

THE HUMAN BODY

LESSON PLAN

LECTURE

I. Topographic Anatomy

A. Anatomic position

1. Person standing, facing forward with arms at the side
2. Palms facing forward

B. Planes of the body

1. Imaginary straight lines that divide the body
2. Anterior
 - a. Front surface of the body
3. Posterior
 - a. Back surface of the body
4. Midaxillary
 - a. Imaginary vertical line from the middle of the armpit to the ankle
 - b. Divides the body into anterior and posterior
5. Midline
 - a. Imaginary vertical line through the middle of the body: nose through the umbilicus (belly button)
 - b. Divides the body into right and left
6. Midclavicular
 - a. Imaginary vertical line through the midportion of the clavicle, parallel to the midline

C. Directional terms

1. Right and left: Refers to the patient's right and left sides
2. Superior: Nearer the head
3. Inferior: Nearer the feet
4. Lateral: Parts of the body that lie away from the midline
5. Medial: Parts of the body that lie toward the midline
6. Proximal: Structures that are closer to the trunk
7. Distal: Structures that are farther from the trunk or nearer to the free end of the extremity

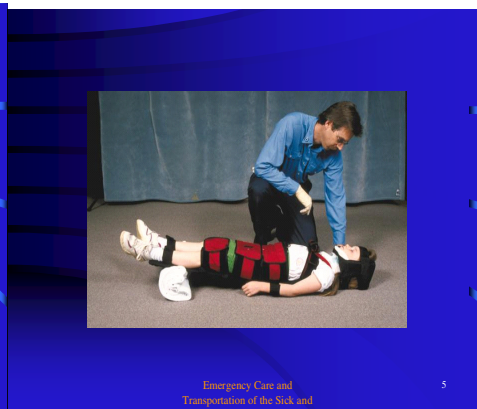
8. Superficial: Closer to or on the skin
9. Deep: Further inside the body and away from the skin
10. Ventral: Anterior surface
11. Dorsal: Posterior surface
12. Palmar: Palm/front of hand
13. Plantar: Bottom of foot
14. Apices: Tip or topmost portion of a structure
15. Bilaterally: Body part that appears on both sides of the midline (i.e., eyes, ears, hands, feet, lungs, kidneys)
16. Quadrants: Sections of the abdominal cavity
 - a. Right upper quadrant (RUQ)
 - b. Left upper quadrant (LUQ)
 - c. Right lower quadrant (RLQ)
 - d. Left lower quadrant (LLQ)



A. Anatomic positions:

1. Prone: Face down
2. Supine: Face up
3. Fowler's position: Body sitting up, knees bent
4. Trendelenburg's position: Body supine with head lower than feet

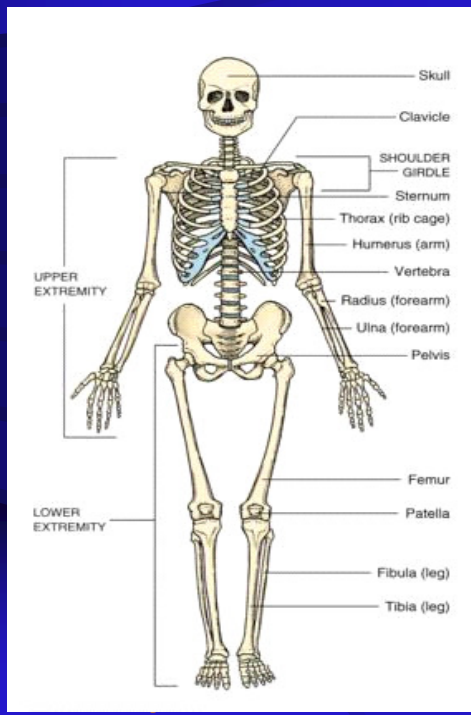
5. Shock position: Trendelenburg's position with legs elevated and the head and torso (trunk) supine



II. The Skeletal System

A. Function

1. Gives the body shape
2. Protects vital internal organs
3. Provides for body movement



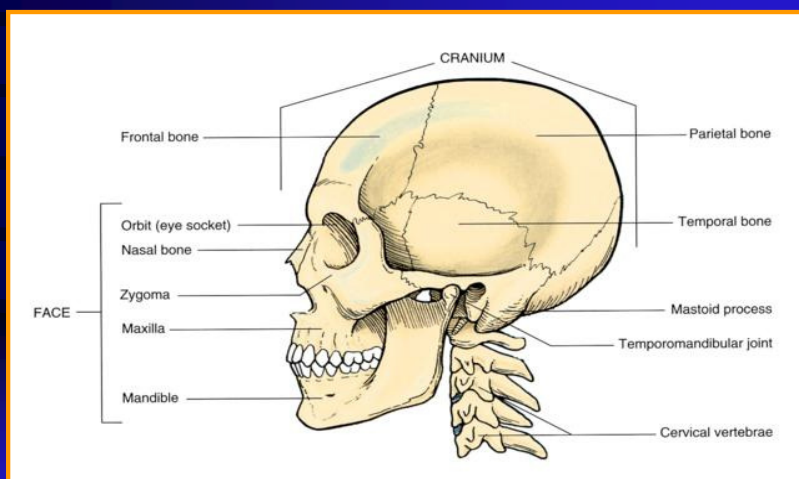
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B. Components

1. Skull

- a. Houses and protects the brain
- b. Two major parts
 - (1) Cranium
 - (2) Face

The Skull



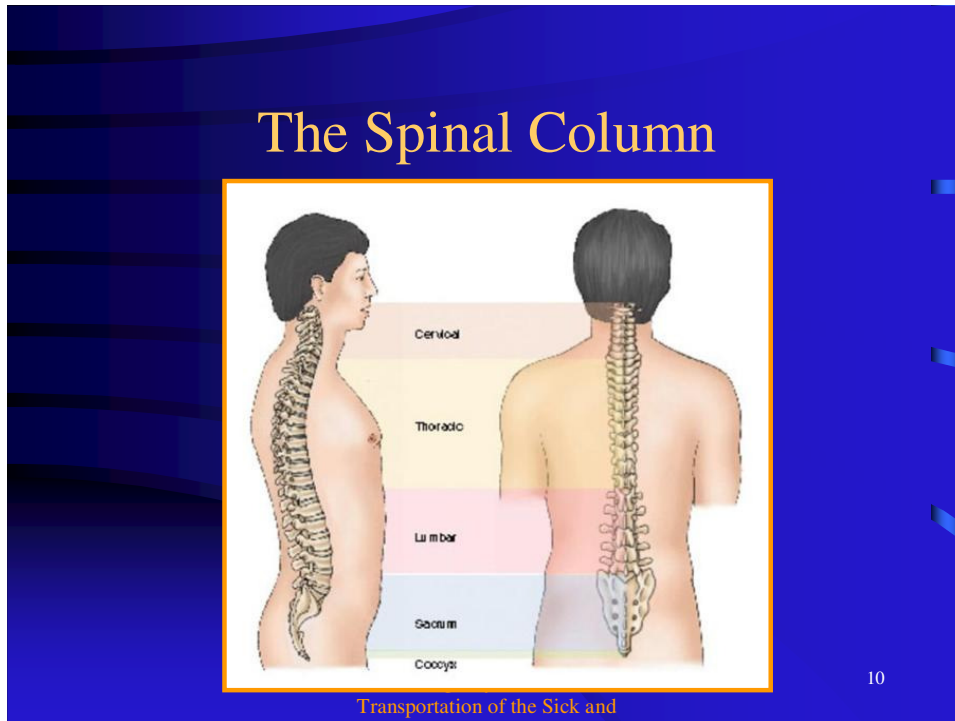
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2. Cranium

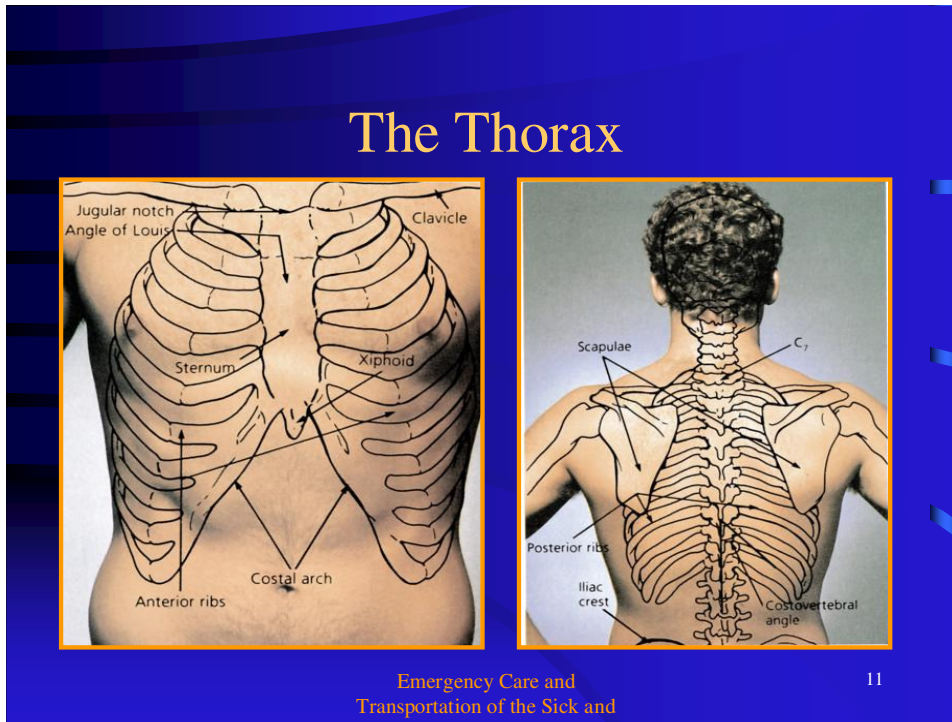
- a. The cranium is composed of a number of thick bones that fuse together to form a shell that holds and protects the brain.
 - b. Foramen magnum: Large opening at base of skull where brain connects to spinal cord
 - c. Occiput (occipital): Most posterior portion of the cranium
 - d. Temporal regions: Lateral portions of cranium
 - e. Parietal regions: Between temporal regions and occipital portions
 - f. Frontal: Forehead
3. Face
- a. The face is composed of the eyes, ears, nose, mouth, and cheeks.
 - (1) Pinna: Visible part of the ear
 - (2) Mastoid process: Prominent bony mass at the base of the skull; about 1" posterior to the external opening of the ear
 - b. The face is comprised of six bones.
 - (1) Nasal bone (flexible cartilage)
 - (2) Maxillae: Contains the upper teeth and forms the hard palate (roof of the mouth)
 - (3) Zygomatic bones (cheeks)
 - (4) Mandible (jaw): The only movable facial bone that has a joint (temporomandibular joint), which meets with the cranium just in front of each ear.
 - (5) Orbit (eye socket): Made of maxilla and zygoma
4. Neck
- a. The upper part of the esophagus and the trachea (windpipe) lie deep in the midline of the neck.
 - b. The carotid arteries and jugular veins are found on each side of the trachea.
 - c. Adam's apple: A firm prominence in the upper part of the larynx (the thyroid cartilage)
 - d. Cricoid cartilage: A firm ridge of cartilage completing the larynx
 - e. Cricothyroid membrane: A thin sheet of connective tissue (fascia) that joins the thyroid and cricoid cartilages
 - f. The trachea connects the larynx with the main air passage of the lungs (the bronchi).
 - g. Cervical vertebrae
 - h. The most prominent spine is the seventh cervical vertebra.
5. Spinal column

- a. Central supporting structure of the body
- b. Consists of 33 bones called vertebra
 - 1) Cervical (neck) – 7
 - 2) Thoracic (upper back) – 12
 - 3) Lumbar (lower back) – 5
 - 4) Sacral (back wall of the pelvis) – 5
 - 5) Coccyx (tailbone) – 4



- c. Bones of the spinal canal encase and protect the spinal cord.
 - d. Nerves branch from the spinal cord and exit from the spinal canal between each two vertebrae to form the motor and sensory nerves of the body.
6. Thorax
 - a. Clavicle (collarbone)
 - b. Scapula (shoulder blade)
 - c. Thoracic cage (bony rib cage): Defines dimensions of thorax
 - d. Sternum (breastbone): Midline of the chest
 - (1) Manubrium (upper quarter of sternum)
 - (2) Body (middle)
 - (3) Xiphoid process (inferior portion of the sternum)
 - e. Ribs

- (1) 12 pairs
- (2) Attached posterior to the thoracic vertebrae
- (3) Pairs 1 through 10 are attached anterior to the sternum.
- (4) Pairs 11 and 12 are floating.



- f. Diaphragm: A muscular dome that forms the inferior boundary of the thorax, separating the chest from the abdominal cavity.
- g. Organs and vascular structures
 - (1) The largest structures are the heart and lungs.
 - (2) The major blood vessels that travel to and from the heart also lie in the chest cavity.
 - (3) The superior and inferior venae cavae carry blood to the heart on the right side of the spinal column.
 - (4) The lungs occupy all space within the chest not occupied by the heart, great vessels, and the esophagus.
7. Abdomen
 - a. The abdomen is the second major body cavity and contains the major organs of digestion and excretion.
 - b. The diaphragm separates the thorax from the abdomen.
 - c. Organs and vascular structures
 - (1) Right upper quadrant (RUQ): Liver, gallbladder, and a portion of the colon

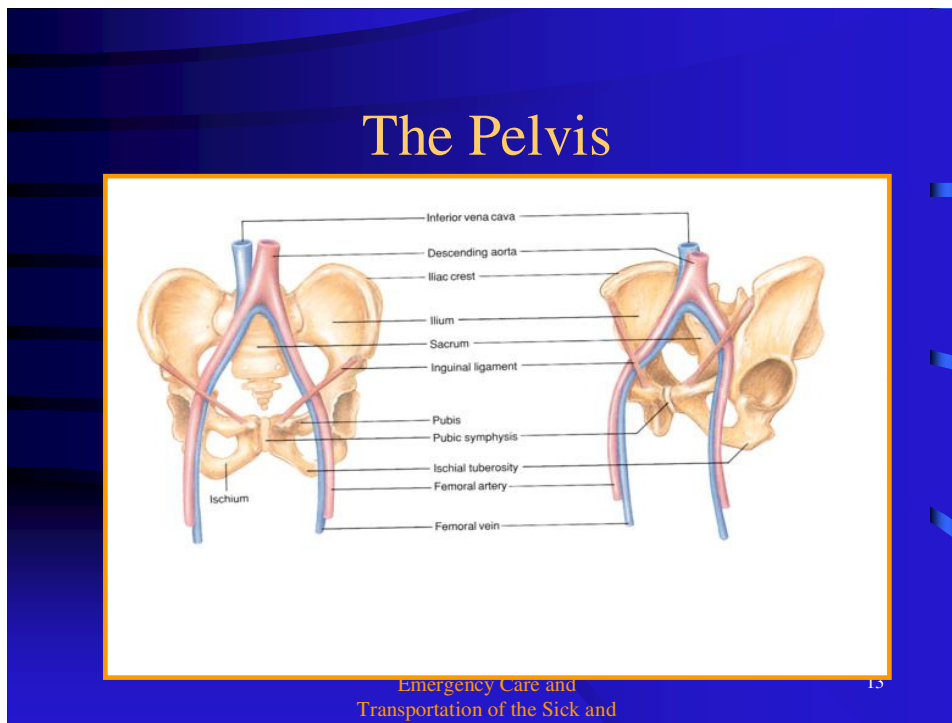
- (2) Left upper quadrant (LUQ): Stomach, the spleen, and a portion of the colon
- (3) Right lower quadrant (RLQ): Two portions of the larger intestine (cecum and the ascending colon) and the appendix (a small tubular structure that is attached to the lower border of the cecum)
- (4) Left lower quadrant (LLQ): The descending and the sigmoid portions of the colon
- (5) Several organs lie in more than one quadrant.
 - (a) Small intestine
 - (b) Pancreas
 - (c) Large intestine
 - (d) Urinary bladder
- (6) The kidneys are retroperitoneal organs; they lie behind the abdominal cavity.



8. Pelvis

- a. The pelvis is a closed bony ring that consists of three bones: the sacrum and the two pelvic bones.
- b. Each pelvic bone is formed by the fusion of three separate bones called the ilium, the ischium, and the pubis.
- c. On the lateral side of each pelvic bone is the socket for the hip joint.
- d. The depression, in which the femoral head fits very snugly, is called the acetabulum.

- e. The pelvic cavity contains openings for the gastrointestinal tract (the rectum), the female reproductive system (the vagina), and the urinary tract (the urethra).
- f. The pelvis contains the final portions of the gastrointestinal tract, the female reproductive organs, and the urinary bladder.

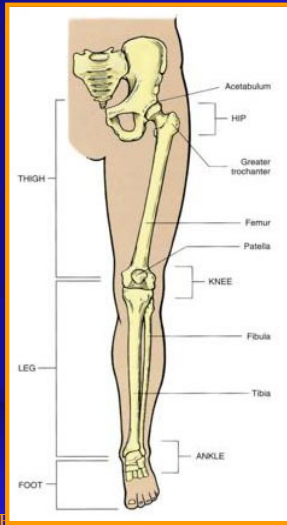


9. Lower extremity

- a. The main parts of the lower extremity are the thigh, the leg, and the foot.
- b. Femur (thigh): The longest and one of the strongest bones in the body
- c. Tibia (shin/lower leg)
- d. Fibula (lower leg)
- e. Tarsals and metatarsals (foot)
- f. Calcaneus (heel)
- g. Phalanges (toes)
- h. Three joints connect the parts of the lower extremity.
 - (1) Hip: Consists of the greater trochanter (ball) and acetabulum (socket of hip bone)
 - (2) Knee: Consists of the patella (knee cap), a hinge joint that is the largest joint in the body
 - (3) Ankle: Consists of the medial and lateral malleolus, the surface landmarks of the ankle

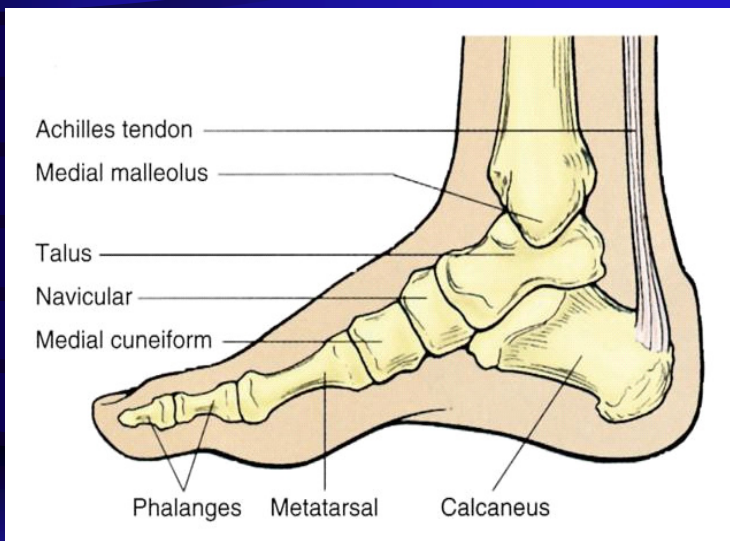
The Lower Extremity

- Thigh
- Knee
- Leg
- Ankle
- Foot



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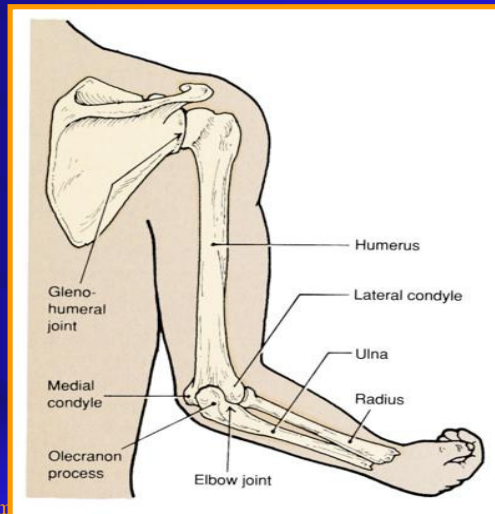
10. Upper extremity

- The upper extremity extends from the shoulder girdle to the fingertips and is composed of the arm, elbow, forearm, wrist, hand, and fingers.
- The shoulder girdle consists of three bones:
 - (1) Clavicle (collar bone)
 - (2) Scapula (shoulder blade)
 - (3) Humerus (superior portion of upper extremity)

- c. Acromion process (tip of shoulder)
- d. Olecranon (elbow)
- e. Forearm
 - (1) The radius bone lies on the lateral, or thumb, side of the forearm,
 - (2) The ulna bone is on the medial or little finger side.
- f. The wrist is a modified ball-and-socket joint formed by the ends of the radius and ulna and several small wrist bones called carpals.

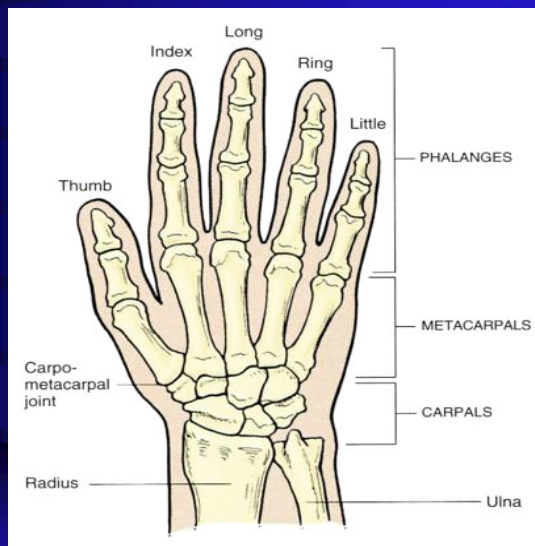
The Upper Extremity

- Shoulder girdle
- Arm
- Elbow
- Forearm
- Wrist
- Hand



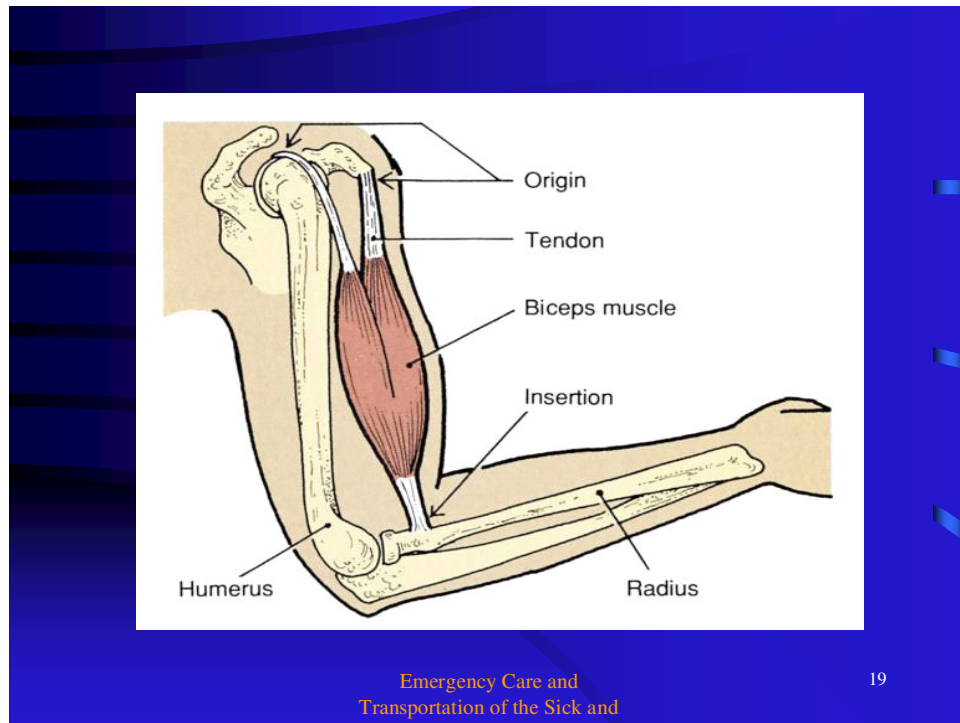
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- g. Hand
 - (1) Five metacarpals serve as the base for each of the five fingers (digits).
 - (2) The carpometacarpal (thumb) joint is a modified ball-and-socket joint.
 - (3) The other joints in the hand are simple hinge joints.
 - (4) The phalanges are the bones in the thumb and fingers.



C. Joints

1. A joint is formed wherever bones connect to other bones.
2. Most joints allow motion (knee, hip, or elbow).
3. Some bones fuse with another bone at joints to form a solid, immobile, bony structure (skull).
4. The bone ends of a joint are held together by a fibrous sac joint capsule (ligaments).
5. A joint with few ligaments, such as the shoulder, will be free to move in almost any direction and will, as a result, be more prone to dislocation.
6. Types of joints
 - a. Ball and socket (hip)
 - b. Hinged (elbow)
 - (1) Can only flex (bend) and extend (straighten)
 - c. Amount of motion varies from joint to joint.
 - d. All joints have a definite limit beyond which motion cannot occur.
 - e. When a joint is forced beyond this limit, damage to some structure will occur.



III. Musculoskeletal System

A. Functions of the muscular system

1. Gives the body shape
2. Protects internal organs
3. Provides for movement

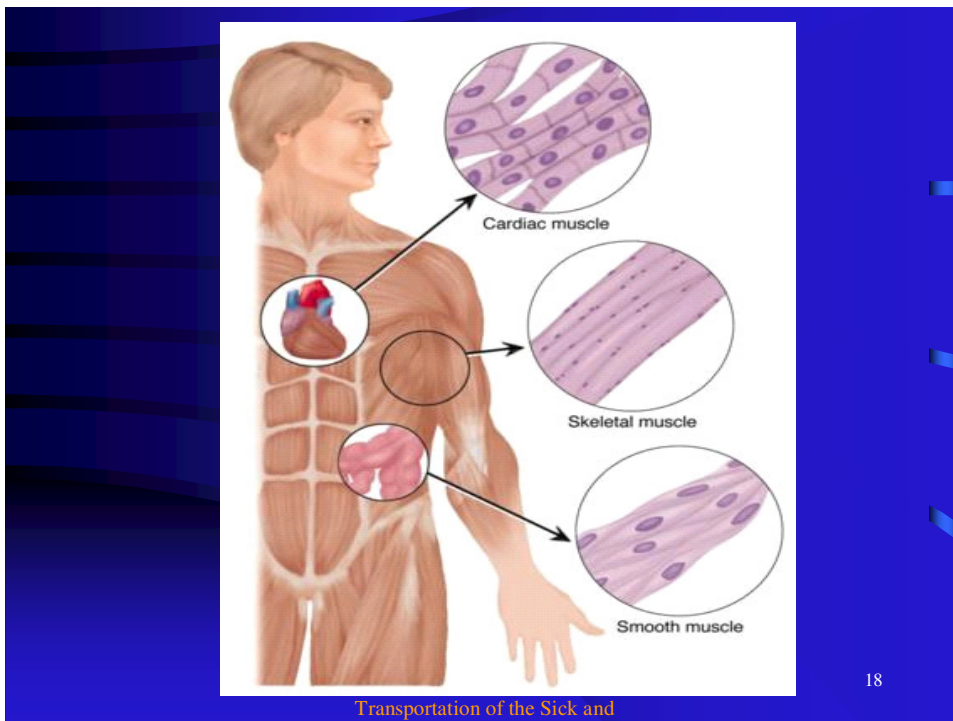
B. Types of Muscles

1. Voluntary (skeletal) muscle

- a. Attached to the bones
- b. Forms the major muscle mass of the body
- c. Under control of the nervous system and brain
- d. All bodily movement results from skeletal muscle contraction or relaxation.
- e. All skeletal muscles are supplied with arteries, veins, and nerves.
- f. Muscle cramps result when insufficient oxygen or food is carried to the muscle or when acidic waste products accumulate and are not carried away.
- g. Electrical impulses are carried from the cells in the brain and spinal cord along the peripheral nerves to each muscle, signaling it to contract.
- h. Skeletal muscles attach directly to bone by tough, ropelike cords of fibrous tissue called tendons.

2. Involuntary (smooth) muscle

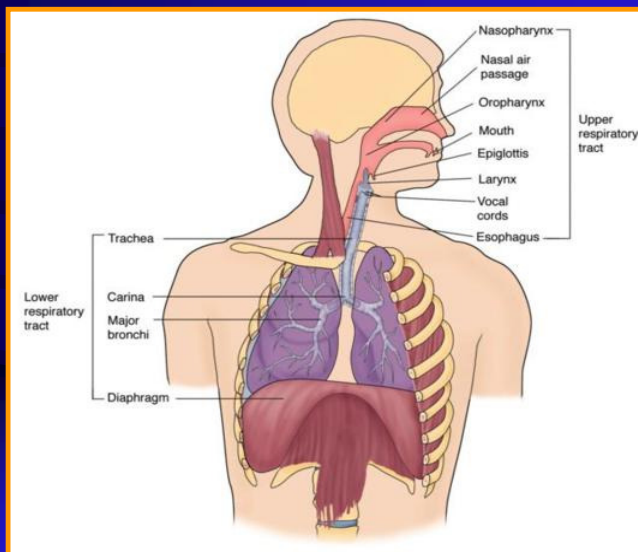
- a. Carry out the automatic muscular functions of the body
 - b. Found in the walls of the tubular structures of the gastrointestinal tract and urinary system, as well as in the blood vessels and bronchi
 - c. Control the flow of contents through these structures
 - d. Respond to stimuli such as stretching, heat, and cold
 - e. Individuals have no direct control over these muscles.
3. Cardiac muscle
- a. Involuntary muscle – has its own supply of blood and its own electrical system
 - b. Can tolerate interruptions of blood supply for only very short periods



IV. The Respiratory System

- A. The respiratory system consists of all structures of the body that contribute to respiration, or the process of breathing.
- B. The function of the respiratory system is to provide the body with oxygen and eliminate carbon dioxide.

The Respiratory System



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C. Upper airway

1. Oropharynx (throat)
2. Nasopharynx (above roof of mouth)
3. Epiglottis – a leaf-shaped structure that allows air to pass into the trachea but prevents food and liquid from entering the trachea during swallowing

D. Lower airway

1. Larynx (voice box)
2. Thyroid cartilage (Adam's apple)
3. Cricoid cartilage – firm cartilage ring forming the lower portion of the larynx
4. Trachea (windpipe)
 - a. Approximately 5" long, semi-rigid, enclosed air tube made up of rings of cartilage that are open in the back
 - b. Trachea ends at the carina and divides into the right and left main bronchi, which enter the lungs.
5. Bronchi
 - a. Each main bronchus immediately branches within the lung into smaller and smaller airways.
 - b. Within the right lung, three major bronchi are formed.
 - c. Within the left, there are only two.

d. Each bronchus supplies air to one lobe of the lung.

E. Lungs

1. Each lung is divided into lobes.

a. The right lung has three lobes: the upper, middle, and lower lobes.

b. The left lung has an upper and lower lobe.

2. The exchange of oxygen and carbon dioxide occurs within the alveoli of each lobe.

3. Pleura

a. Covering each lung is a layer of very smooth, glistening tissue called visceral pleura.

b. Another layer of pleura, called the parietal pleura, lines the inside of the chest cavity.

c. Between the parietal pleura and the visceral pleura is the pleural space, also called a potential space because these layers are usually in close contact everywhere.

F. Diaphragm

1. A unique muscle because it has characteristics of both voluntary and involuntary muscles

2. Dome-shaped muscle that divides the abdomen from the thorax

3. Inhalation (active)

a. Diaphragm and intercostal muscles contract, increasing the size of the thoracic cavity.

b. When the diaphragm contracts, it moves slightly downward, flares into the lower portion of rib cage, and the ribs move upward/outward.

c. Pressure in lungs decreases.

d. Air flows into the lungs.

4. Exhalation

a. Diaphragm and intercostal muscles relax, decreasing the size of the thoracic cavity.

b. As the muscles relax, all dimensions of the thorax decrease.

c. Ribs and muscles assume a normal resting position.

d. Pressure in the lungs increases.

e. Air flows out of the lungs.

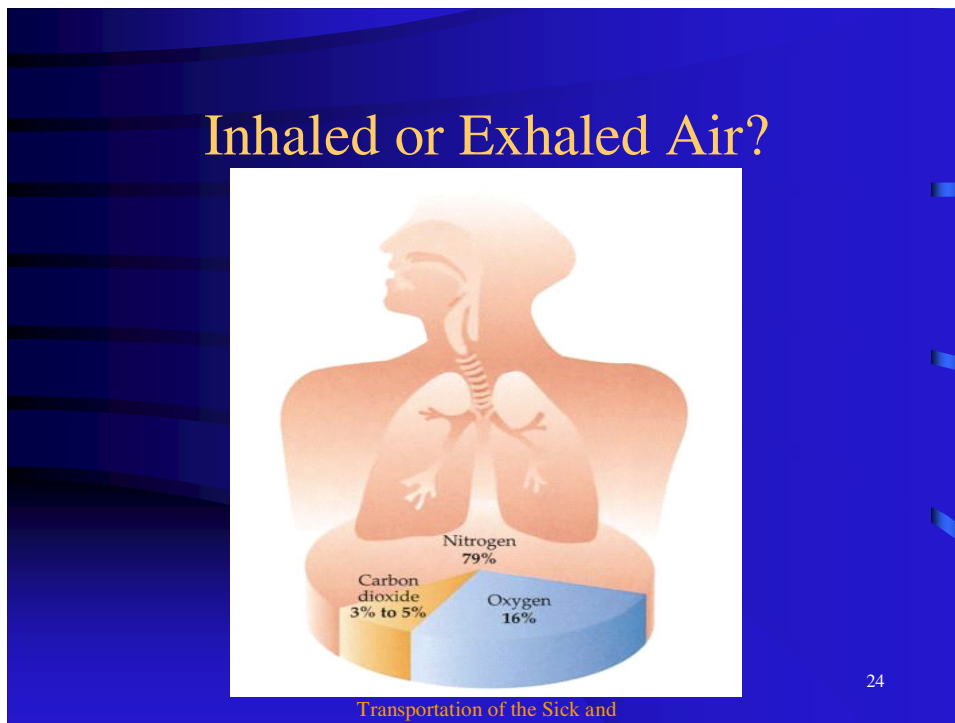
G. Respiratory physiology

1. Each living cell in the body requires a regular supply of oxygen.

2. Brain and nervous system cells may die after 4 to 6 minutes without oxygen.

3. The air we breathe normally contains 21% oxygen, 78% nitrogen, and small amounts of other gases make up the final 1%.

4. The exchange of oxygen and carbon dioxide
 - a. Oxygen passes from the blood through the capillaries to tissue cells.
 - b. Carbon dioxide and cell waste passes from tissue cells through capillaries to the blood.
 - c. Oxygen and carbon dioxide pass rapidly across these thin tissue layers through diffusion.
 - d. Diffusion is a passive process in which molecules move from an area with higher concentration of molecules to an area of lower concentration.
 - e. Oxygen-rich air enters the alveoli during each inspiration.
 - f. Oxygen-poor blood in the capillaries passes into the alveoli.
 - g. Oxygen enters the capillaries as carbon dioxide enters the alveoli.
 - h. The body does not use all the inhaled oxygen.
 - i. Exhaled air contains 16% oxygen and 3% to 5% carbon dioxide; the rest is nitrogen.
 - j. This 16% concentration of oxygen is adequate to support artificial ventilation.



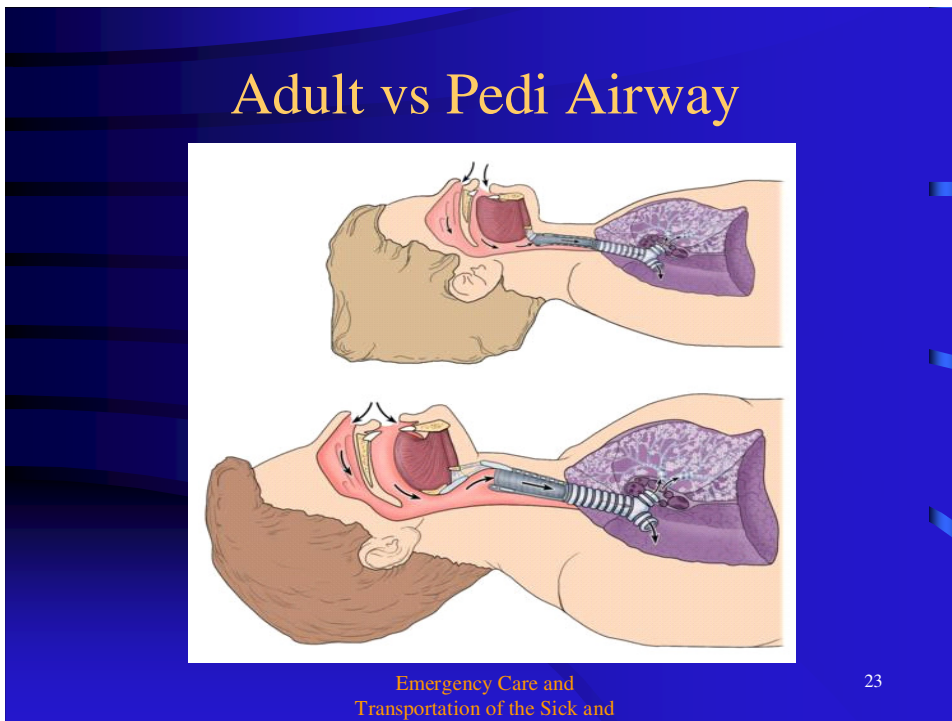
5. Control of breathing
 - a. The brain stem controls breathing.
 - b. The brain automatically controls breathing if the levels of carbon dioxide or oxygen in the arterial blood are too high or too low.
 - c. If the level of carbon dioxide becomes too high, the brain stem sends nerve impulses to increase breathing or respiratory rate.

- d. The hypoxic drive, a “backup system” to control respiration, activates when oxygen levels fall and stimulates breathing.
 - e. The hypoxic drive is much less sensitive and less powerful than the carbon dioxide sensors in the brain stem.
6. Characteristics of normal breathing
- a. Rate
 - (1) Adult: 12–20 breaths/min
 - (2) Child: 15–30 breaths/min
 - (3) Infant: 25–50 breaths/min
 - b. Rhythm
 - (1) Regular
 - (2) Irregular
 - c. Quality
 - (1) Breath sounds: Present and equal on both sides of the chest
 - (2) Chest expansion: Adequate and equal on both sides of the chest
 - (3) Breathing: Should be easy, not labored
 - d. Depth (tidal volume): Adequate
7. Inadequate breathing
- a. Rate: Outside of normal ranges
 - b. Rhythm: Irregular
 - c. Quality
 - (1) Breath sounds: Diminished or absent
 - (2) Chest expansion: Unequal or inadequate
 - (3) Increased effort of breathing
 - (4) An adult who is not breathing well will appear to be working hard to breathe (labored breathing).
 - d. Depth (tidal volume)—inadequate/shallow
 - e. There may be muscle retractions above the clavicles, between the ribs and below the rib cage, especially in children.
 - f. The skin may be pale or cyanotic (blue) and cool and clammy.
 - g. Tripod positioning (sitting up, leaning forward, legs dependent)

- h. Signs such as a faster respiratory rate, an irregular breathing pattern, unequal breath sounds, and unequal chest expansion indicate breathing problems in both adults and children.
- i. Nasal flaring may be present, especially in children.
- j. In infants, there may be seesaw respirations in which the abdomen and chest move in opposite directions.
- k. Agonal respirations (occasional gasping breaths) may be seen just before death.

H. Infant and child anatomy considerations

1. The anatomy of the respiratory system in children is proportionally smaller and less rigid than that in an adult.
2. All structures are smaller, softer, more flexible, and more easily obstructed as a result.
3. Infants' and children's tongues take up proportionally more space in the mouth than adults.
4. The chest wall is softer in infants and children, who tend to depend more heavily on the diaphragm for breathing.
5. You will notice the abdomen moves in and out considerably with each breath.



V. The Circulatory System

A. General considerations

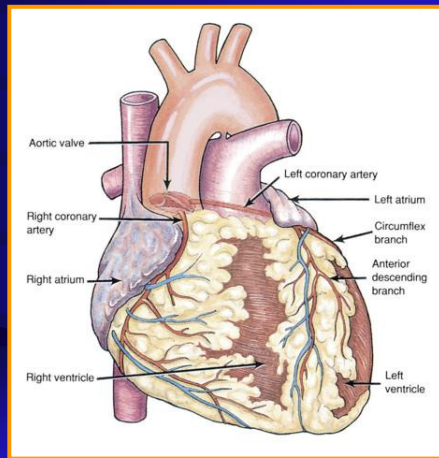
1. The circulatory system is a complex arrangement of connected tubes, including the arteries, arterioles, capillaries, venules, and veins.

2. There are two circuits in the body.
 - a. Systemic circulation
 - b. Pulmonary circulation
3. The systemic circulation carries oxygen-rich blood from the left ventricle through the body and back to the right atrium.
4. The pulmonary circulation carries oxygen-poor blood from the right ventricle through the lungs and back to the left atrium.

C. Heart

1. The heart is a hollow muscular organ approximately the size of an adult's clenched fist.
2. It is made of a unique, adapted tissue called myocardium (cardiac muscle) and actually works as two paired pumps.
3. The septum divides the heart down the middle into right and left sides.
4. Each side is divided into an upper chamber (atrium) and a lower chamber (ventricle).
 - a. Atrium
 - (1) Right: Receives blood from the veins of the body and the heart and pumps oxygen-poor blood to the right ventricle
 - (2) Left: Receives blood from the pulmonary veins (lungs) and pumps oxygen-rich blood to the left ventricle
 - b. Ventricle
 - (1) Right: Pumps blood to the lungs
 - (2) Left: Pumps blood to the body

The Heart



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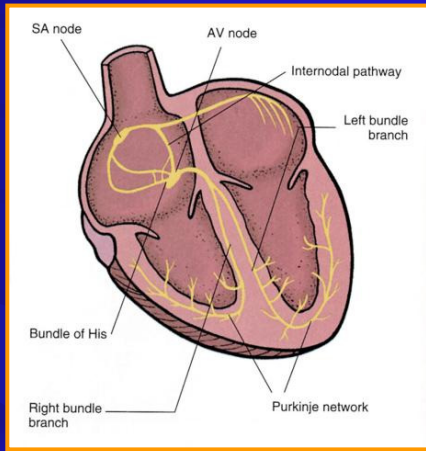
5. It is an involuntary muscle.
6. It has its own electrical system and continues to function even without central nervous system control.
7. How the heart works
 - a. The heart receives the first blood distribution from the aorta.
 - b. The two main coronary arteries have openings immediately above the aortic valve at the beginning of the aorta where the pressures are highest.
 - c. The right side of the heart receives blood from the veins of the body.
 - d. The blood enters from the venae cavae into the right atrium and fills the right ventricle.
 - e. Contraction of the right ventricle causes blood to flow into the pulmonary artery and the pulmonary circulation system.
 - f. The left side receives the oxygenated blood from the lungs through the pulmonary veins into the left atrium where it passes through a valve into the left ventricle.
 - g. The left ventricle is the most muscular of the pumping chambers and when it contracts, the blood is pumped into the aorta and then to the arteries of the body.
 - h. A one-way valve governs the exit of each of the four heart chambers.
 - i. Valves prevent backflow of blood.
 - j. When a valve controlling the filling of a heart chamber is open, the valve that controls when the heart chamber empties is shut and vice versa.

D. Electrical conduction system

1. A network of specialized tissue capable of conducting electrical current runs throughout the heart.
2. The flow of electrical current through this network causes smooth, coordinated contraction of the heart.
3. Contractions produce the pumping action of the heart.
4. Each mechanical contraction of the heart is associated with two electrical processes.
 - a. Depolarization: Electrical charges on the surface of the muscle cell change from positive to negative.
 - b. Repolarization: The heart returns to its resting state, and the positive charge is restored to the surface.
5. The electrical impulse begins high in the atria at the sinus (SA) node, travels to the atrioventricular (AV) node, and then moves through the Purkinje fibers to the ventricles.
6. The heart's electrical system becomes disturbed if part of the heart is oxygen-deficient, injured, or dies.

Electrical Conduction System

- SA node
- AV node
- Bundle of his
- Bundle branches
- Purkinje network



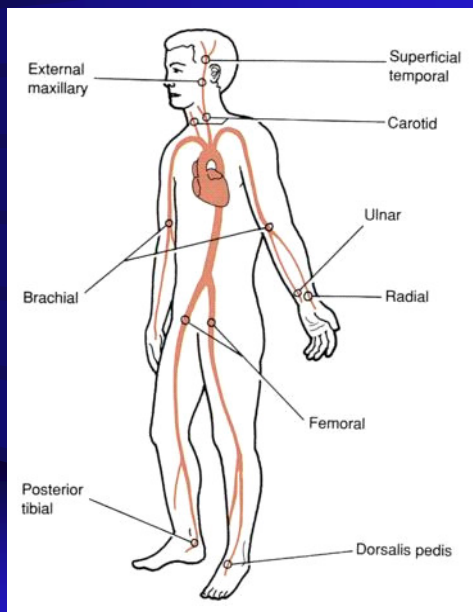
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D. Arteries

1. Arteries carry blood from the heart to all body tissues.
2. Arteries branch into smaller arteries and then into arterioles.
3. Arterioles branch into smaller vessels until they connect to the vast network of capillaries.

4. Arteries contract to accommodate for loss of blood volume and also to increase blood pressure.
5. Aorta
 - a. The aorta is the principal artery leaving the left side of the heart and carries freshly oxygenated blood to the body.
 - b. Divides at the level of the navel into the iliac arteries
6. Pulmonary
 - a. Artery originating at the right ventricle
 - b. Carries oxygen-poor blood to the lungs
7. Carotid
 - a. Major artery of the neck
 - b. Supplies the head and brain with blood
 - c. Pulsations can be palpated on either side of the neck.
8. Femoral
 - a. The major artery of the thigh
 - b. Supplies the lower extremities with blood
 - c. Pulsations can be palpated in the groin area (the crease between the abdomen and thigh).
9. Posterior tibial: Pulsations can be palpated on the posterior surface of the medial malleolus.
10. Dorsalis pedis: Pulsations can be palpated on the anterior surface of the foot.
11. Brachial
 - a. Major artery of the upper extremity that supplies blood to the arm
 - b. Pulsations can be palpated on the inside of the arm between the elbow and the shoulder.
 - c. Used when determining a blood pressure (BP) using a BP cuff and a stethoscope
12. Radial
 - a. Major artery of the lower arm
 - b. Pulsations can be palpated at the wrist thumb side.



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13. Arterioles: The smallest branch of an artery leading to the capillaries

14. Capillaries

- a. Fine end divisions of the arterial system that allow contact between cells of the body tissue and plasma and red blood cells.
- b. Allow for the exchange of oxygen and of the nutrients and waste at the cellular level
- c. Tiny blood vessels that connect arterioles to venules

E. Veins

1. Vessels that carry blood back to the heart
2. Returns to the heart via a network of larger and larger veins
3. Major veins
 - a. Venae cavae
 - (1) Superior
 - (2) Inferior
 - (3) Carries oxygen-poor blood back to the right atrium
 - b. Pulmonary vein: Carries oxygen-rich blood from the lungs to the left atrium
4. Venules: The smallest branch of the veins leading to the capillaries

F. Components of blood

1. Plasma: Fluid that carries the blood cells and nutrients
2. Red blood cells

- a. Give the blood its color
- b. Carry oxygen to organs
3. White blood cells: Part of the body's defense against infections
4. Platelets: Essential for the formation of blood clots
5. Blood from an artery is bright red, under pressure, and will gush or spurt from injury sites.
6. From a vein, blood is dark bluish-red and will flow in a steady stream.
7. From capillaries, blood will ooze at many tiny individual points.

G. Physiology of the circulatory system

1. Pulse (heart rate)
 - a. Left ventricle contracts, sending a wave of blood through the arteries.
 - b. Can be palpated anywhere an artery simultaneously passes near the skin surface and over a bone
 - c. Central
 - (1) Carotid
 - (2) Femoral
 - d. Peripheral
 - (1) Radial
 - (2) Brachial
 - (3) Posterior tibial
 - (4) Dorsalis pedis
2. Blood pressure
 - a. Systole: The pressure exerted against the walls of the artery when the left ventricle contracts
 - b. Diastole: The pressure exerted against the walls of the artery when the left ventricle is at rest
 - c. The high and low points of the wave can be measured with a sphygmomanometer (blood pressure cuff) and are expressed numerically in millimeters of mercury (mm Hg).

H. Perfusion

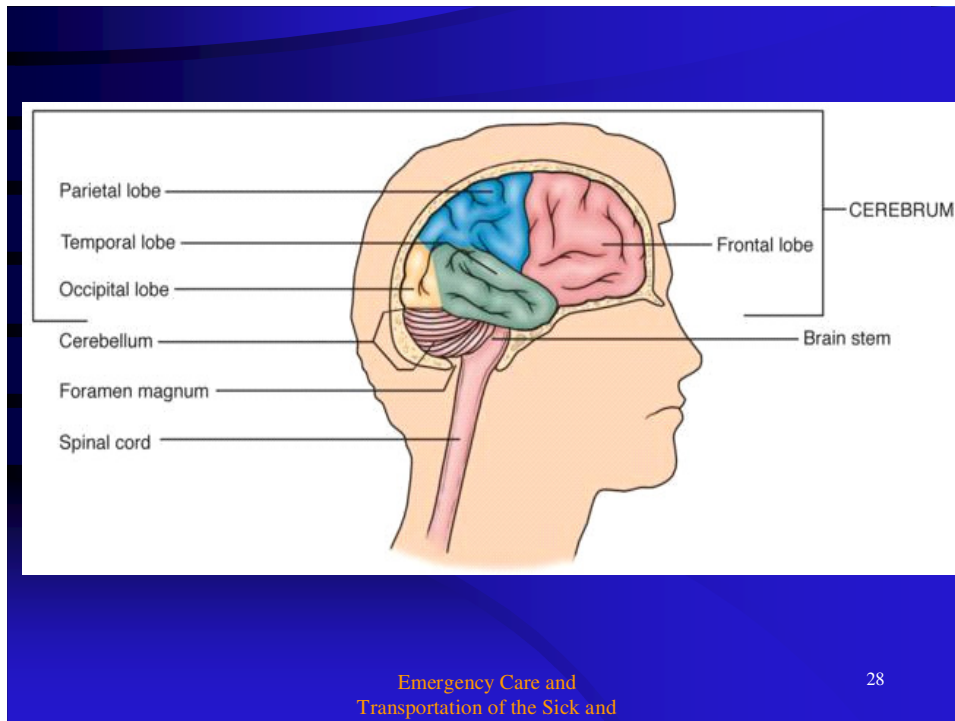
1. Circulation of blood within an organ or a tissue in adequate amounts to meet the cells' current needs.

2. Perfusion is the delivery of oxygen and other nutrients to the cells of all organ systems and the removal of waste products from those cells.
 3. There are many reasons for loss of blood pressure. In each case, cells are no longer adequately perfused.
 4. Shock is the inadequate circulation of blood through an organ or a tissue.
- I. Inadequate circulation
1. When a patient loses a small amount of blood, the arteries, veins, and heart automatically adjust to the smaller volume.
 2. As the blood pressure falls, the pulse increases in an attempt to keep the cardiac constant.
 3. If the loss of blood is too great, the adjustment fails and the patient goes into shock.

VI. The Nervous System

- A. Controls the voluntary and involuntary activity of the body
- B. The somatic nervous system regulates voluntary activities.
- C. The autonomic nervous system controls involuntary functions.
- D. Components
1. Central nervous system
 - a. Brain: Located within the cranium
 - (1) The controlling organ of the body
 - (2) Three major subdivisions of the brain: the cerebrum, the cerebellum, and the brain stem.
 - (3) Cerebrum
 - (a) The largest part of the brain (gray matter)
 - (b) Composed of four lobes: Frontal, parietal, temporal, and occipital
 - (c) Controls activities on the opposite side of the body
 - (4) Cerebellum
 - (a) Located underneath the great mass of cerebral tissue and called the “little brain”
 - (b) Coordinates the various activities of the brain, particularly body movements
 - (5) Brain stem
 - (a) The most primitive part of the central nervous system
 - (b) Controlling center for virtually all body functions that are absolutely necessary for life

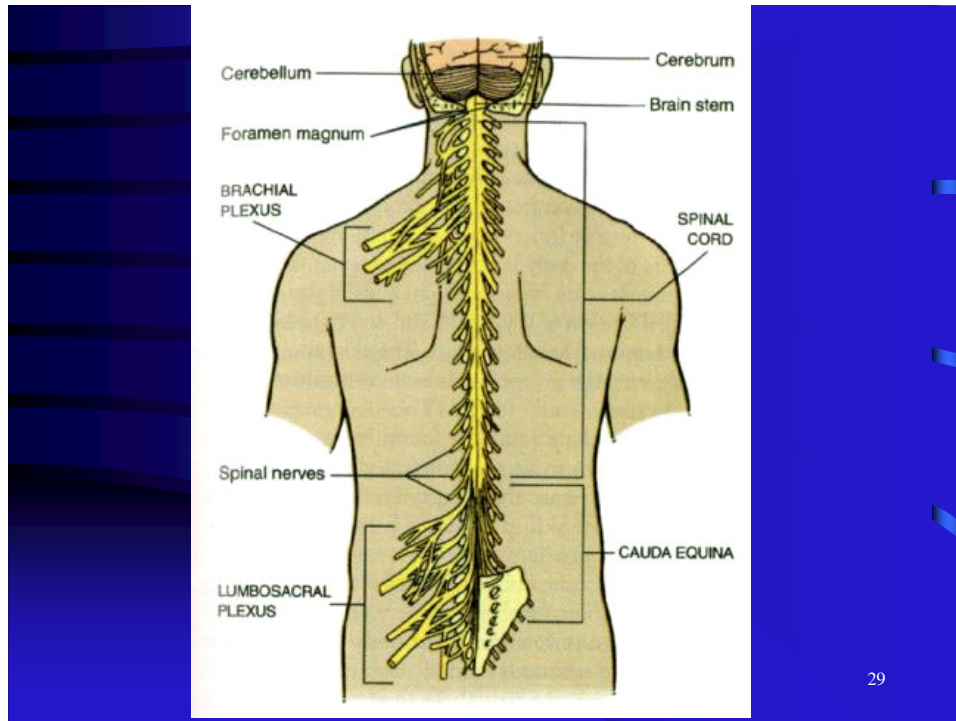
- b. Spinal cord: Located within the spinal column from the brain through the lumbar vertebrae
 - (1) The major portion of the spinal cord is made up of nerve fibers that transmit information to and from the brain.
 - (2) The entire connection of fibers join together just below the brainstem to form the spinal cord.
 - (3) Principal function of the spinal cord is to transmit messages between the brain and the body.



2. Peripheral nervous system

- a. Consists of long fibers that extend from the cell body out through openings in the bony covering to form a cable of nerve fibers that link the central nervous system to the various organs of the body
- b. Sensory nerves carry information from the body to the central nervous system
 - (1) The sensory impulses constantly provide information to the brain about what different parts of the body are doing in relation to surroundings.
- c. Motor nerves carry information from the central nervous system to the muscles of the body.
 - (1) Each muscle in the body has its own motor nerve.
 - (2) Electrical impulses produced by cell bodies in the spinal cord are transmitted along the motor nerve to the muscle and cause it to contract.

- d. Connecting nerves connect the sensory nerves with the motor nerves.
- e. The peripheral nervous system is composed of 31 pairs of peripheral nerves called spinal nerves and 12 pairs called cranial nerves.
- f. The cranial nerves are specialized nerves designed to provide specific functions in the head and face.



VII. The Skin

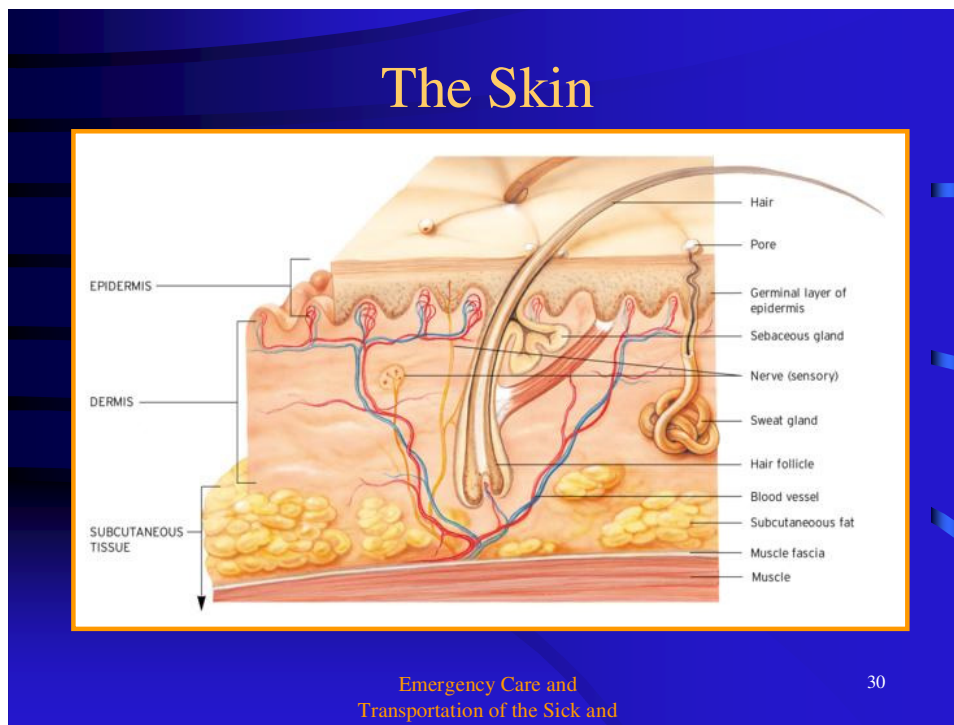
A. Functions of the skin

1. Protects the body in the environment
2. Helps regulate the temperature of the body
3. Transmits information from the environment to the brain and spinal cord
4. In a cold environment, constriction of the blood vessels shunts the blood away from the skin to decrease the amount of heat radiated from the body surface.
5. In a warm environment, the vessels in the skin dilate, the skin becomes flushed or red, and heat radiates from the body surface.
 - a. Sweat is secreted to the skin surface from the sweat glands.
 - b. Sweating alone will not reduce body temperature, evaporation of the sweat must also occur.

B. Anatomy of the skin

1. Epidermis: Outermost layers of skin

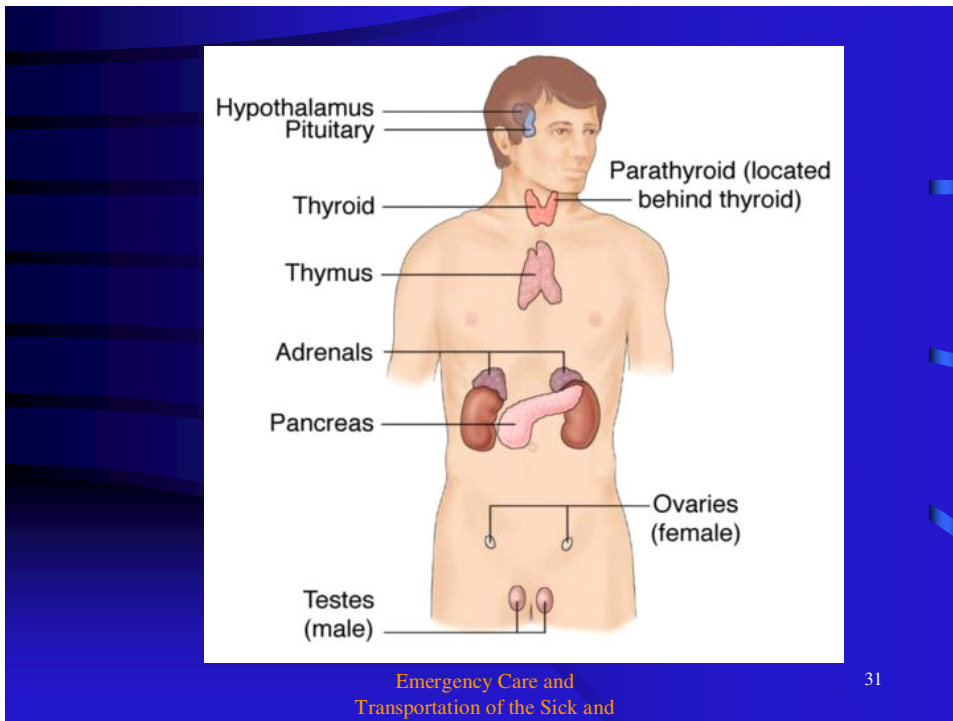
2. Dermis: Deeper layer of skin containing sweat and sebaceous glands, hair follicles, blood vessels, and nerve endings (sensitive to environmental stimuli)
3. Subcutaneous layer: A layer of fat below the skin; serves as an insulator for the body and as a reservoir to store energy
4. Sweat glands: Produce sweat for cooling the body
5. Sebaceous glands: Produce sebum, the oily material that seals the surface epidermal cells
6. Hair follicles: Small organs that produce hair
7. Blood vessels: Provide nutrients and oxygen to the skin
8. Mucous membranes line the openings to the body (mouth, nose, anus, and vagina)
 - a. Provide a protective barrier against bacterial invasion
 - b. They secrete mucus, a watery substance that lubricates the openings.



VIII. Endocrine System

- A. Complex message and control system that integrates body functions
- B. Releases substances called hormones
- C. Each endocrine gland produces one or more hormones.
- D. Each hormone has a specific effect on some organ, tissue, or process.
- E. The brain controls the release of hormones.
- F. Tightly controlled system of communications using primary and secondary feedback loops to keep the body in balance

G. Excesses or deficiencies in hormones can cause disease processes, such as diabetes



IX. Digestive System

A. Digestion is the processing of food that nourishes the individual cells of the body.

B. How digestion works

1. Digestion of food is a complicated chemical process.
2. Different secretions are added to the food in succession to convert the food into basic sugars, fatty acids, and amino acids.
3. These basic products of digestion are transported to the liver, processed further, and then stored or transported to the heart.
4. Nutrients are then passed through the capillary walls to nourish the body's individual cells.

C. Anatomy of the digestive system

1. Mouth
2. Salivary glands
 - a. Located under the tongue
 - b. Produce saliva
 - c. Saliva is approximately 98% water.
3. Oropharynx
4. Esophagus
 - a. A collapsible tube about 10" long that extends from the end of the pharynx to the stomach

5. Stomach
 - a. Located in the left upper quadrant of the abdominal cavity
 - b. Receives food in large quantities intermittently, stores it, and provides for its movement into the small bowel in regular, small amounts
6. Pancreas
 - a. A flat, solid organ that lies below and behind the liver and stomach and behind the peritoneum on the spine and muscles of the back
 - b. Contains two types of glands
 - (1) One type secretes nearly 2 L of pancreatic juice daily, which contains many enzymes that aid in the digestion of fat, starch, and protein.
 - (2) The other type, the islets of Langerhans, produces insulin, which regulates the amount of sugar in the blood.
7. Liver
 - a. Large solid organ immediately beneath the diaphragm in the right quadrant
 - b. Largest solid organ in the abdomen
 - c. Poisonous substances produced by digestion are brought to the liver and rendered harmless.
 - d. Factors necessary for blood clotting and for the production of normal plasma are formed in the liver.
 - e. Principal organ for the storage of sugar or starch for immediate use by the body for energy
 - f. Anatomically, the liver is a large mass of blood vessels and cells.
 - g. It is fragile and relatively easily injured.
 - h. Approximately 25% of the cardiac output of blood (1.5 liters) passes through the liver each minute.
8. Bile ducts
 - a. Connects the liver to the intestine
 - b. The gallbladder is an outputting from the bile ducts that serves as a reservoir and concentrating organ for bile produced in the liver.
9. Small intestine
 - a. The small intestine is the major hollow organ of the abdomen.
 - b. Produces enzymes and mucus to aid in digestion

- c. The small intestine is composed of the duodenum, the jejunum, and the ileum.
- d. The major function of bile is the digestion of fat.

10. Large intestine

- a. The large intestine is a major hollow organ and consists of the cecum, colon, and the rectum.
- b. The major function of the colon is to absorb the final 5% to 10% of digested food and water from the intestine to form solid stool.

11. Appendix

- a. A 3” or 4” long tube that opens into the cecum in the right lower quadrant of the abdomen
- b. It may easily become obstructed, inflamed, and infected.
- c. Appendicitis is one of the major causes of severe abdominal distress.
- d. The appendix has no known function.

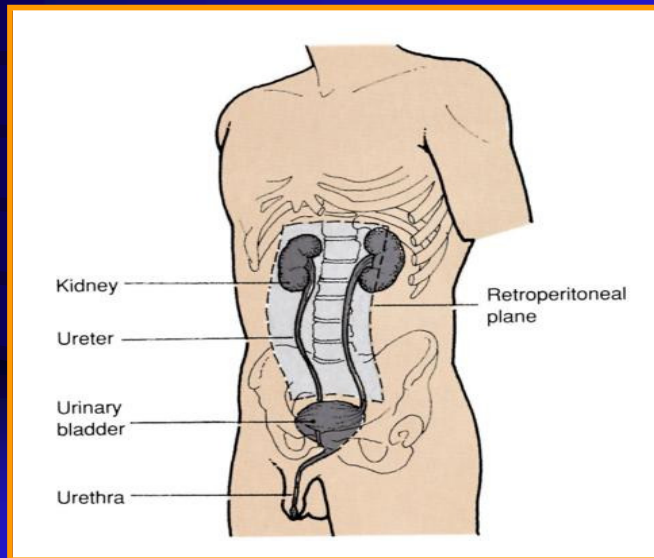
12. Rectum

- a. The lowermost end of the colon
- b. A large hollow organ adapted to store quantities of feces until it is expelled

X. **Urinary System**

- A. Controls the discharge of certain waste materials filtered from the blood by the kidney
- B. The kidneys are solid organs.
- C. The ureters, bladder, and urethra are hollow organs.
- D. The body has two kidneys that lie in the retroperitoneal space.
- E. Kidneys rid the blood of toxic waste products and control the balance of water and salt.
- F. Large vessels attach the kidneys directly to the aorta and the inferior vena cava.
- G. A ureter passes from each kidney to drain into the urinary bladder.
- H. The urinary bladder is located immediately behind the pubic symphysis in the pelvic cavity.
- I. The bladder empties to the outside of the body through the urethra.

The Urinary System



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Transportation of the Sick and

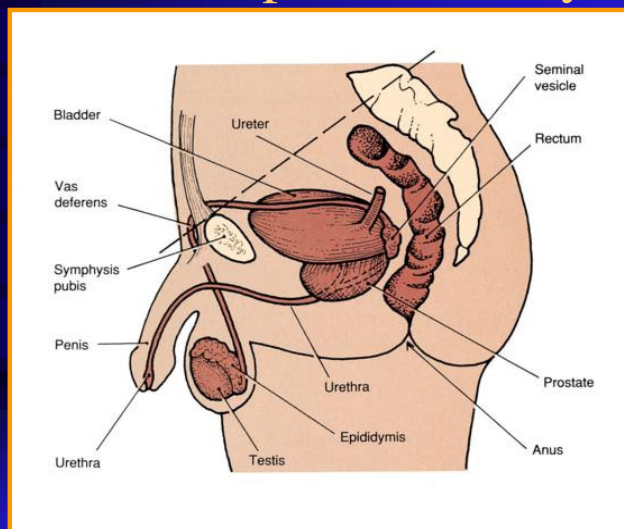
XI. Genital System

A. The genitalia system controls the reproductive processes.

B. Male reproductive system and organs

1. Testicles, vasa deferentia seminal vesicles, prostate gland, urethra, and penis

The Male Reproductive System



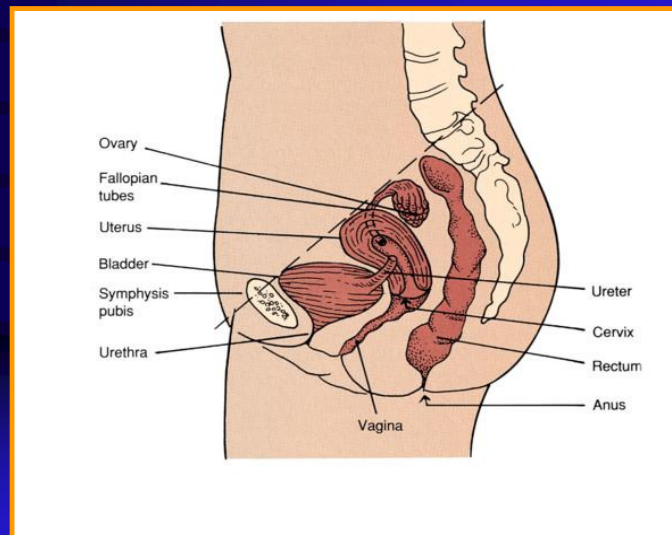
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Emergency Care and
Transportation of the Sick and

C. Female reproductive system and organs

1. Ovaries, fallopian tubes, uterus, cervix, and vagina.

The Female Reproductive System



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Transportation of the Sick and

Lesson Review

- A. Describe and demonstrate the normal anatomical position. (Lecture I-A)
- B. What are the two anatomical planes used in describing points of the body? (Lecture I-B)
- C. What are the primary functions of the skeletal system? (Lecture II-A)
- D. What are the major parts of the thorax? (Lecture II-A-6)
- E. List the major division of the abdomen and what organs are located in each division. (Lecture II-A-7)
- F. Describe the difference between inhalation/expiration and respiration. (Lecture IV)
- G. Describe how blood flows through the heart. (Lecture V-7)
- H. List the major arteries and veins. (Lecture V-D/E)
- I. What do the terms diastole and systolic mean? (Lecture V-G)
- J. What are the major components of the nervous system? (Lecture VI)
- K. What are the functions of the skin? (Lecture VII)
- L. What is the endocrine system and what is its role in human body functioning? (Lecture VIII)
- M. List the major components and process of digestion. (Lecture IX)