavity and its subdivisions. The muscular diaphragm divides the ventral body cavity into a superior thoracic (chest) cavity and an inferior abdominopelvic cavity.
The Language of Anatomy

• Anatomical Regions
  • Sectional anatomy: anterior cavity
    • Thoracic cavity consists of:
      • Pleural cavity: lungs
      • Pericardial cavity: heart
      • Mediastinal cavity: space between the apex of the lungs
Figure 1.13a Body Cavities

Ventral Body Cavity (Coelom)
- Provides protection; allows organ movement; lining prevents friction

Thoracic Cavity
- Surrounded by chest wall and diaphragm
  - Subdivided into:
    - Left Pleural Cavity: Surrounds left lung
    - Right Pleural Cavity: Surrounds right lung
  - Also contains Mediastinum: Contains the trachea, esophagus, and major vessels; also contains Pericardial Cavity: Surrounds heart

Abdominopelvic Cavity
- Contains the peritoneal cavity
  - Includes:
    - Abdominal Cavity: Contains many digestive glands and organs
    - Pelvic Cavity: Contains urinary bladder, reproductive organs, last portion of digestive tract

Anterior view of the ventral body cavity and its subdivisions. The muscular diaphragm divides the ventral body cavity into a superior thoracic (chest) cavity and an inferior abdominopelvic cavity.
The Language of Anatomy

• Anatomical Regions
  • Sectional anatomy: anterior cavity
    • Abdominopelvic cavity consists of:
      • **Peritoneal cavity**: stomach, intestines, spleen, liver, etc.
      • **Pelvic cavity**: urinary bladder
Anterior view of the ventral body cavity and its subdivisions. The muscular diaphragm divides the ventral body cavity into a superior thoracic (chest) cavity and an inferior abdominopelvic cavity.

Sectional view of the thoracic cavity. Unless otherwise noted, all sectional views are presented in inferior view. (See Clinical Note on pp. 22–23 for more details.)
The Language of Anatomy

• Anatomical Regions
  • Sectional anatomy: body cavities
    • Each cavity consists of a double-layered membrane
      • The membrane nearest the wall of the body (farthest from the organs) is the **parietal membrane** (parietal pleura, parietal pericardium, parietal peritoneum)
      • The membrane farthest from the wall of the body (nearest the organs) is the **visceral membrane** (visceral pleura, visceral pericardium, visceral peritoneum)
c Lateral view of the subdivisions of the ventral body cavities.

d The heart projects into the pericardial cavity like a fist pushed into a balloon.