

Nursing -Level III

Based on January 2022 Curriculum Version I



Module Title: Basic nursing care

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Abbreviations and Acronyms

ACTH	Adreno Cortico Tropic Hormone
ADH	Anti di Uretic Hormone
ADP	Adenosine Di Phosphate
ANS	Autonomic Nervous System
ATP	Adenosine Tri Phosphate
CNS	Central Nervous System
CRH	Corticotropin Releasing Hormone
CSF	Cerebro Spinal Fluid
DNA	Deoxyribo Nucleic Acid
ECF	Extra Cellular Fluid
ER	Endoplasmic Reticulum
FSH	Follicular stimulating hormone
GHIH	Growth Hormone Inhibiting Hormone
GHRH	Growth Hormone Releasing Hormone
GI	Gastro Intestinal
GnRH	Gonadotrophin Releasing Hormone
HCG	Human Chorionic Gonadotrophin hormone
ICSH	Interstitial Cell Stimulating Hormone
IGF	Insulin like Growth Factors
IUD	Intra Uterine Device
LES	Lower esophageal sphincter
LH	Leutinizing Hormone
PIH	Prolactin Inhibiting Hormone
PNS	Peripheral Nervous System
PRH	Prolactin Releasing Hormone
PTH	Para Thyroid Hormone
TGB	Tyroglobulin
TRH	Tyrotropin Releasing Hormone
TSH	Thyroid Stimulating Hormone
UV	Ultra Violet

Module units

- 1: Human body structure and function
- 2: Causes of Diseases
- 3: Individualize nursing care
- 4: Safe manual handling
- 5: Patient safety and comfort
- 6: Hygienic care for patients
- 7: Patient transportation

Learning objectives of the Module

At the end of this module, the students will able to:

- Differentiate human body structure and function
- Identify causes of diseases
- Identify clients need to individualize nursing care.
- Apply safe manual handling
- Ensure patient safety and comfort
- Provide hygienic care for patients
- Perform patient transportation

Module Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Unit ONE: Introducing to human body structure and function

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Human anatomy and physiology
- Structure and function of skeletal system
- Structure and function of muscular system
- Structure and function of nervous system
- Structure and function of endocrine system
- Structure and function of cardiovascular systems
- Structure and function of respiratory system
- Structure and function of urinary systems
- Structure and function of reproductive organs
- Structure and function of head, eye, ear, nose and throat
- Structure and function of digestive system
- Fluid electrolyte and acid base balances balance

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify structure and function of musculoskeletal system
- Differentiate structure and function of nervous system
- Identify structure and function of endocrine system
- Differentiate structure and function cardiovascular systems
- Identify structure and function of respiratory system
- Differentiate structure and function Urinary system
- Identify structure and function of Reproductive system
- Differentiate structure and function Immune System
- Identify structure and function of Digestive System
- Have basic understanding about fluid electrolyte and acid base balances balance

Anatomy: the word anatomy is derived from a Greek word “Anatome” meaning to cut up. It is the study of structures that make up the body and how those structures relate with each other.

Physiology: the word physiology derived from a Greek word for study of nature. It is the study of how the body and its part work or function. Hence, Anatomy and physiology are studied together to give students a full appreciation and understanding of human body.

Subdivisions of anatomy

Gross Anatomy: study of body structures visible to naked eye

Cellular Anatomy: study of structure of cells

Histology: study of the microscopic structure of tissues

Developmental Anatomy: study of changes in an individual from conception to old age

Embryology: study of the developmental changes that occur before birth

Physiology: the word physiology derived from a Greek word for study of nature. It is the study of how the body and its part work or function.

Sub division of physiology

Renal Physiology: Kidney function and urine production

Neurophysiology explains the functions of the nervous system

Cardiovascular Physiology examines the operation of the heart and blood vessels.

Anatomical Terms

Anatomical terminologies can be explained in terms of anatomical positions can be described in terms of planes, directions, regions

Knowing these terms will make it much easier for us to understand the content of the following learning units. It describes the relationship of parts of the body in the anatomical position and compares the position of two structures. Three groups of terms are introduced here:

- I. Directional Terms
- II. Planes of the Body
- III. Body Cavities

Directional Terms

Directional terms describe the positions of structures relative to other structures or locations in the body.

Superior or cranial: Toward the head end of the body; upper (e.g., the hand is part of the superior extremity).

Inferior or caudal: Away from the head; lower (e.g., the foot is part of the inferior extremity).

Anterior or ventral: Front (example, the kneecap is located on the anterior side of the leg).

Posterior or dorsal: Back (example, the shoulder blades are located on the posterior side of the body).

Medial: Toward the midline of the body (example, the middle toe is located at the medial side of the foot).

Lateral: Away from the midline of the body (example, the little toe is located at the lateral side of the foot).

Proximal: Toward or nearest the trunk or the point of origin of a part (example, the proximal end of the femur joins with the pelvic bone)

Distal: way from or farthest from the trunk or the point or origin of a part (example, the hand is located at the distal end of the forearm).

Planes of the Body

Coronal/Frontal Plane: A vertical plane running from side to side; divides the body or any of its parts into anterior and posterior portions.

Sagittal /Lateral: A vertical plane running from front to back; divide the body or any of its parts into right and left sides.

Axial/ Transverse: A horizontal plane; divides the body or any of its parts into upper and lower parts.

Median /Sagittal plane: Through the midline of the body; divides the body or any of its parts into right and left halves.

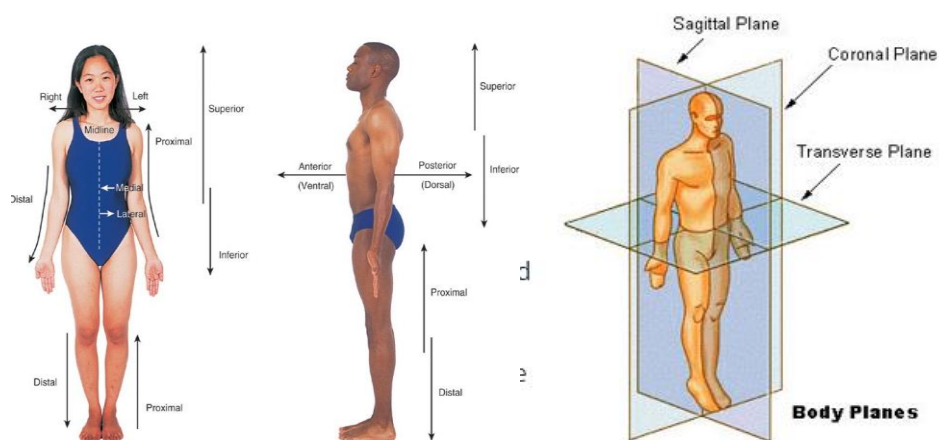


Figure 1.1: Figure showing body planes

Body Cavities

The cavities, or spaces, of the body contain the internal organs, or viscera. The two main cavities are called the ventral and dorsal cavities. The ventral is the larger cavity and is subdivided into two parts (thoracic and abdominopelvic cavities) by the diaphragm, a dome-shaped respiratory muscle.

Thoracic cavity

The upper ventral, thoracic, or chest cavity contains the heart, lungs, trachea, esophagus, large blood vessels, and nerves. The thoracic cavity is bound laterally by the ribs (covered by costal pleura) and the diaphragm caudally (covered by diaphragmatic pleura).

Abdominal and pelvic cavity

The lower part of the ventral (abdominopelvic) cavity can be further divided into two portions: abdominal portion and pelvic portion. The abdominal cavity contains most of the gastrointestinal tract as well as the kidneys and adrenal glands. The abdominal cavity is bound cranially by the diaphragm, laterally by the body wall, and caudally by the pelvic cavity. The pelvic cavity contains most of the urogenital system as well as the rectum. The pelvic cavity is bounded cranially by the abdominal cavity, dorsally by the sacrum, and laterally by the pelvis.

Dorsal cavity

The smaller of the two main cavities is called the dorsal cavity. As its name implies, it contains organs lying more posterior in the body. The dorsal cavity, again, can be divided into two portions. The upper portion, or the cranial cavity, houses the brain, and the lower portion, or vertebral canal houses the spinal cord.

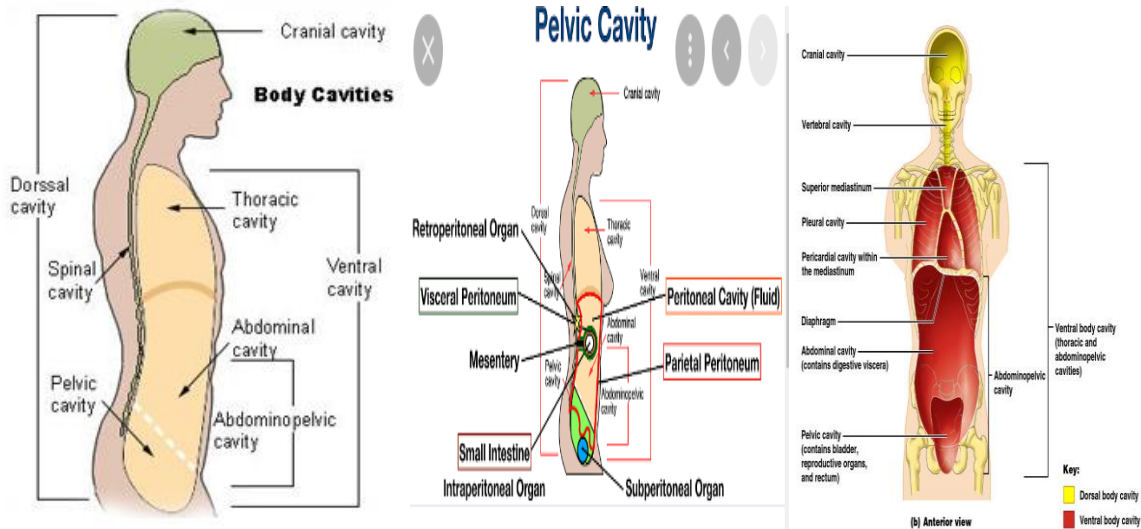


Figure 1.1: Figure showing body cavities

Homeostasis

Normal cellular function requires that the intracellular composition of ions, small molecules, water, pH, and a host of other substances be maintained within a narrow range. This ability to maintain internal stability is called **homeostasis**. This is accomplished by the transport of many substances and water into and out of the cell with the use of membrane transport proteins. **Homeostasis** is self-regulating process by which biological systems tend to maintain stability while adjusting to conditions that are optimal for survival.

Homeostatic control mechanisms

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Homeostasis is the ability of the body to maintain nearly constant conditions in its internal environment in spite of changes in the surroundings. All organs & tissues of the body perform functions that help maintain homeostasis. The homeostatic mechanisms are the regulatory mechanisms that tend to correct any deviation from normal in response to changes in the external or internal environment.

Each cell benefits from homeostasis, and in turn, each cell contributes its share toward the maintenance of a constant internal environment e.g. body temperature. If one or more systems of the body lose this function, all the cells of the body suffer. Moderate dysfunction leads to sickness whereas extreme dysfunction leads to death.

The control systems of the body

The disease is often considered to be a state of disrupted homeostasis. The body depends mainly on two major control systems for the regulation of all its functions; the nervous and endocrine systems. Many interrelationships exist between the endocrine and nervous systems.

The nervous system is responsible for the functions that need rapidity of execution, e.g. applying a hot object to the hand causes immediate flexion of the arm to withdraw it from such harmful hot object.

Sensory receptors can detect the state of the body or the state of the surroundings. The human brain can store the information, generate thoughts, create ambition, and determine the reactions that the body performs in response to the sensations, suitable signals are transmitted through the motor output portion of the nervous system.

The autonomic system is an important segment of the nervous system. It can control many functions of the internal organs, including the pumping activity by the heart, movements of the gastrointestinal tract, and secretion by many of the body's glands.

The endocrinal system is composed of many endocrine glands and several organs and tissues that secrete chemical substances called hormones into the bloodstream. Hormones are transported in the extracellular fluid to other parts of the body to help regular cellular function. The endocrine system is concerned with the functions that do not need rapidity of execution e.g. thyroid hormone increases the rates of most chemical reactions in all cells and Insulin controls glucose metabolism.

Characteristics of Homeostatic Control Systems

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All homeostatic control mechanisms have at least three main components:

The first component, the receptor is a sensor that detects a change in the surrounding environment, which is the stimuli, and responds by sending the information (input) to the second component. The input flows from the receptor to the control centre along the so-called afferent pathway.

The second component, the control centre, which determines the exact set point, analyses the input it receives from the receptor and then determines the appropriate response. The third component, the effector provides the means for the center's response (output) to the stimulus. Information flows from the centre to the effector along the efferent pathway.

Negative feedback mechanisms

Most homeostatic control mechanisms of the body act as negative feedback. When some factor becomes excessive or deficient, the control system initiates a series of changes that return it back toward a certain mean value. In negative feedback, the output response is opposite to the stimulus, and shuts it off or reduces its intensity. There are hundreds of negative feedback mechanisms that operate in the human body, e.g. with increase activities of the cells, the concentration of carbon dioxide in the extracellular fluid increases.

Positive Feedback Mechanisms

The response enhances the original stimulus in positive feedback mechanisms. The response proceeds in the same direction of the initial disturbance, causing the deviate further from its normal range. The positive feedback mechanism is often referred to as “cascades”. The positive feedback is better known as the “vicious cycle”.

Distribution of Water in the Body Fluid Compartments

In the human body, water constitutes a high proportion of body weight. The total amount of fluid or water is called total body water, which accounts for 50% to 70% of body weight. For example, a 70-kilogram (kg) man whose total body water is 65% of his body weight has 45.5 kg or 45.5 liters (L) of water (1 kg water \approx 1 L water).

In general, total body water correlates inversely with body fat. Thus, total body water is a higher percentage of body weight when body fat is low and a lower percentage when body fat is high. Because females have a higher percentage of adipose tissue than males, they tend to have less body water.

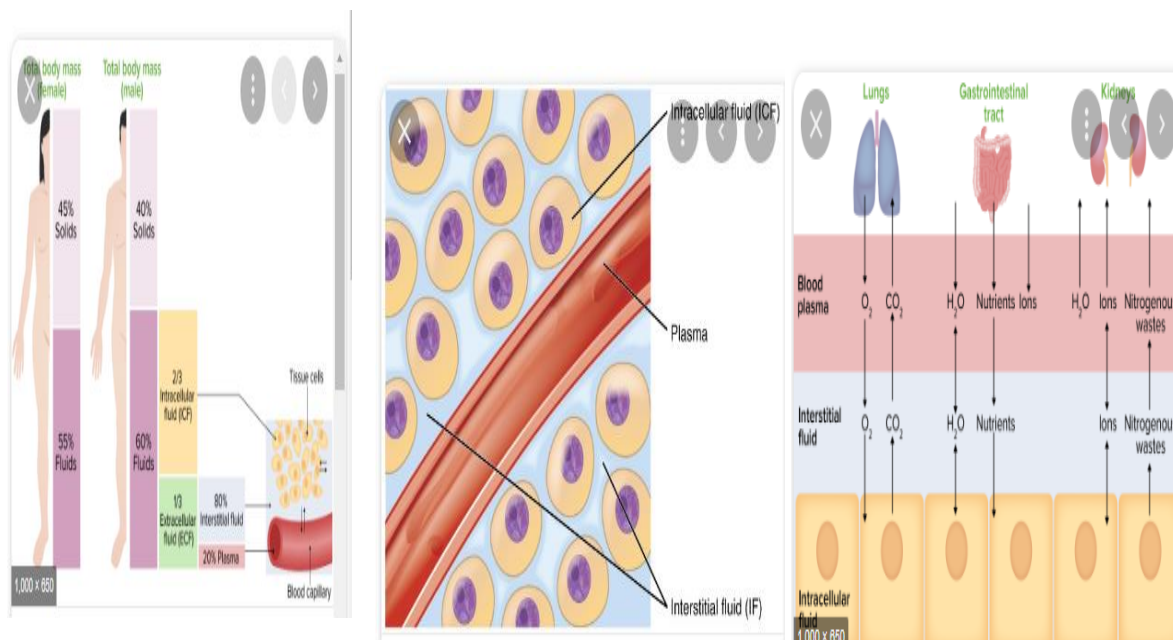


Figure 1.3: Figure showing body fluid compartments

Mechanisms of Absorption of nutrients

Passive transport

Simple diffusion: Movement of a substance through a biological barrier from the phase of higher concentration to phase of lower concentration. E.g, Highly lipid soluble substances

Filtration: The process by which water soluble drugs of relatively low molecular weight cross the plasma membrane through pores as a result of hydrodynamic pressure gradient across the membrane

Specialized transport

Special carrier molecules exist for certain substances that are important for cell function and **too large or too insoluble in lipid** to diffuse passively through membranes. E.g, Peptides, Amino acids, Glucose, Albumin

Facilitated diffusion (carrier mediated diffusion) :

The passage of substances across the biological membrane along the concentration gradient by the protein carrier mediated system

Active transport

The process by which drugs pass across the biological membrane against their concentration gradient with help of carriers along with the expenditure of energy

Endocytosis

The process by which large molecules are engulfed by the cell membrane releases them intracellular. E.g Toxins

Removal of waste products

Waste materials/products that are either ingested or produced by metabolism should be removed from the body.

Those unwanted substance or material is removed from our body by different means, among these the kidney is the most responsible organ.

Kidney clear unwanted substances from blood by filtrating and excreting them in the urine while, returning substances that are needed back to the blood

- ✓ Waste materials can also eliminated from our body through;
- ✓ Gastro intestinal tract in the form of feces
- ✓ Liver – by detoxification and removal of many toxin chemicals including drugs which is later secreted in to bile and finally eliminated in the feces.
- ✓ The skin in the form of sweat
- ✓ The lung in the form of mucus

Structure and Functions of Musculoskeletal System

The musculoskeletal system is made up of bones, cartilage, ligaments, tendons and muscles, which form a framework for the body. Tendons, ligaments and fibrous tissue bind the structures together to create stability, with ligaments connecting bone to bone, and tendons connecting muscle to bone. There are 206 bones in the adult skeleton; male and female skeletons are almost the same, but the female skeleton has a broader pelvis to accommodate childbirth and the male skeleton is typically taller with greater bone density. The skeleton is divided into the:

Axial skeleton: Comprising the skull, vertebral column and the rib cage;

Appendicular skeleton: Consisting of the pelvic and pectoral girdles, and the upper and lower limbs.

Coordinated movement is made possible through the combination of purposeful and synchronized movements across the relevant muscles and bones to create articulation of the joints. The configuration of the joint surface determines the movement possible. Planes of movement include flexion, extension, abduction, adduction, rotation and circumduction.

The word skeleton comes from the Greek word skeleton meaning “dried up”. It is strong yet light adapted for its function of body protection and motion. The skeletal system includes bones, joints, cartilages and ligaments. The joint give the body flexibility and allow movements to occur. But from structural point of view, the human skeletal system consists of two main types of supportive connective tissue, bone and cartilage.

Functions of the skeletal system

Support: it forms the internal framework that supports and anchors all soft organs

Protection: bones protect soft body organs

Movement: skeletal muscles attached to the skeletal system use the bone to levers to move the body and its part

Storage: Minerals and fat is stored in the internal cavities of bones

Blood cell formation: it occurs within the marrow cavities of certain bones

Bone

Bone: It is specialized connective tissue that has the strength of cast iron and lightness of pinewood. Living bone is not dry, brittle or dead. It is a moist changing, productive tissue that is continually resorbed, reformed and remodeled.

Types of Bone

- ✓ Long bone
- ✓ Short bone
- ✓ Flat bones
- ✓ Irregular bones

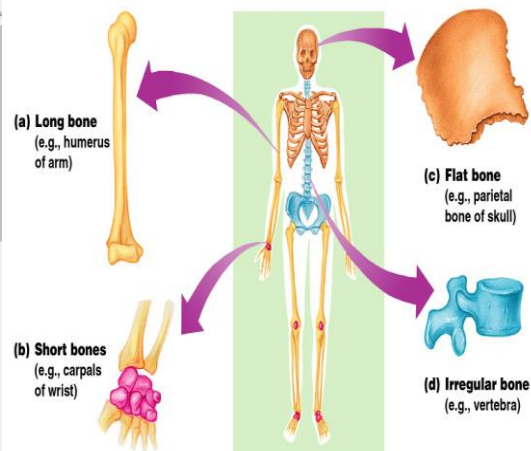


Figure 1.4: Figure Showing types of bone

A. Long Bones

- ✓ Typically longer than wide
- ✓ Have a shaft with heads at both ends
- ✓ Contain mostly compact bone
- ✓ Examples: Femur, humerus

B. Short Bones

- ✓ Generally cube-shape
- ✓ Contain mostly spongy bone
- ✓ Examples: Carpals, tarsals

. Flat Bones

- ✓ Thin and flattened
- ✓ Usually curved
- ✓ Thin layers of compact bone around a layer of spongy bone
- ✓ Examples: Skull, ribs, sternum

Irregular bones

- ✓ Irregular shape
- ✓ Do not fit into other bone classification categories
- ✓ Example: Vertebrae and hip

Changes in the Human Skeleton

- In embryos, the skeleton is primarily hyaline cartilage
- During development, much of this cartilage is replaced by bone
- Cartilage remains in isolated areas
 - Bridge of the nose
 - Parts of ribs
 - Joints

Bone Growth

Epiphyseal plates allow for growth of long bone during childhood

- ✓ New cartilage is continuously formed

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- ✓ Older cartilage becomes ossified

Bones are remodeled and lengthened until growth stops

- ✓ Bones change shape somewhat
- ✓ Bones grow in width

Types of Bone Cells

Osteocytes: Mature bone cells

Osteoblasts: Bone-forming cells

Osteoclasts: Bone-destroying cells. Break down bone matrix for remodeling and release of calcium. Bone remodeling is a process by both osteoblasts and osteoclasts.

Skeletal Classification

There are 206 named bones in the human body.

Each belongs to one of 2 large groups:

Axial skeleton

- ✓ Forms long axis of the body.
- ✓ Includes the bones of the skull, vertebral column, and rib cage.
- ✓ These bones are involved in protection, support, and carrying other body parts.

Appendicular skeleton

- ✓ Bones of upper & lower limbs and the girdles (shoulder bones and hip bones) that attach them to the axial skeleton.
- ✓ Involved in locomotion and manipulation of the environment.

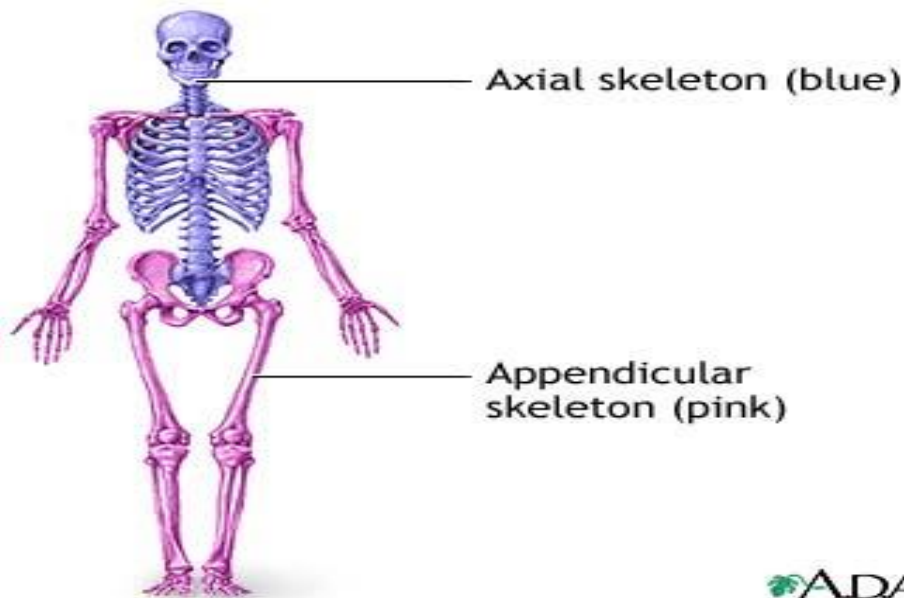


Figure 1.5: Figure Showing types of bone

The Axial Skeleton

- Forms the longitudinal part of the body
- There are 80 bones in the axial skeleton
- Divided into three parts
 - Skull
 - Vertebral column
 - Bony thorax

The Skull

- Two sets of bones
 - ✓ Cranium(eight cranial bones)
 - ✓ Facial bones(fourteen facial bones)
- Bones are joined by sutures
- Only the **mandible** is attached by a freely movable joint

The Skull

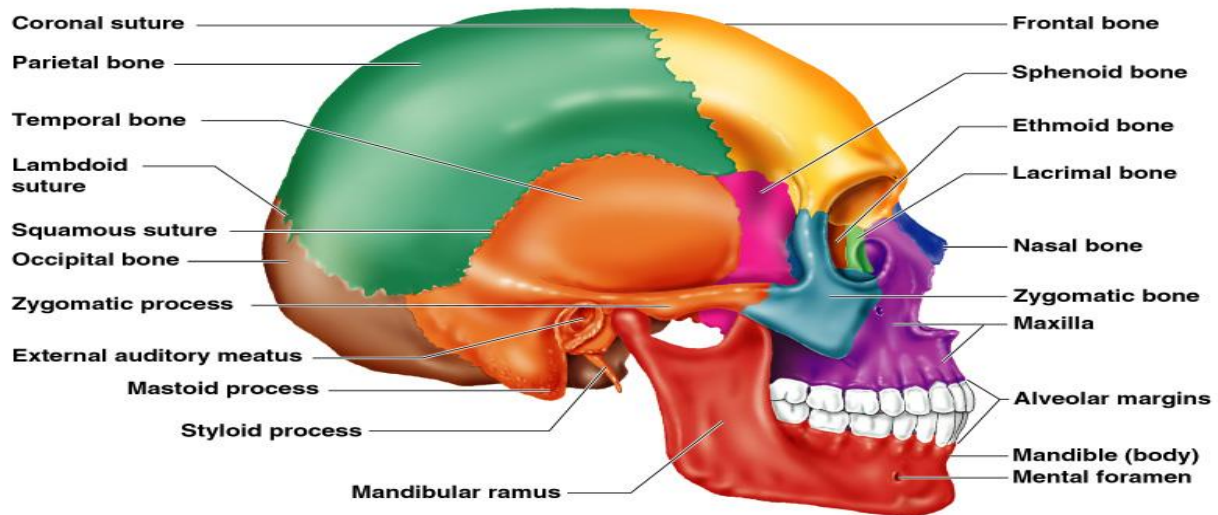


Figure 1.6: Figure Showing skull bone

Cranium- 8 bones

- ✓ **Ethmoid (1)** Base of cranium, anterior to body of sphenoid.
- ✓ **Frontal (1)** Anterior and superior parts of cranium, forehead, brow areas.
- ✓ **Occipital (1)** Posterior part of cranium, including base.
- ✓ **Parietal (2)** Superior sides and roof of cranium, between frontal and occipital bones.
- ✓ **Sphenoid (1)** Base of cranium, anterior to occipital and temporal bones.
- ✓ **Temporal (2)** Sides and base of cranium at temples.

✓ **Bones of the Skull**

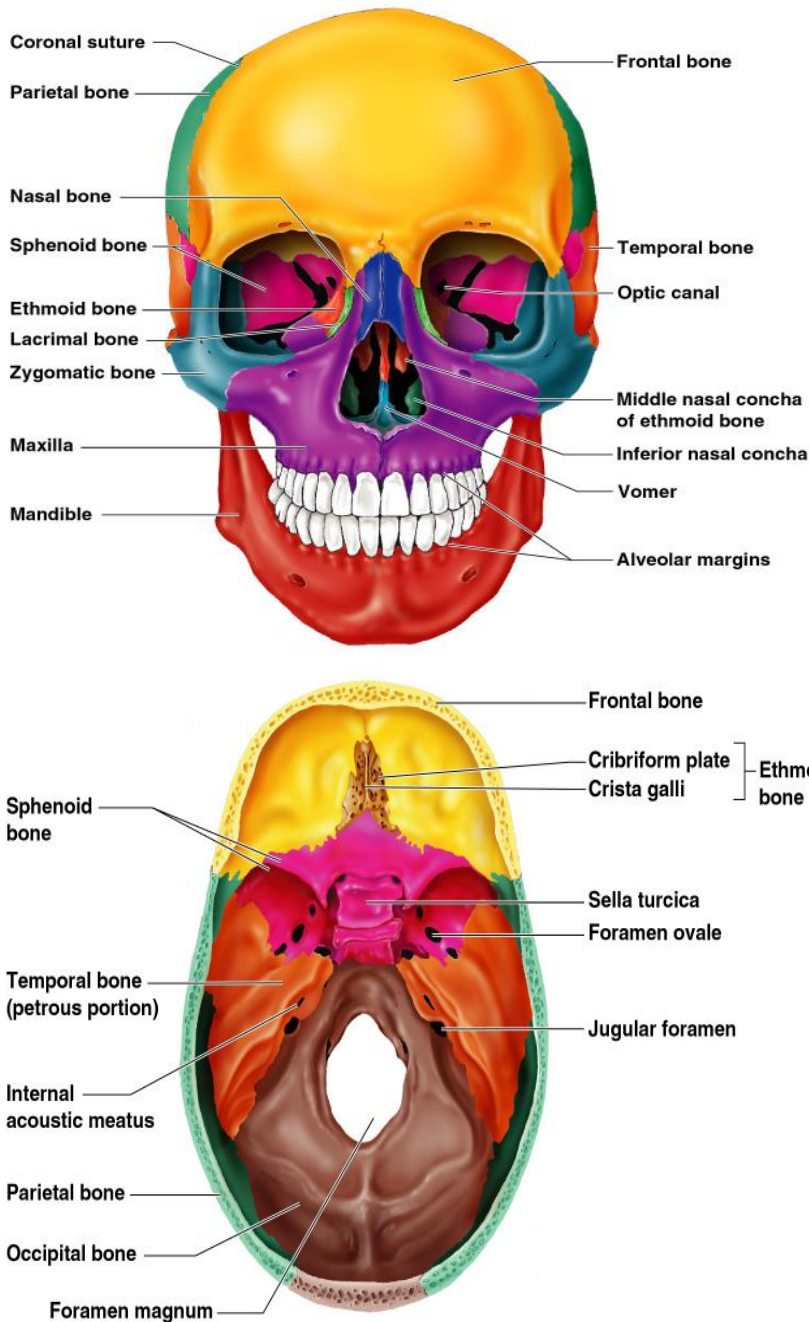


Figure 1.7: Figure Showing cranial bone
Facial bones (fourteen facial bones)

Inferior nasal Lateral walls of nasal cavities, below superior and middle

Conchii (2) conchae of Ethmoid bone. Thin, cancellous, shaped like curved leaves.

Lacrimal (2) Medial wall of orbit, behind frontal process of maxilla.

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Mandible (1) Lower jaw, extending from chin to mandibular fossa of temporal bone.

Maxillae (2) Upper jaw and anterior part of hard palate

Nasal (2) Upper bridge of nose between frontal processes of maxillae.

Palatine (2) Posterior part of hard palate, floor of nasal cavity and orbit.

Vomer (1) Posterior and inferior part of nasal septum.

Zygomatic (2) Cheekbones below and lateral to orbit.

Hyoid(1) Below root of tongue, above larynx.

Ossicles of ear (6) Inside cavity of petrous portion of temporal bone. These are Incus(2), malleus (2) and stapes (2)

Sutures

- ✓ Meaning to stitch, are immovable joint found between skull bones.
- ✓ There are four main sutures in the skull.

Coronal suture: between the frontal & the two-parital bone.

Sagittal suture: between the two parietal bones.

Lambdoidal suture: between parietal & occipital bone.

Squamosal suture: between parietal bone and temporal bone.

Paranasal Sinuses

- Hollow portions of bones surrounding the nasal cavity

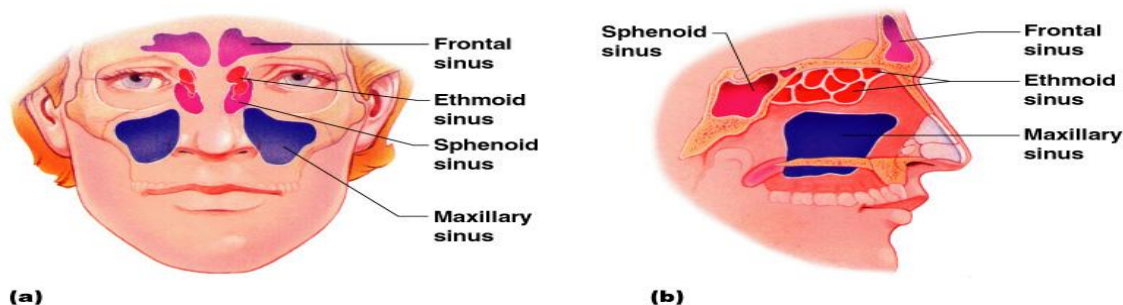


Figure 1.8: Figure Showing nasas bone

- Functions of paranasal sinuses
 - Lighten the skull
 - Give resonance and amplification to voice

The Hyoid Bone

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- The only bone that does not articulate with another bone
- Serves as a moveable base for the tongue



Figure 1.9: Figure Showing hyoid bone

The Fetal Skull

- The fetal skull is large compared to the infants total body length

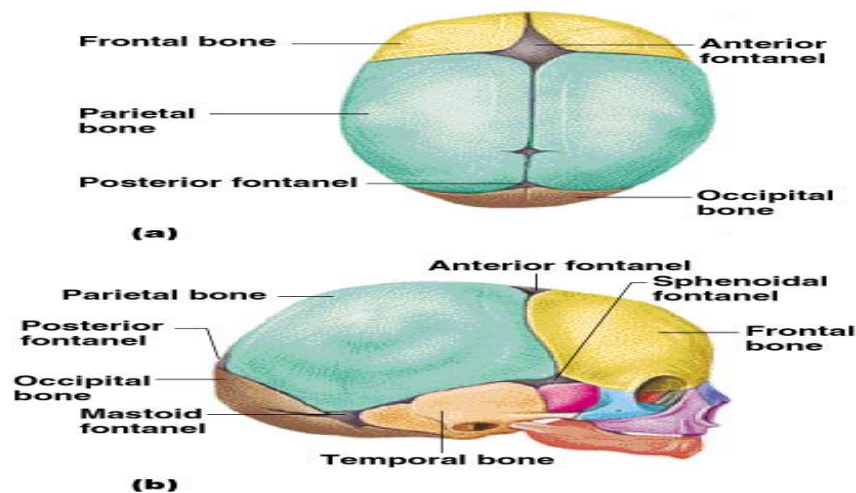


Figure 1.10: Figure Showing frontal skull bone

- **Fontanelles** – fibrous membranes connecting the cranial bones
 - ✓ Allow the brain to grow
 - ✓ Convert to bone within 24 months after birth

Function of Fontanelles

- ✓ They enable skull of the fetus to compress as it pass through the birth canal
- ✓ Permit rapid growth of brain during infancy
- ✓ Serves as a landmark (anterior fontanel) for withdrawal of blood from the superior sagittal sinus

- ✓ Aid in determination of fetal position prior to birth.
- ✓ In the skull of the fetus there are 6 prominent fontanel:

The Anterior (frontal) fontanel, between angle of two parietal bones & segment of the frontal bone.

It is diamond shaped and is the largest fontanel.

It closes 18 to 24 months after birth.

The posterior (occipital) fontanel, between parietal & occipital bone.

It is also diamond shaped but smaller than the anterior fontanel.

It closes 2 months after birth

The Antrolateral (sphenoidal) fontanel, they are pair, one in each side.

Found at the junction of frontal, parietal, temporal & sphenoidal bone.

They are small & irregular in shape and closes at 3rd month after birth.

The postrolateral (mastoid) fontanel, Paired one in each side.

Found at the junction of parietal, occipital and temporal bones.

They are irregular in shape and begin to close at 1 or 2 months after birth and completed by 12 months.

The Vertebral Column

- Vertebrae separated by intervertebral discs
- The spine has a normal curvature
- Each vertebrae is given a name according to its location

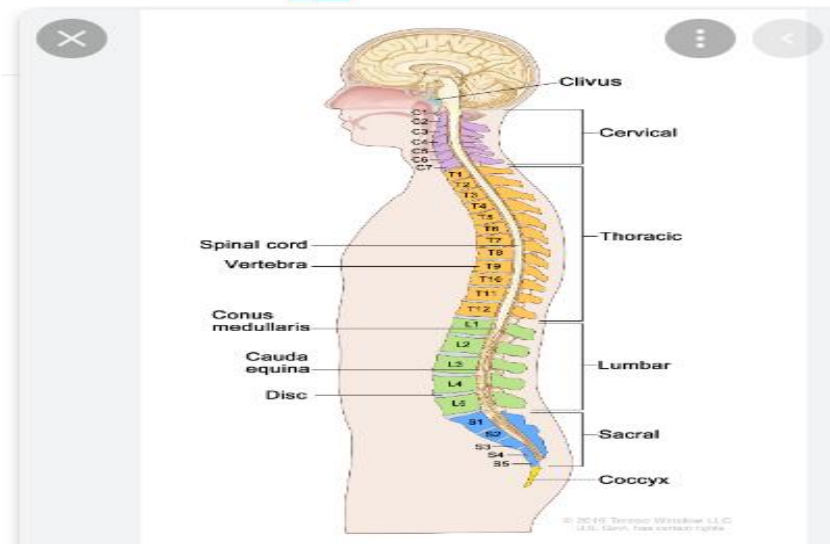


Figure 1.11: Figure Showing vertebral column

The vertebral column consists.

- ✓ **7 cervical** vertebrae
- ✓ **12 thoracic** vertebrae
- ✓ **5 lumbar** vertebrae

The **bony thorax** forms a cage to protect major organs

In a child there are 33 separate vertebrae, the 9 in the sacrum and coccyx not yet being fused.

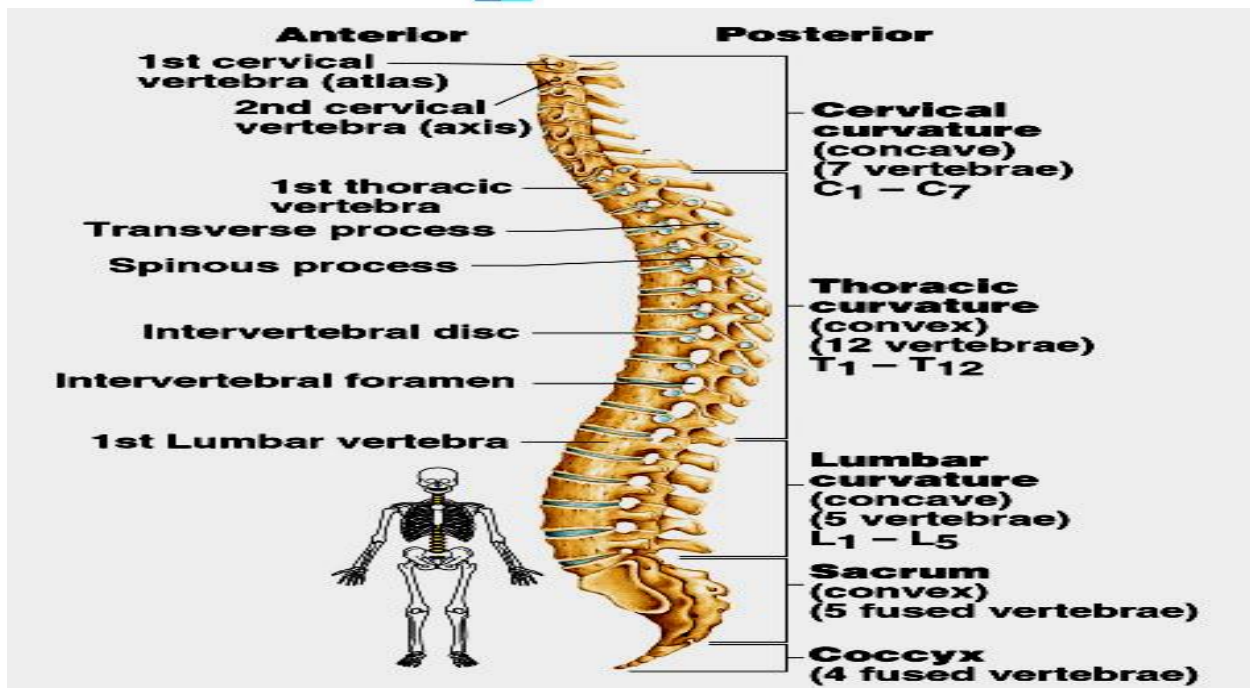


Figure 1.12: Figure Showing vertebral column

The Bony Thorax

- Forms a cage to protect major organs
- Made-up of three parts
 - ✓ Sternum
 - ✓ Ribs
 - ✓ Thoracic vertebrae

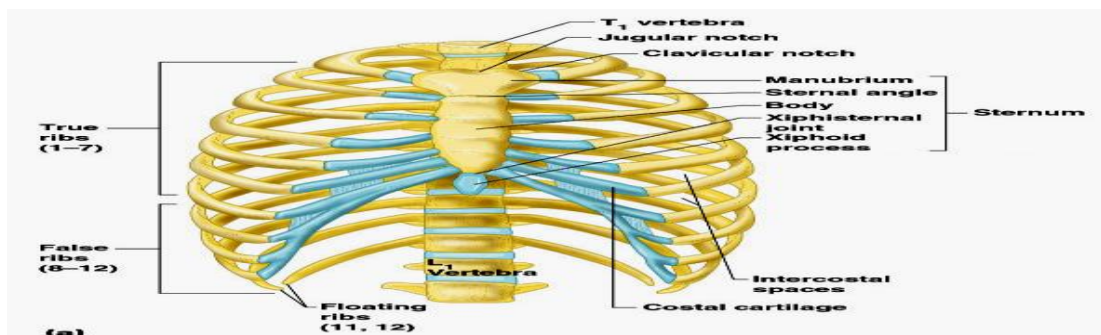


Figure 1.13: Figure Showing thoracic bone

Sternum (breast bone)

- Sternum is flat, narrow bone measuring about 15 c.m. (6 inch) located in the median line of anterior thoracic wall.
- It consists 3 basic portions:
 - ✓ The **manubrium** (superior portion),
 - ✓ The **body** (middle & largest portion) and
 - ✓ The **xiphoid process** (inferior & smallest portion).
- The junction of the manubrium and the body forms the **sternal angle**.

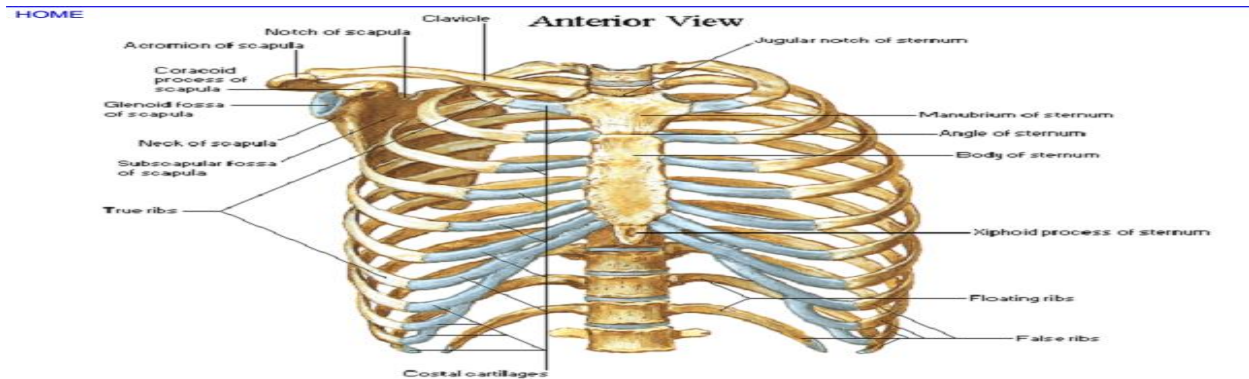


Figure 1.14: Figure Showing thoracic bone

The Appendicular Skeleton

- There are 126 bones in the Appendicular Skeleton.
- Consists of 3 parts
 - 1) Limbs (appendages) - 120 bones
 - Upper limb - 60 bones
 - Lower limb - 60 bones
 - 2) Pectoral girdle (shoulder) - 4 bones
 - 3) Pelvic girdle (pelvis) - 2 bones

The Appendicular Skeleton

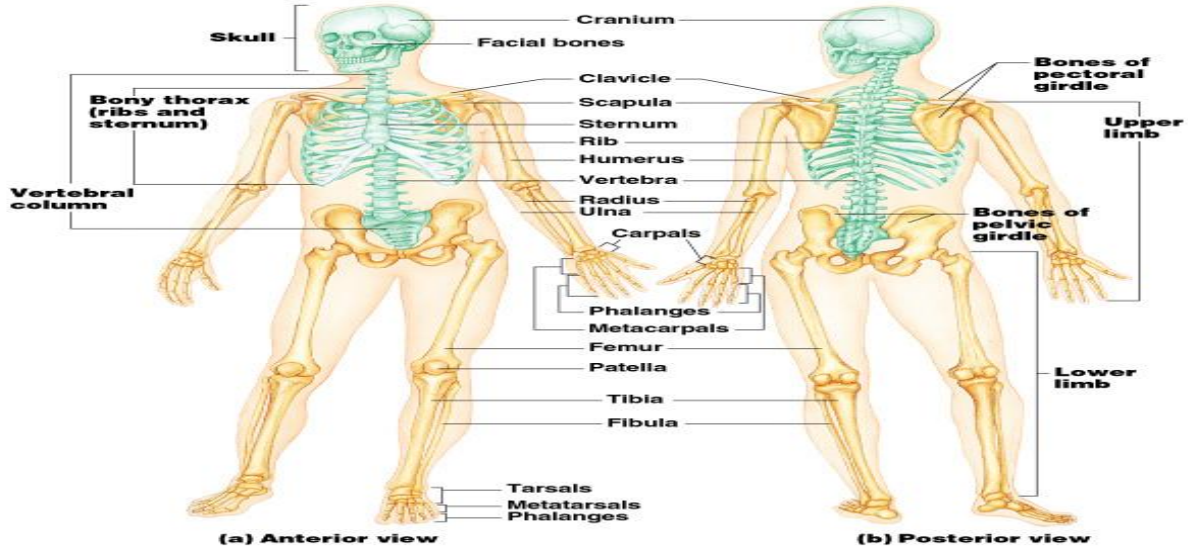


Figure 1.15: Figure Showing Appendicular Skeleton

The Pectoral (Shoulder) Girdle

- Composed of two bones
 - ✓ Clavicle (2 bones) – collarbone
 - ✓ Scapula (2 bones) – shoulder blade
- These bones allow the upper limb to have exceptionally free movement

Bones of the Shoulder Girdle

Clavicle (2)

- Collarbone; double-curved, long bone with rounded medial end and flattened lateral end; held in place by ligaments.
- Holds shoulder joint and arm away from thorax so upper limb can swing freely.

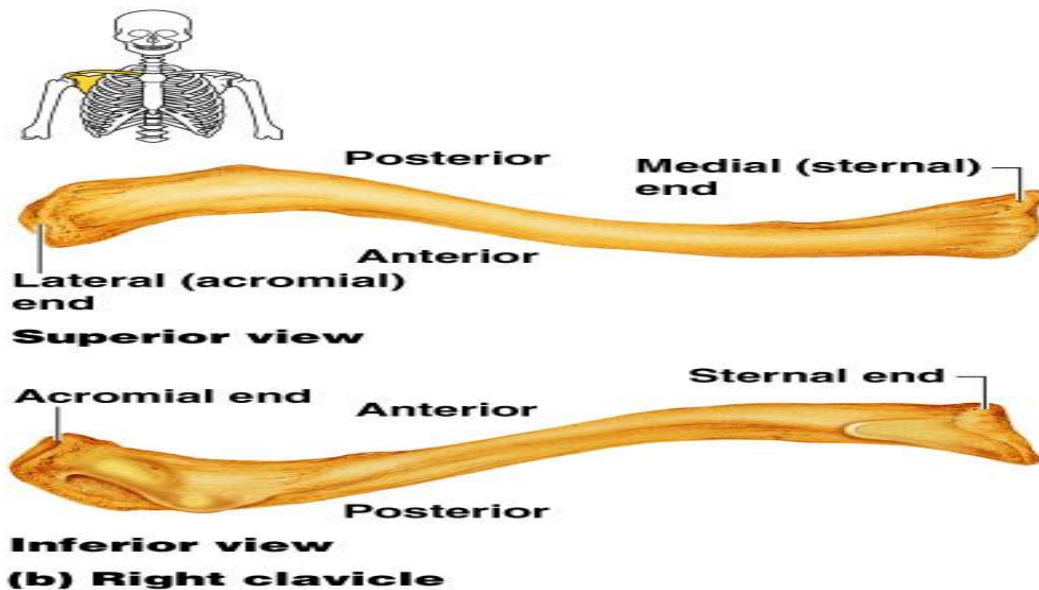


Figure 1.16: Figure Showing Bones of the Shoulder Girdle

Scapula (2)

Shoulder blade; flat, triangular bone with horizontal spine separating fossae.

Site of attachment for muscles of arm and chest.

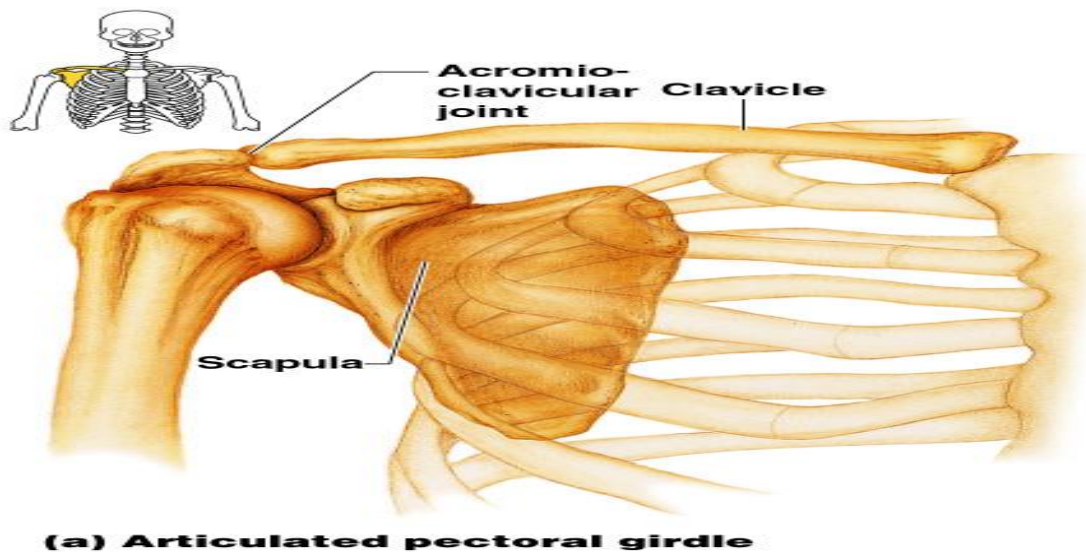


Figure 1.17: Figure Showing scapular bones

Bones of the Upper Limb - Arm

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- The **arm** is formed by a single bone
 - ✓ Humerus (2)
- Longest, largest bone of upper limb; forms ball and socket joint with glenoid fossa of scapula.
- Permits the arm to flex and extend at elbow

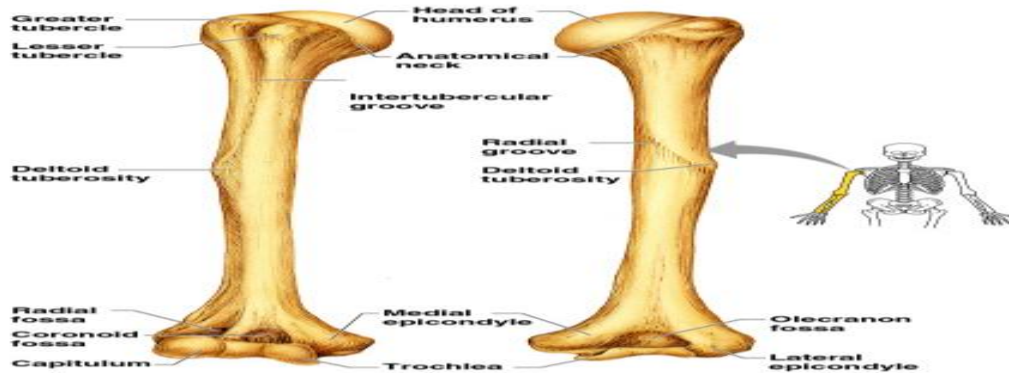


Figure 1.18: Figure Showing bones of the upper limb

Bones of the Upper Limb - Forearm

- The **forearm** has two bones
 - Ulna
 - Radius
- **Radius** Larger of two bones in forearm large proximal end consists of olecranon process (prominence of elbow).

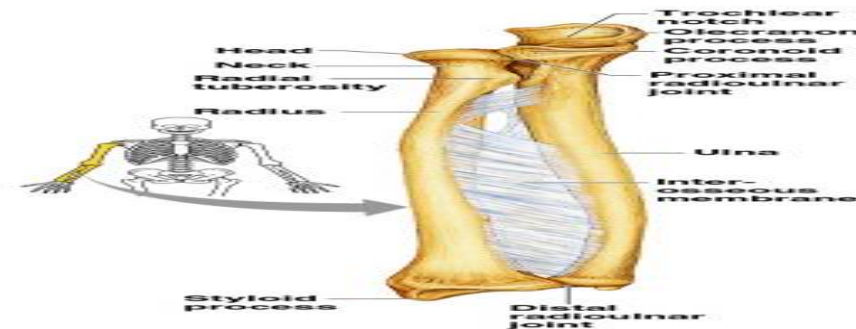


Figure 1.19: Bones of the Upper Limb- The hand

Bones of the Upper Limb- The hand

- The hand
 - Carpals – wrist

- Metacarpals – palm
- Phalanges – fingers

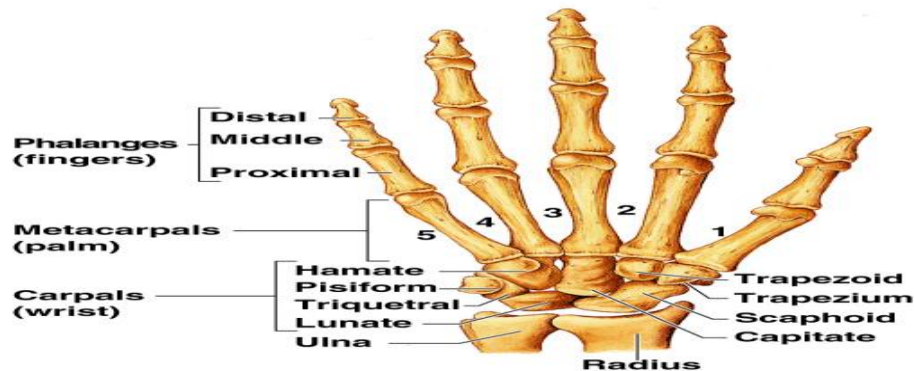


Figure 1.20: Bones of the Upper Limb- The hand

- **Carpals (16)** Small short bones; in each wrist, 8 carpals in 2 transverse rows of 4.
- with attached ligaments, allow slight gliding movement.
- **Metacarpals (10)** Five miniature long bones in each hand in fanlike arrangement; articulate with fingers at metacarpophalangeal joint (the Knuckle).
- **Phalanges (28)** Miniature long bones, 2 in each thumb, 3 in each finger; articulate with each other at interphalangeal joint.

Allow fingers to participate in stable grips

Bones of the Pelvic Girdle

- Hip bones
- Composed of three pair of fused bones
 - Ilium
 - Ischium
 - Pubic bone
- The total weight of the upper body rests on the pelvis
- Protects several organs
 - Reproductive organs
 - Urinary bladder
 - Part of the large intestine

The Pelvis

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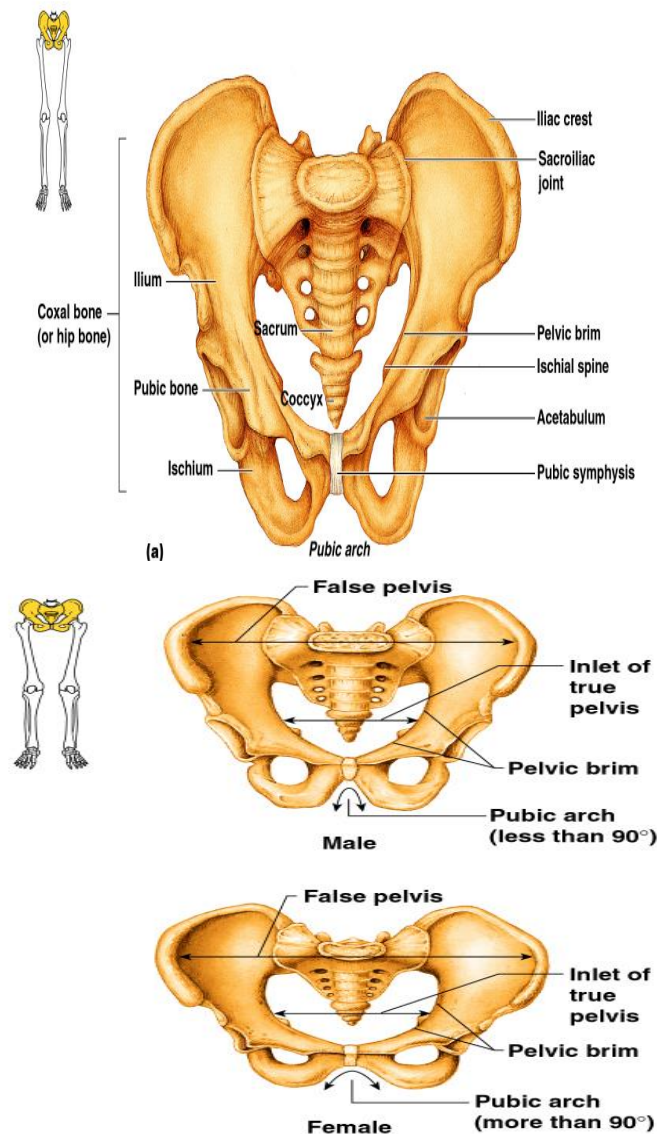


Figure 1.21: Figure showing Pelvic Bone

Bones of the Lower Limbs- The thigh

- **The thigh** has one bone **Femur** (thigh bone)
- Typical long bone; longest, strongest, heaviest bone;
- Forms ball of ball-and-socket joint with pelvic bones;
- provides articular surface for knee. Supports body.

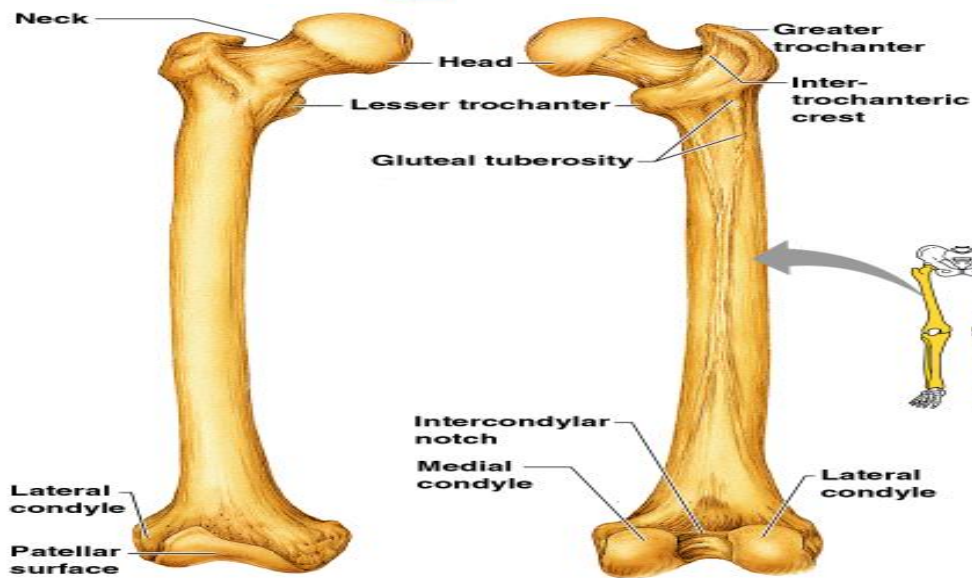


Figure 1.22: Figure showing Bones of the Lower Limbs

Patella (2)

Patella – Kneecap sesamoid bone within quadriceps femoris tendon.

Increases leverage for quadriceps muscle by keeping tendon Away from axis of rotation.

Bones of the Lower Limbs- The leg

- **The leg** has two bones
 - **Tibia;** Smaller long bone of lower leg; articulates proximally with tibia and distally with talus.
 - **Fibula;** Larger long bone of lower leg; articulates with femur fibula, talus.

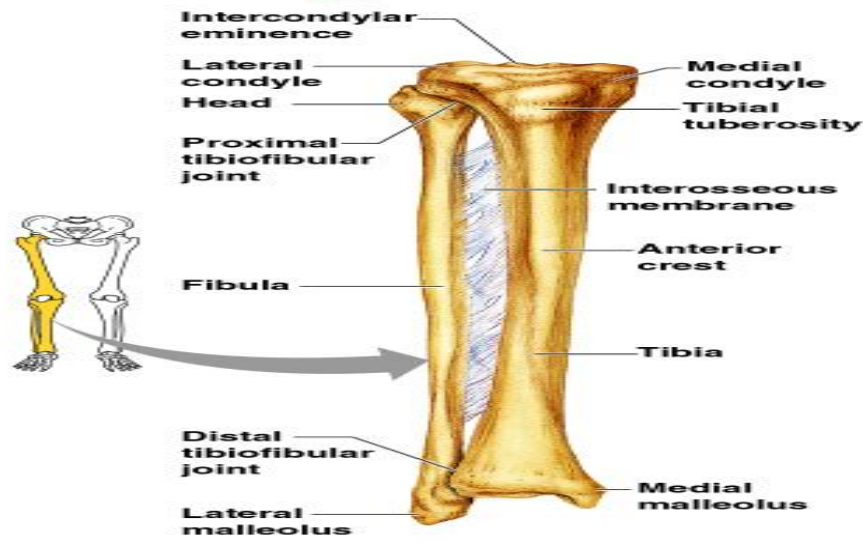


Figure 1.23: Figure showing Bones of the Lower Limbs

Bones of the Lower Limbs- The foot

- **The foot** consists of
 - **Tarsus** – ankle; Bear body weight; raise body and transmit thrust during running and walking.
 - **Metatarsals** – sole; Improve stability while standing; absorb shocks; bear weight; aid in locomotion.

Phalanges– toes; Provide stability during locomotion

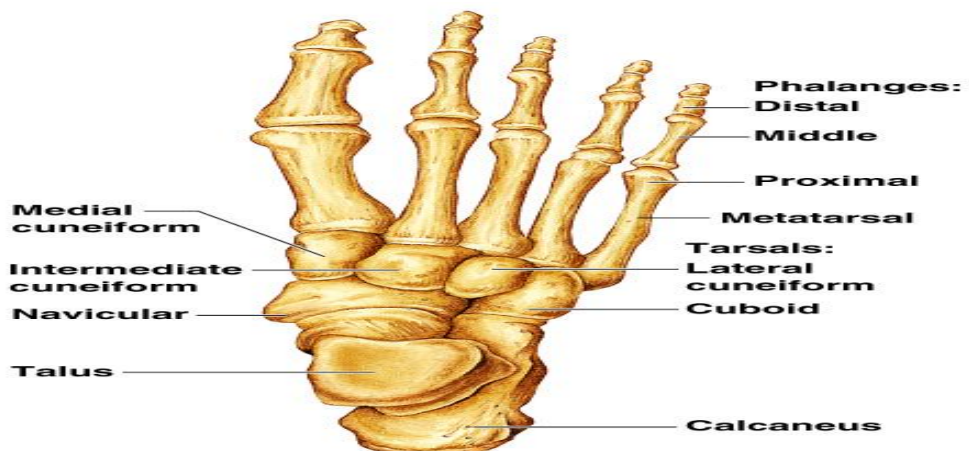


Figure 1.24: Figure showing Bones of the Lower Limbs

- **Tarsals (14)** Ankle, heel bones; short bones; 7 in each ankle including talus, calcaneus, cuboid, navicular, 3 cuneiforms; with metatarsals, form arches of foot.

- **Metatarsals (10)** Miniature long bones; 5 in each foot; form sole; with tarsal, form arches of feet.
- **Phalange (28)** Toes; miniature long bones; 2 in each big toe, 3 in each other toe; arranged as in hand.

With its highly engineered joints, the living skeleton is intimately connected with the muscular system. It provides a framework of stiff levers and stable plates that permits a multitude of movements. The skeleton also integrates functionally with the cardiovascular system as every second, millions of fresh blood cells pour out of the bone marrow. A healthy diet that provides enough minerals, especially calcium, along with regular moderate exercise, can reduce the risks of many bone and joint disorders

The skeleton makes up almost one-fifth of a healthy body's weight.

This flexible inner framework supports all other parts and tissues, which would collapse without skeletal reinforcement. It also protects certain organs, such as the delicate brain inside the skull. Bones are reservoirs of important minerals, especially calcium, and also make new cells for the blood. About one person in 20 has an extra rib. Bone is an active tissue, and even though it is about 22 per cent water, it has an extremely strong yet lightweight and flexible structure. A similar frame made of high-technology composite materials could not match the skeleton's weight, strength, and durability. It's as strong as steel but light as aluminum. It can repair itself if damaged and can remodel its bones to thicken and strengthen them in areas of extra stress, when persons do extreme sports.

Interactions between the Skeleton, Muscles, and Nerves Move the body

How does the skeleton move? Muscles throughout the human body are attached to bones. Nerves around a muscle can signal the muscle to move. When the nervous system sends commands to skeletal muscles, the muscles contract. That contraction produces movement at the joints between bones.

Joints

- Articulations of bones
- Functions of joints
 - ✓ Hold bones together
 - ✓ Allow for mobility

- Ways joints are classified
 - ✓ Functionally
 - ✓ Structurally

Functional Classification of Joints

- **Synarthroses:** Immovable joints. e.g. Sutures, Teeth, Epiphyseal plates,
- **Amphiarthroses:** Slightly moveable joints e.g. Intervertebral discs
- Pubic symphysis
- **Diarthroses** – freely moveable joints. e.g. Glenohumeral joint, Knee joint

Structural Classification of Joints

- Fibrous joints (Immovable)
- Cartilaginous joints (Immovable or slightly moveable)
- Synovial joints (Freely moveable)

Table 2.1: Joints by Structural Classification

Structure	Type	Example
Cartilagenous	Synchondrosis Symphysis	Epiphyseal plates Intervertebral discs
Fibrous	Sutures Syndesmosis Gomphosis	Skull Distal Tibia/fibula Teeth in sockets
Synovial		Glenohumeral joint Knee joint TMJ

Bones united by fibrous tissue – synarthrosis or largely immovable.

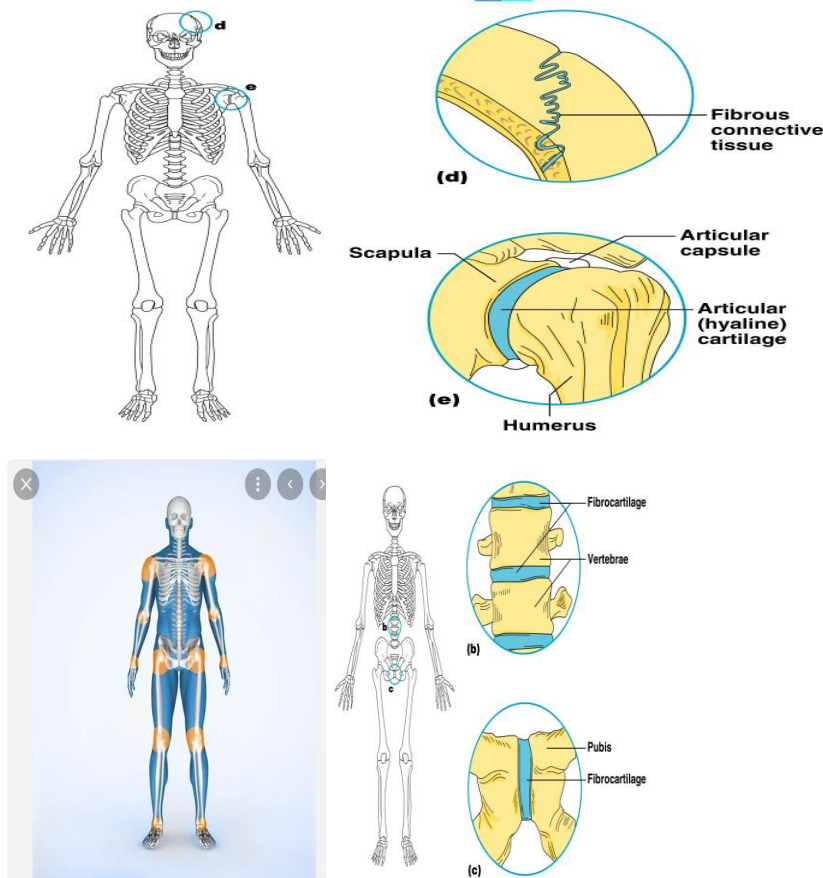


Figure 1.25: Figure showing different types of Joints

Cartilaginous Joints – mostly amphiarthrosis

- Bones connected by cartilage
- Examples
 - Pubic symphysis
 - Intervertebral joints

Figure 2.24: Figure showing different types of Joints

Synovial Joints

- Articulating bones are separated by a joint cavity
- Synovial fluid is found in the joint cavity

Features of Synovial Joints- Diarthroses

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- Articular cartilage (hyaline cartilage) covers the ends of bones
- Joint surfaces are enclosed by a fibrous articular capsule
- Have a joint cavity filled with synovial fluid
- Ligaments reinforce the joint

Structures Associated with the Synovial Joint

- Bursae – flattened fibrous sacs
 - ✓ Lined with synovial membranes
 - ✓ Filled with synovial fluid
 - ✓ Not actually part of the joint
- Tendon sheath
 - ✓ Elongated bursa that wraps around a tendon

The Synovial Joint

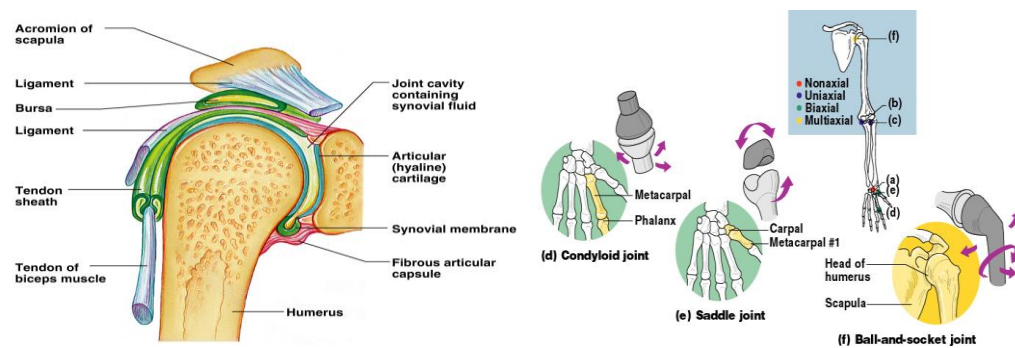


Figure 1.26: Figure showing Synovial Joint

Types of synovial joint: by shape

A. Plane: articular surface in flat plane with short gliding movement ((eg) intertarsal, articular processes of vertebrae)

B. Hinge: cylindrical end of one bone fits into **trough shape** of other end. Allow Angular movement-one plane (eg) elbow, ankle, interphalangeal

C. Pivot: round end fits into ring of bone + ligament

- ✓ Rotation on long axis (eg) proximal radio-ulna, atlanto-axial joint)

Types of Synovial Joints Based on Shape

D. Condylloid: egg-shape articular surface + oval concavity

- ✓ side-to-side, back+forth movement (eg) metacarpophalangeal (knuckle)

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E. Saddle: articular surface both concave + convex

- ✓ side-to-side, back-forth movement (eg) carpometacarpal joint of thumb

F. Ball + Socket: spherical head + round socket

- ✓ Multiaxial movement (eg) shoulder, femur

Muscle

The muscular system is composed of specialized cells called muscle fibers. Their predominant function is contractibility. Muscles, attached to bones or internal organs and blood vessels, are responsible for movement. Nearly all movement in the body is the result of muscle contraction.

Functions of the Muscular System

Producing movement is a common function of all muscle types, but skeletal muscle plays three other important roles in the body as well.

- I. **Producing movement.** Mobility of the body as a whole reflects the activity of the skeletal muscles, which are responsible for all locomotion; they enable us to respond quickly to changes in the external environment.
- II. **Maintaining posture.** We are rarely aware of the skeletal muscles that maintain body posture, yet they function almost continuously, making one tiny adjustment after another so that we can maintain an erect or seated posture despite the never-ending downward pull of gravity.
- III. **Stabilizing joints.** As the skeletal muscles pull on **bones** to cause movements, they also stabilize the joints of the skeleton; muscle tendons are extremely important in reinforcing and stabilizing joints that have poorly fitting articulating surfaces.
- IV. **Generating heat.** The fourth function of muscle, generation of body heat, is a by-product of muscle activity; as ATP is used to power muscle contraction, nearly three-quarters of its energy escape as heat and this heat is vital in maintaining normal body temperature.

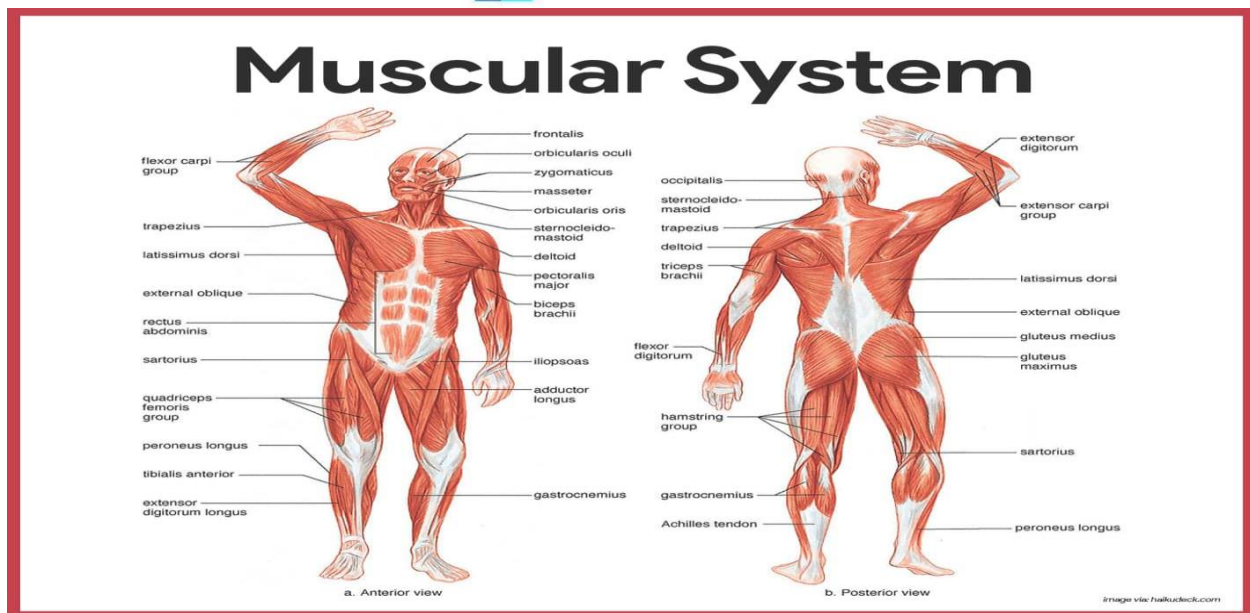


Figure 1.27: Figure showing Muscular System

Characteristics of Muscles

- Muscle cells are elongated (muscle cell = muscle fiber)
- Contraction of muscles is due to the movement of microfilaments
- All muscles share some terminology
 - ✓ Prefix myo refers to muscle
 - ✓ Prefix mys refers to muscle
 - ✓ Prefix sarco refers to flesh

Functional Characteristics of Muscle Tissue

- **Excitability**, also termed responsiveness or **irritability**, is the ability to receive and respond to a stimulus,
- **Contractility** is the ability to shorten forcibly when adequately stimulated.
- **Extensibility** is the ability to be stretched or extended.

Elasticity is the ability of a muscle fiber to recoil and resume its resting length after being stretched.

3 Types of muscles

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- Body movements are determined by three types of muscles

A. Smooth (involuntary) – cannot be controlled by will

B. Cardiac – control the contractions of the heart.

C. Skeletal (Voluntary) – can be controlled by will.

Skeletal Muscle Characteristics

- Most are attached by tendons to bones
- Cells are multinucleate
- Striated – have visible banding
- Voluntary – subject to conscious control
- Cells are surrounded and bundled by connective tissue = great force, but tires easily

Muscle structure

A. Connective Tissue Component

- A skeletal muscle is an organ composed mainly of striated muscle cells and connective tissue. Each skeletal muscle has two parts; the connective tissue sheath that extend to form specialized structures that aid in attaching the muscle to bone and the fleshy part the **belly** or **gaster**. The extended specialized structure may take the form of a cord, called a **tendon**; alternatively, a broad sheet called an **aponeurosis** may attach muscles to bones or to other muscles, as in the abdomen or across the top of the skull.
- A connective tissue sheath called **facia** surrounds and separates muscles (Figure 6-1). Connective tissue also extends into the muscle and divides it into numerous **muscle bundles** (fascicles). There are three connective tissue components that cover a skeletal muscle tissue. These are:
 1. Epimysium: a connective tissue sheath that surrounds and separates muscle.
 2. Perimysium: a connective tissue that surrounds and holds fascicles together.
 3. Endomysium: a connective tissue that surrounds each muscle fibre.

Muscle contractions

- The thick myofilaments are composed of a protein called myosin. Each myosin filament has small regular projections known as **cross bridges**.

- The cross bridges lie in a radial fashion around the long axis of the myofilaments. The rounded heads of the cross bridges lie in opposition to the thin myofilaments.
- The thin myofilaments are composed of a complex protein called actin, arranged in a double stranded coil.
- The actin filaments also contain two additional proteins called **troponin** and **tropomyosin**.

Energy Requirements for Muscle Contraction

- Contraction of skeletal muscle requires adenosine triphosphate (ATP).
- The ATP releases energy when it breaks down to adenosine diphosphate (ADP) and a phosphate (P), some of the energy is used to move the cross bridges and some of the energy is released as heat.
- $ATP \rightarrow ADP + P + \text{Energy (for crossbridge movement)} + \text{Heat}$
- The ATP required for muscle contraction is produced primarily in numerous mitochondria located within the muscle fibres. Because ATP is a very short-lived molecule and rapidly degenerates to the more stable ADP, it is necessary for muscle cells to constantly produce ATP.

Types of muscle contraction

- Muscle contractions are classified as either isotonic or isometric.
- In **isotonic contractions**, the amount of tension produced by the muscle is constant during contraction, but the length of the muscle changes; for example, movement of the fingers to make fist.
- In **isometric contractions**, the length of the muscle does not change, but the amount of tension increases during the contraction process. Clenching the fist harder and harder is an example. Most movements are a combination of isometric and isotonic contractions.
- For example, when shaking hands, the muscles shorten some distance (isotonic contractions) and the degree of tension increases (isometric contractions).

Naming skeletal muscles

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Most of the skeletal muscles are named according to one or more of the following basis:

1. Direction of muscle fibres relative to the midline of the body or longitudinal axis of a structure

Rectus means the fibres run parallel to the midline of the body or longitudinal axis of a structure. Example, rectus abdominis

Transverse means the fibres run perpendicular to the midline longitudinal axis of a structure.

Example,

transverse abdominis

Oblique means the fibres run diagonally to the midline longitudinal axis of a structure.

Example, external oblique

2. Location—structure to which a muscle is found closely related

Example: Frontal, a muscle near the frontal bone Tibialis anterior, a muscle near the front of tibia

3. Size—relative size of the muscle

✓ **Maximus** means largest. Example, gluteus maximus

✓ **Minimus** means smallest. Example, gluteus minimus

✓ **Longus** means longest. Example, Adductor longus

✓ **Brevis** means short. Example, Peroneus brevis

4. Number of origins—number of tendons of origin Biceps means two origins. Example, biceps brachii Triceps means three origins. Example, triceps brachii Quadriceps means four origins. Example, quadriceps femoris

5. Shape—relative shape of the muscle

✓ **Deltoid** means triangular. Example, deltoid

✓ **Trapezius** means trapezoid. Example, trapezius

✓ **Serratus** means saw-toothed. Example serratus anterior

✓ **Rhomboideus:** means rhomboid or diamond shape. Example, Rhomboideus major

6. Origin and insertion—sites where muscles originates and inserts

Example, sternocleidomastoid—originates on sternum and clavicle and inserts on mastoid process of temporal bone

7. Action—principal action of the muscle

- ✓ **Flexor:** decrease the angle at a joint. Example, flexor carpiradialis
- ✓ **Extensor:** increases the angle at a joint. Example, extensor carpiulnaris
- ✓ **Abductor:** moves a bone away from the midline. Example, abductor policis brevis
- ✓ **Adductor:** moves a bone closer to the midline. Example, adductor longus
- ✓ **Levator:** produces an upward movement. Example, levator labii superioris
- ✓ **Depressor:** produces a downward movement. Example, depressor labii inferioris
- ✓ **Supinator:** turns the palm upward or anteriorly. Example, supinator
- ✓ **Pronator:** turns the palm downward or posteriorly. Example, pronator teres
- ✓ **Sphincter:** control the size of an opening. Example

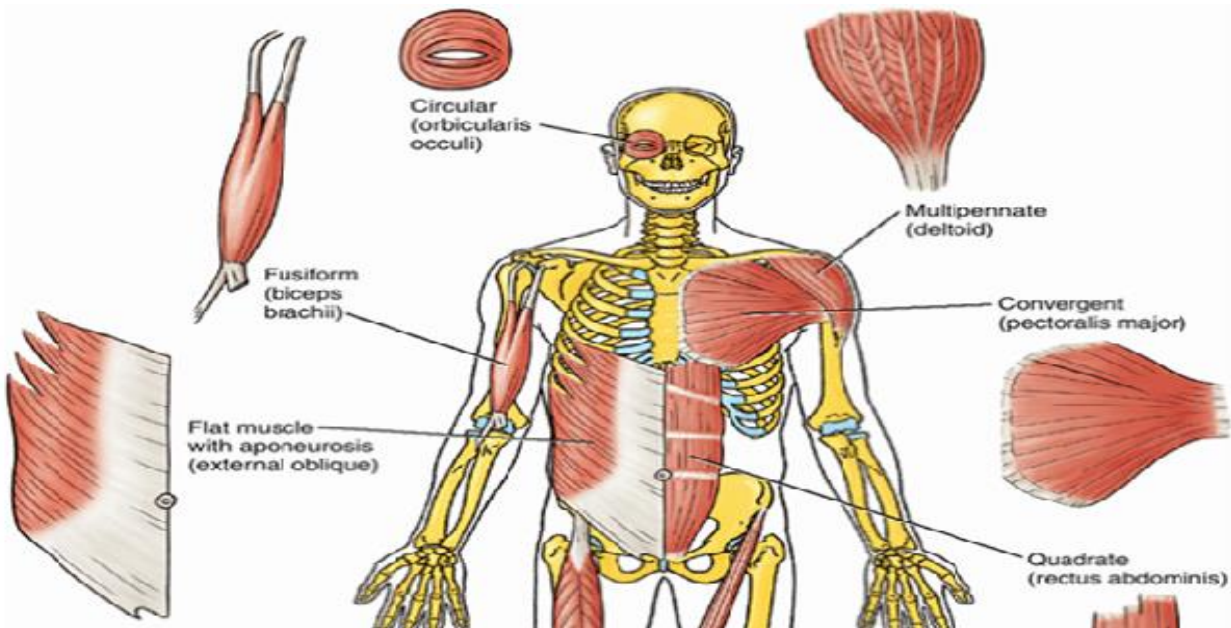


Figure 1.28: Figure showing ppprincipal skeletal muscles

Principal skeletal muscles

- ✓ Although there are over 700 individual skeletal muscles in the human body, an appreciation and understanding of skeletal muscles can be accomplished by concentrating on the large superficial muscles and muscle groups. Table 6-1 through

- ✓ Table 6-4 summarizes the origin, insertion, and action of these muscles. Refer to Figures 6-4 and 6-5 as you study the attachments and action of these muscles, and try to figure out why each has the name that it does

Muscles and Body Movements

- Movement is attained due to a muscle moving an attached bone
- Muscles are attached to at least two points
 - ✓ Origin – attachment to a moveable bone
 - ✓ Insertion – attachment to an immovable bone

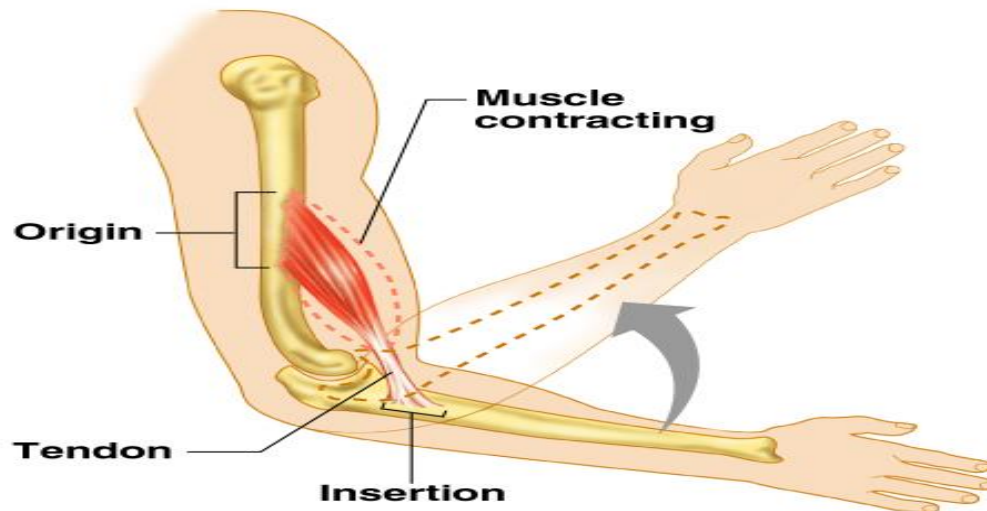


Figure 1.29: Figure showing muscular movements

Effects of Exercise on Muscle

- Results of increased muscle use
 - ✓ Increase in muscle size
 - ✓ Increase in muscle strength
 - ✓ Increase in muscle efficiency
 - ✓ Muscle becomes more fatigue resistant

Types of Muscles

- Prime mover – muscle with the major responsibility for a certain movement
- Antagonist – muscle that opposes or reverses a prime mover

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- Synergist – muscle that aids a prime mover in a movement and helps prevent rotation

Muscles you need to know the functions

- Biceps: flexes lower arm
- Deltoid: abducts arm; injection site
- Sternocleidomastoid: turns head
- Gastrocnemius: flexes sole of feet
- Latissimus dorsi: extends & adducts upper arm
- Pectoralis major: adducts and flexes upper arm
- Intercostal: moves ribs for breathing

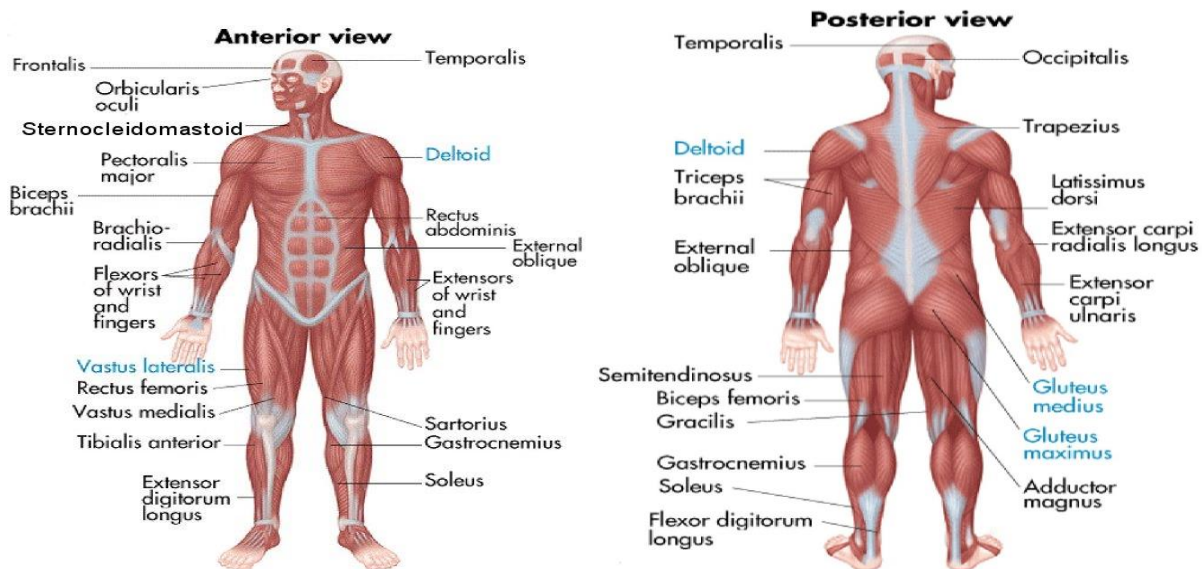


Figure 1.30: Figure showing different types of muscle

- Trapezius: extends head, moves shoulder
- Triceps: extends lower arm
- **Gluteus Maximus:** extends thigh; **injection site**
- Sartorius – abducts thigh, flexes leg
- **Vastus lateralis:** extends leg; **injection site**
- **Rectus abdominus:** compresses the abdomen
- **Rectus femoris:** flexes thigh & extends lower leg; **injection site**



Head and Neck Muscles

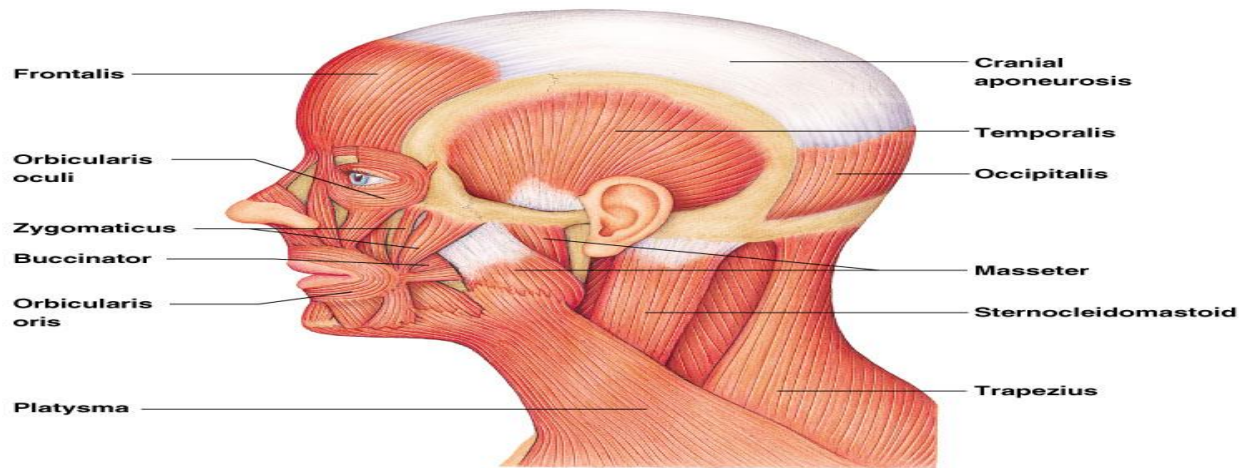


Figure 1.31: Figure showing Head and Neck Muscles

Trunk Muscles

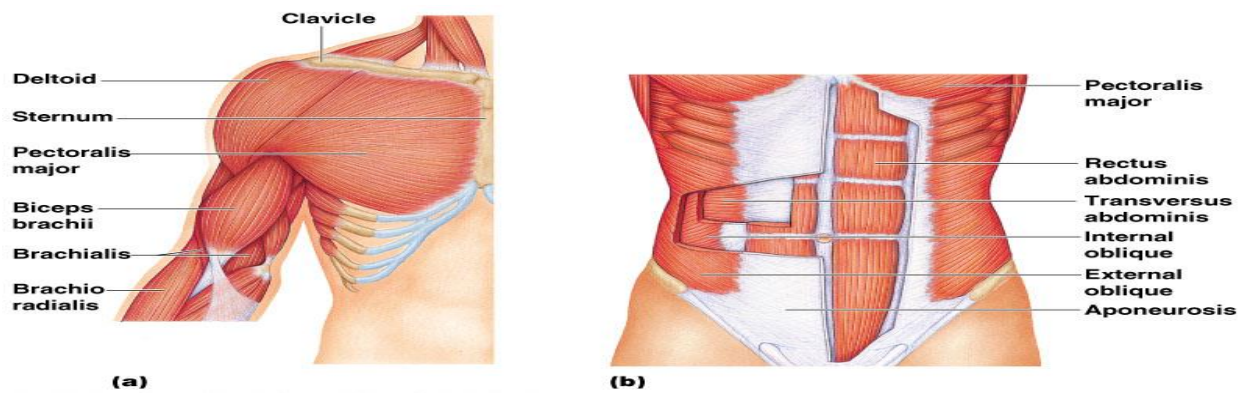


Figure 2.30: Figure showing Trunk Muscles

Deep Trunk and Arm Muscles

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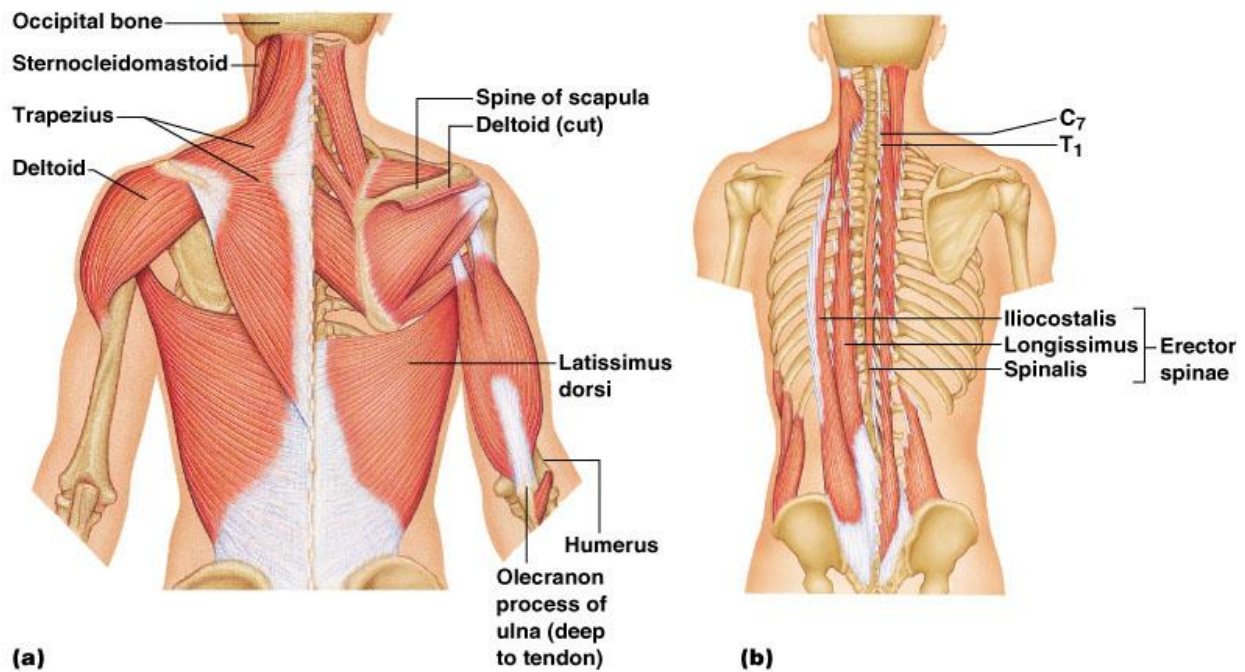


Figure 1.32: Figure showing deep trunk and arm muscles

Muscles of the Lower Leg

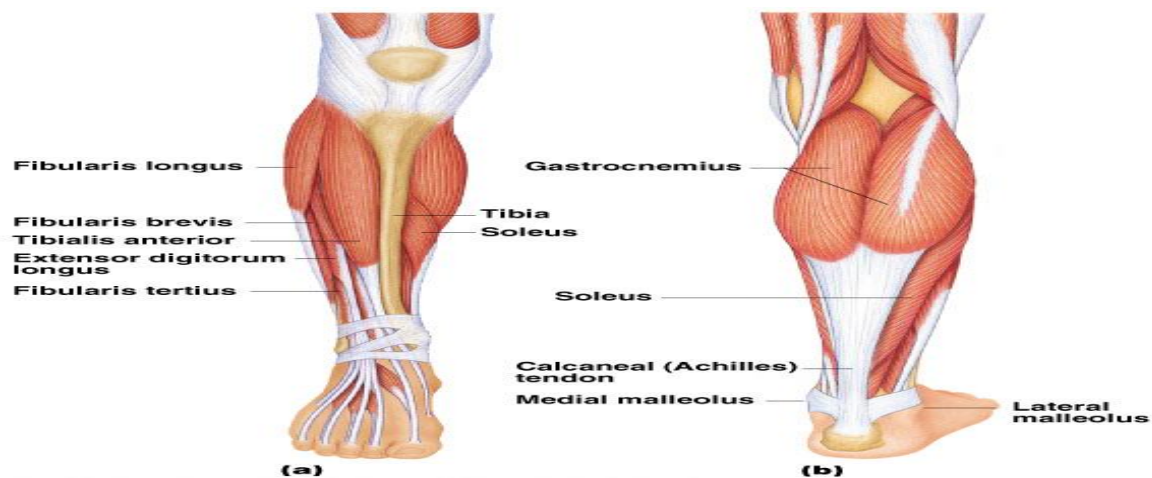


Figure 1.33: Figure showing superficial muscles

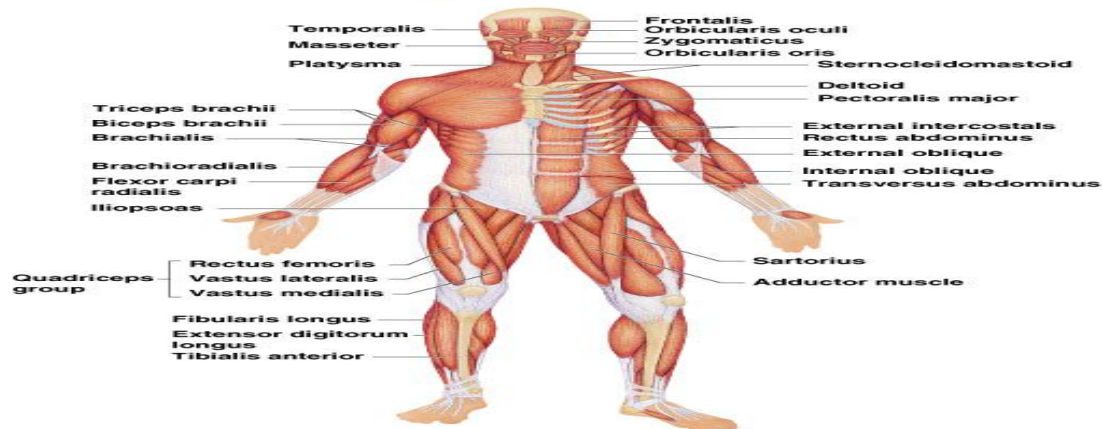


Figure 1.34: Figure showing superficial muscles

Superficial Muscles: Posterior

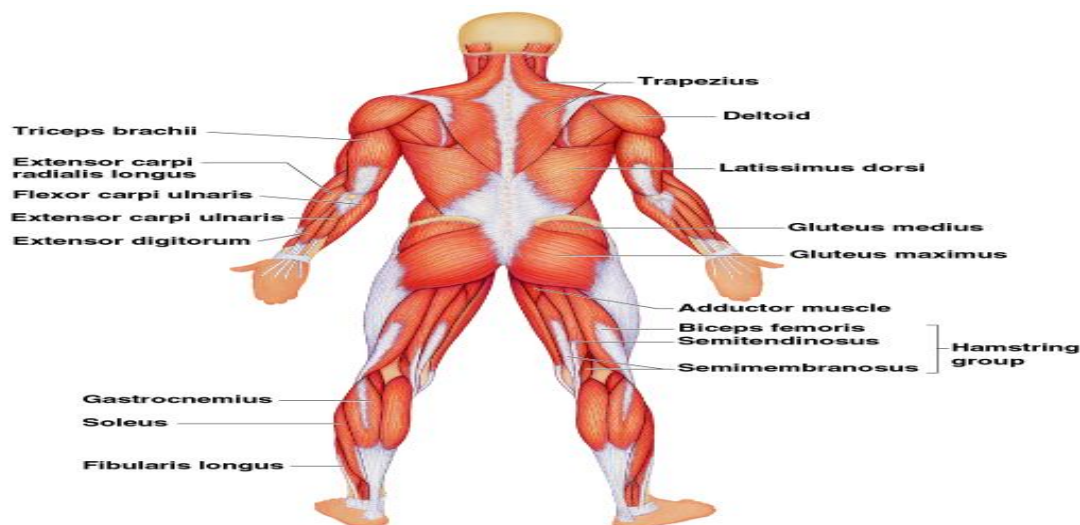


Figure 1.35: Figure showing superficial muscles

Nervous System

Introduction:

The nervous system is composed of neurons and neuroglia. Neurons transmit nerve impulses along nerve fibers to other neurons.

Neurons

A. Typically have a cell body, axons and dendrites.

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Nerves are made up of bundles of nerve fibers.

Neuroglia carries out a variety of functions to aid and protect components of the nervous system.

Neurons

- The brain is a collection of about 10 billion interconnected neurons.
- Each neuron is a cell that uses biochemical reactions to receive process and transmit information.

Neuron Anatomy

- ✓ Cell body
- ✓ Nucleus
- ✓ Large nucleolus

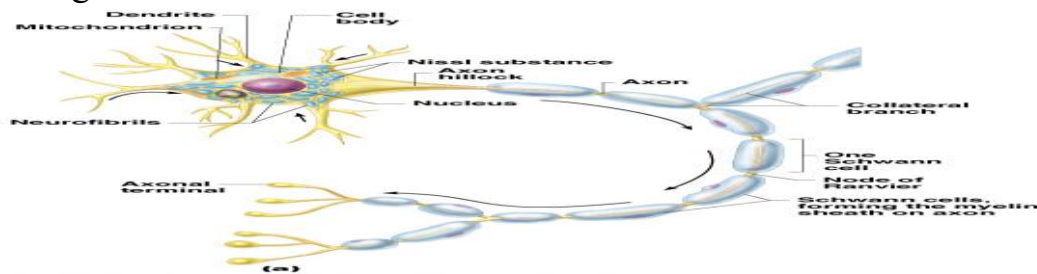


Figure 2.1: Figure showing neurons

- Extensions outside the cell body
 - ✓ Dendrites – conduct impulses toward the cell body
 - ✓ Axons – conduct impulses away from the cell body (only 1!)

Neurotransmitters

Chemical substances that carry messages from one neuron to another or from a neuron to other body tissues, such as cardiac or skeletal muscles

Synapses

The synapse is a small gap separating neurons.

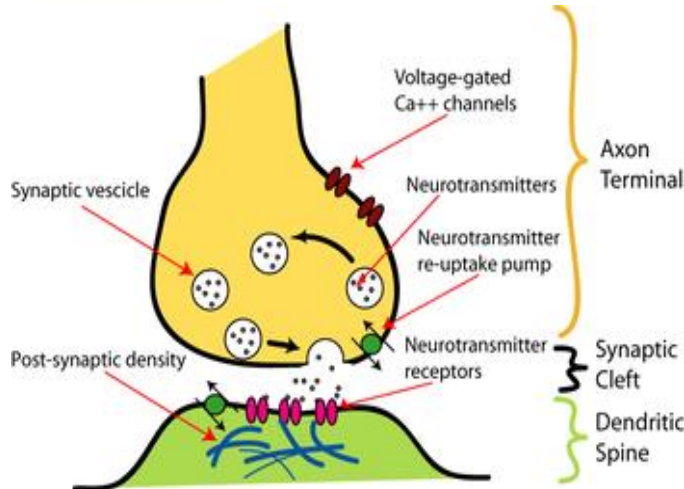
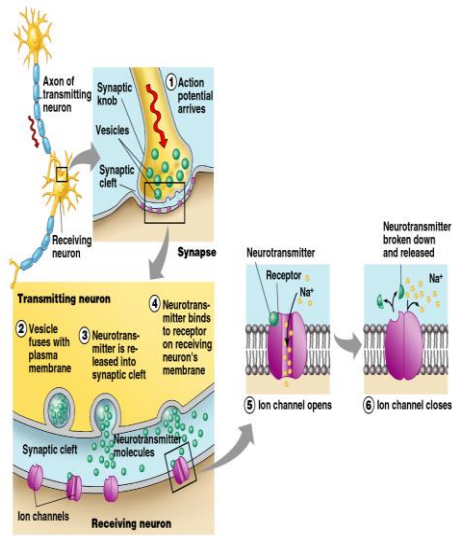


Figure 2.2: Figure showing Synapses

Receptors

- Proteins embedded in the cell membranes of neurons.
- A neurotransmitter must bind to receptors to exert an effect on the next neuron in the chain.

Components of the Nervous System

- Central Nervous System
 - ✓ Brain
 - ✓ Spinal Cord
- Peripheral Nervous System
 - ✓ Sensory and Motor Nerves
 - ✓ Cranial Nerves

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- ✓ Spinal Nerves
- Autonomic - controls the involuntary processes of the body.
 - ✓ Sympathetic
 - Parasympathetic

Central Nervous System (CNS)

Brain- lies inside the hard outer shell of the skull, inside a protected cushion of cerebrospinal fluid. Meninges are layers of non-nervous tissue that surround and protect the brain and spinal cord. Dura Mater – a tough, fibrous membrane that lies immediately internal to the skull and encloses the brain and spinal cord.

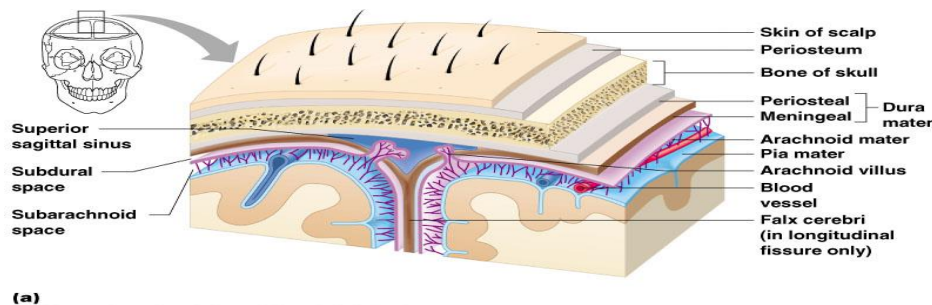


Figure 2.3: Figure showing Central Nervous System

Arachnoid- resembling a spider web, this is a delicate layer and a thin, cellular membrane with many silk-like tissue strands. Pia Mater – loose tissue that covers the brain and encases the blood vessels that supply the brain. This is a thin, delicate and highly vascularized membrane. The cerebrospinal fluid lies in the space between the arachnoid and pia mater layers. Its main function is to act as a cushion, helping to diminish the transmission of shocking forces.

Brain

- Needs 3 things to properly function
 - ✓ Oxygen – requires more oxygen than any other organ
 - ✓ Glucose – energy source
 - ✓ Thiamine – needed for production and use of glucose

Regions of the Brain

- Cerebral hemispheres

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- Diencephalon
- Brain stem
- Cerebellum

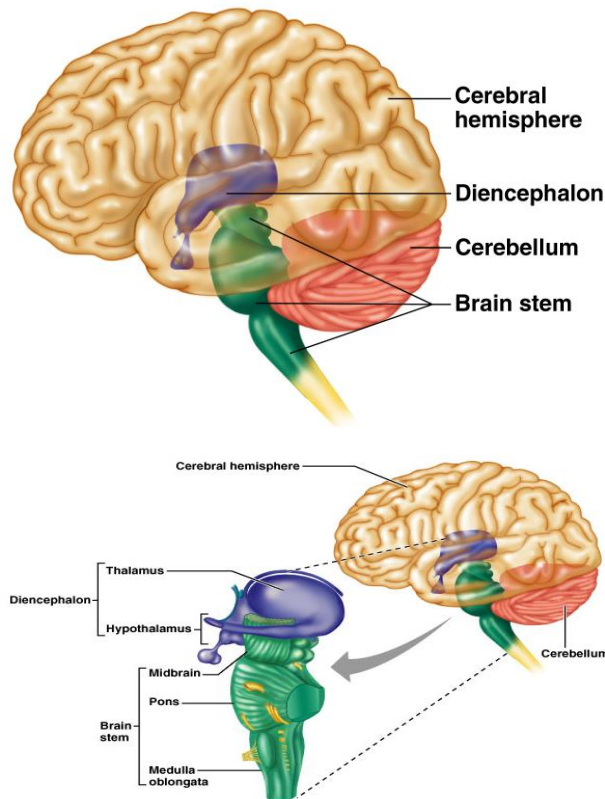


Figure 2.4: Figure showing Regions of the Brain

Central Nervous System

- **Cerebrum:** The largest part of the brain distinguished by the folds or convolutions of much of its surface.
 - ✓ The cerebrum has four paired lobes – frontal, parietal, occipital, and temporal.
 - ✓ Memory and conscious thought, speech, motor and sensory functions are controlled by the cerebrum.
- **Cerebellum:** A mass that occupies the posterior part of the cranium.
 - ✓ The cerebellum controls the automatic regulation of movement, balance, and posture, as well as skilled movements.
- **Medulla Oblongata (Brain Stem):** Connects the cerebrum and cerebellum with the spinal cord. The brain stem controls the heart rate, respiration, and body temperature

Diencephalon

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- Sits on top of the brain stem
- Enclosed by the cerebral heispheres
- Made of three parts
 - ✓ Thalamus
 - ✓ Hypothalamus
 - ✓ Epithalamus

Thalamus

- Surrounds the third ventricle
- The relay station for sensory impulses
- Transfers impulses to the correct part of the cortex for localization and interpretation

Hypothalamus

- Neuro-endocrine functions
- ADH – fluid balance
- Body temperature
- Regulating arterial blood pressure
- Appetite and hunger
- Physical changes associated with emotional

Epithalamus

- Forms the roof of the third ventricle
- Houses the pineal body (an endocrine gland)
- Includes the choroid plexus – forms cerebrospinal fluid
- Spinal Cord – A continuation of the brain which provides pathways to and from the brain, to and from the body.

Central Nervous System

- The spinal cord is also surrounded, protected, and nourished by cerebrospinal fluid.
- The vertebrae also serve as a bony protection to the spinal cord.

The spinal cord terminates with the cauda equine

The Spinal Cord

- Foramen magnum to L1 or L2

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- Runs through the vertebral canal of the vertebral column
- Functions
 - ✓ Sensory and motor innervation of entire body inferior to the head through the spinal nerves
 - ✓ Two-way conduction pathway between the body and the brain
 - ✓ Major center for reflexes

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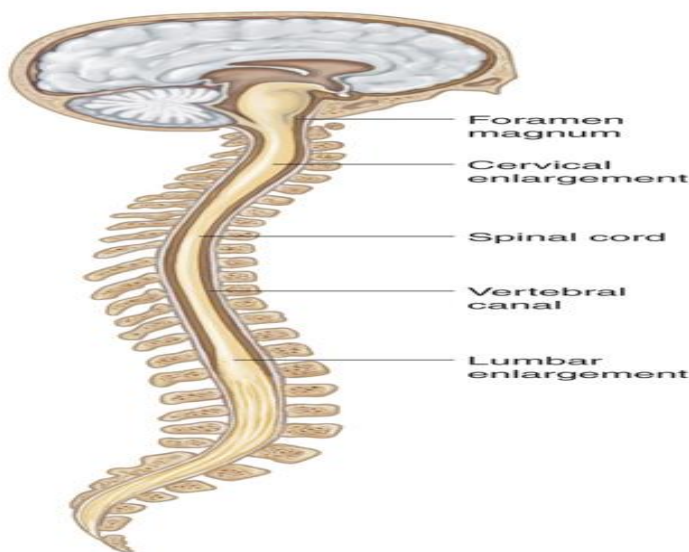


Figure 2.5: Figure showing Regions of the Spinal Cord

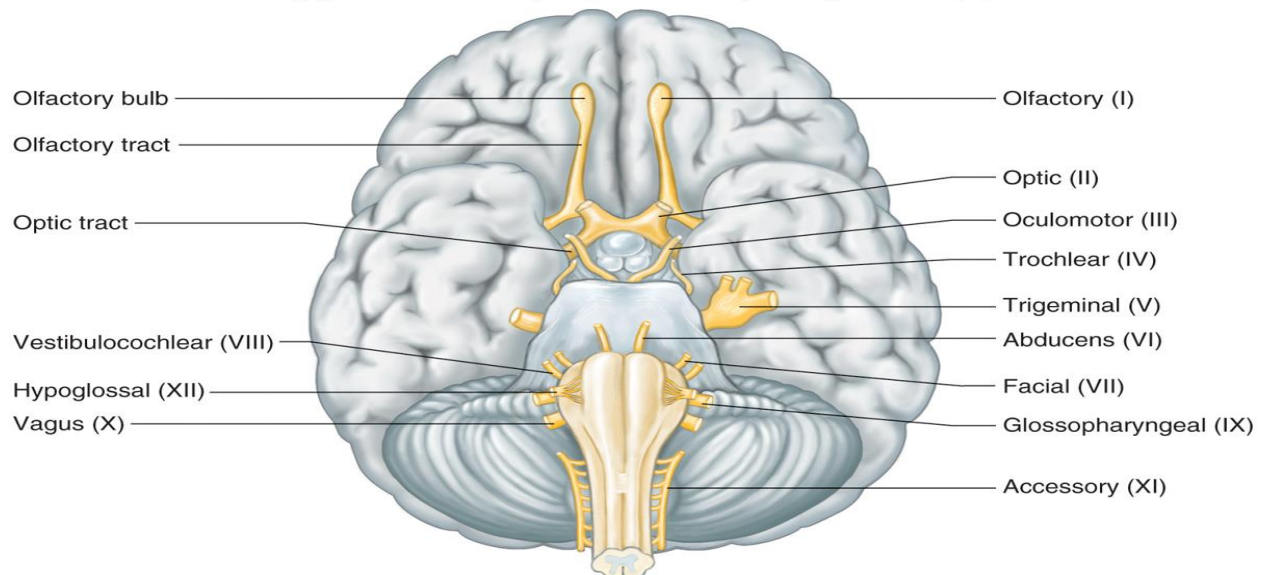
Peripheral Nervous System

Nerves are either motor nerves or sensory nerves. Efferent or motor nerves innervate muscles and glands. In order to accomplish this, they conduct nerve impulses from the CNS to the muscles and glands. Afferent or sensory nerves send sensory information and nerve impulses from sensory receptors in the skin, muscles, and joints to the brain. Cranial Nerves – 12 pairs of cranial nerves which are either sensory or motor nerves

- 10 of these nerves originate at the brain stem.
 - ✓ Cranial Nerve 1: Olfactory – smell
 - ✓ Cranial Nerve 2: Optic – vision

- ✓ Cranial Nerve 3,4&6: Oculomotor, trochlear, and abducens motor nerves controlling movement of the eyes.
- ✓ Cranial Nerve 5: Trigeminal – sensation of the head, face, and movements of the jaw
- ✓ Cranial Nerve 7: Facial – taste, facial movements, and secretions of tears and saliva
- ✓ Cranial Nerve 8: Acoustic – hearing and equilibrium
- ✓ Cranial Nerve 9: Glossopharyngeal – taste, sensation and movement in the pharynx, and secretion of saliva

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- ✓ Cranial Nerve 10: Vagus – controls taste, and movements in the pharynx and larynx
- ✓ Cranial Nerve 11: Spinal accessory – movements of the pharynx, larynx, head, and shoulders
- ✓ Cranial Nerve 12: Hypoglossal – movement of the tongue

Spinal Nerves – there are 31 pairs of spinal nerves branching off the spinal cord.

- ✓ 8 cervical
- ✓ 12 thoracic
- ✓ 5 lumbar
- ✓ 5 sacral
- ✓ 1 coccygeal

Autonomic Nervous System (ANS)

The autonomic or involuntary nervous system is that portion of the nervous system which regulates the activity of cardiac muscle, smooth muscle, and the glands.

The ANS has two parts:

Sympathetic operates under conditions of stress or emergency

- ✓ Parasympathetic
- ✓ operates under normal conditions

Autonomic Functioning

- Sympathetic – “fight-or-flight”
 - ✓ Response to unusual stimulus
 - ✓ Takes over to increase activities
 - ✓ Remember as the “E” division = exercise, excitement, emergency, and embarrassment

Autonomic Functioning

- Parasympathetic – housekeeping activities
 - ✓ Conserves energy
 - ✓ Maintains daily necessary body functions
 - ✓ Remember as the “D” division - digestion, defecation, and diuresis

The Reflex Arc

- ✓ Reflex – rapid, predictable, and involuntary responses to stimuli
- ✓ Reflex arc – direct route from a sensory neuron, to an interneuron, to an effector

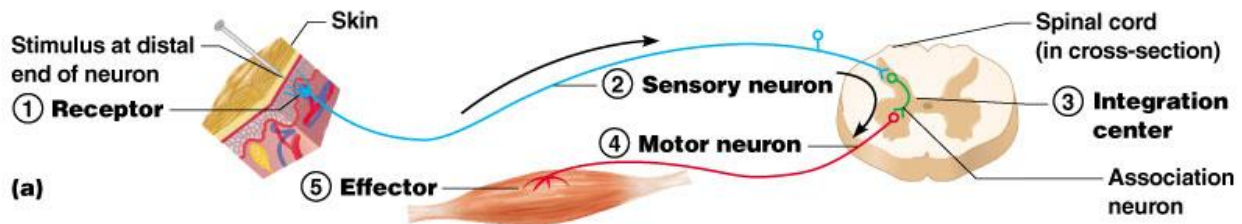


Figure 2.6: Figure showing reflex ark

Types of Reflexes and Regulation

- Autonomic reflexes
 - ✓ Smooth muscle regulation
 - ✓ Heart and blood pressure regulation
 - ✓ Regulation of glands
 - ✓ Digestive system regulation

- Somatic reflexes
 - Activation of skeletal muscles

Sense organs

Sense organs:-are a group of organs that used to detect different stimuli in human body or environment. Is the group of organs with specialized cellular structure that has receptors for specific stimuli?

Classification of sense organs

We can classify sense organs generally in to two broad classification:-

1. Special sense organs: such as the eye, are characterized by large and complex organs or by localized groupings of specialized receptors in areas such as the nasal mucosa or tongue.
2. general sense organs: Used as a stimuli such as pain and touch are microscopic receptors widely distributed throughout the body

Converting stimulus into a sensation

All sense organs, regardless of size, type, or location, have in common some important functional characteristics.

- First, they must be able to sense or detect a stimulus in their environment.
- Then the stimulus must be changed into an electrical signal or nerve impulse.
- This signal is then transmitted over a nervous system "pathway" to the brain, where the sensation is perceived.

Special sense organs

The Eye

The human eye is a sensory organ, part of the sensory nervous system that reacts to visible light and allows us to use visual information for various purposes including seeing things, keeping our balance, and maintaining circadian rhythm.

- Three layers of tissue form the eye ball: the **sclera**, the **choroids**, and the **retina** .
- The outer layer of sclera consists of tough fibrous tissue.
- The white of the eye is part of the front surface of the sclera.
- A mucous membrane known as the conjunctiva lines the eyelids and covers the sclera in front.

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- The conjunctiva is kept moist by tears in the lacrimal gland located in the upper lateral portion of the orbit.
- The middle layer of the eyeball, the **choroid**, contains a dark pigment to prevent the scattering of incoming light rays. Two involuntary muscles make up the front part of the choroids.
- One is the **iris**, the colored structure seen through the cornea, and the other is the **ciliary muscle**
- The black center of the iris is really a hole in this doughnut-shaped muscle; it is pupil of the eye.
- Some of the fibers of the iris are arranged like spokes in a wheel.
- When they contract the pupils dilate, letting in more light rays.
- The retina or innermost layer of the eyeball contains microscopic receptor cells, called **rods** and **cones** because of their shapes.
- Dim light can stimulate the rods, but fairly bright light is necessary to stimulate the cones.
- In other words, **rods** are the receptors for **night vision** and **cones** for **daytime vision**.
- There are three kinds of cones; each is sensitive to a different color: red, green, or blue.
- Scattered throughout the central portion of the retina, these three types of cones **allow us to distinguish** between different colors.
- Fluids fill the hollow inside of the eyeball.
- They maintain the normal shape of the eyeball and help refract light rays; that is, the fluids bend light rays to bring them to focus on the retina.
- Aqueous humor is the name of the watery fluid in front of the lens (in the anterior cavity of the eye), and vitreous humor is the name of the jellylike fluid behind the lens (in the posterior cavity).
- Aqueous humor is constantly being formed, drained, and replaced in the anterior cavity
- If drainage is blocked for any reason, the internal pressure within the eye will increase, and damage that could lead to blindness will occur. This condition is called **glaucoma**.
- The lens of the eye lies directly behind the pupil. It is held in place by a ligament attached to the ciliary muscle.
- In most young people, the lens is transparent and somewhat elastic so that it is capable of changing shape.

- Exposure to ultraviolet (UV) radiation in sunlight may cause cataracts or milky spots on the lens.

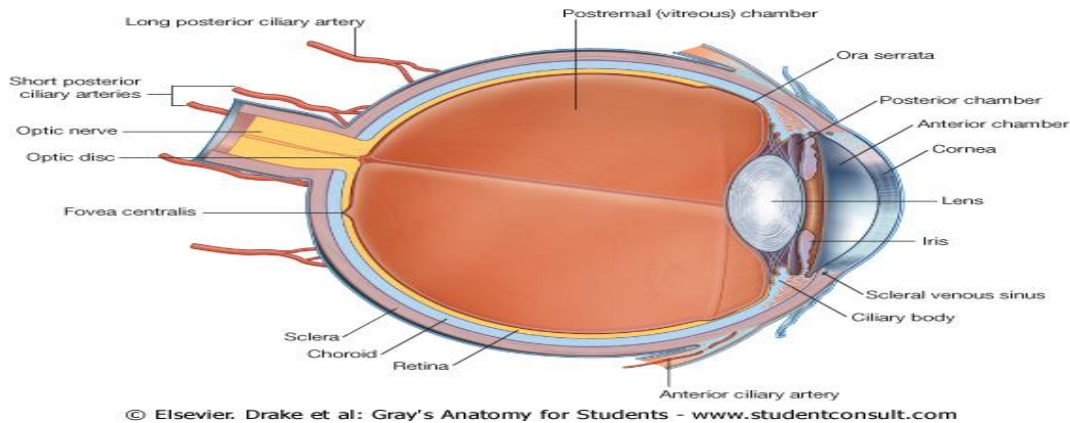


Figure 2.7: Figure showing parts of Human eye

Visual Pathway

- **Light** is the stimulus that results in vision (that is our ability to see objects as they exist in our environment).
- Light enters the eye through the pupil and is refracted or bent so that it is focused on the retina.
- Refraction occurs as light passes through the cornea, the aqueous humor, the lens, and the vitreous humor on its way to the retina.
- The innermost layer of the retina contains the rods and cones, which are the photoreceptor cells of the eye
- They respond to a light stimulus by producing a nervous impulse.
- Nervous signals eventually leave the retina and exit the eye through the optic nerve on the posterior surface of the eyeball.
- After leaving the eye, the optic nerves enter the brain and travel to the visual cortex of the **occipital lobe**.
- In this area of the brain, visual interpretation of the nervous impulses that were generated by light stimuli in the rods and cones of the retina result in "seeing".

The Ear

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Definition: Human ear/organ of hearing and equilibrium that detects and analyzes sound by transduction (or the conversion of sound waves into electrochemical impulses) and maintains the sense of balance (equilibrium).

- In addition to its role in hearing, the ear also functions as the sense organ of equilibrium and balance.
- Physical forces that involve sound vibrations and fluid movements are responsible for initiating nervous impulses eventually perceived as sound and balance.
- The ear is much more than a mere appendage on the side of the head. A large part of the ear, and by far its most important part, lies hidden from view deep inside the **temporal bone**.
 - The ear is divided into the following anatomical areas
 - 1) External ear
 - 2) Middle ear
 - 3) Inner (internal) ear

External ear

- The external ear has two parts: the **auricle or pinna** and the **external auditory canal**.
- The auricle is the appendage on the side of the head surrounding the opening of the external auditory canal.
- The canal itself is a curve about 2.5 cm (1 inch) in length. It extends into the temporal bone and ends at the tympanic membrane or eardrum, which is a partition between the external and middle ear.
- The skin of the auditory canal, especially in its outer one third, contains many short hairs and ceruminous glands that produce a waxy substance called **cerumen** that may collect in the canal and impair hearing by absorbing or blocking the passage of sound waves.
- Sound waves travelling through the external auditory canal strike the tympanic membrane and cause it to vibrate.

Middle Ear

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- The middle ear is a tiny and very thin epithelium lined cavity hollowed out of the temporal bone.
- It houses three very small bones. The names of these ear bones, called **ossicles**, describe their shapes – *malleus* (hammer), *incus* (anvil) and *stapes* (stirrup).
- The "handle" of the malleus attaches to the inside of the tympanic membrane, and the "head" attaches to the incus.
- The incus attaches to the stapes, and the stapes presses against a membrane that covers a small opening, the **oval window**.
- The oval window separates the middle ear from the inner ear. When sound waves cause the eardrum to vibrate, that movement is transmitted and amplified by the ear ossicles as it passes through the middle ear.
- Movement of the stapes against the oval window causes movement of fluid in the inner ear.
- A point worth mentioning, because it explains the frequent spread of infection from the throat to the ear, is the fact that a tube– the **auditory** or **Eustachian tube**– connects the throat with the middle ear.
- The epithelial lining of the middle ears, auditory tubes, and throat are extensions of one continuous membrane
- Consequently a sore throat may spread to produce a middle ear infection called **otitis media**.

Inner Ear

- The activation of specialized mechanoreceptors in the inner ear generates nervous impulses that result in hearing and equilibrium.
- Anatomically, the inner ear consists of three spaces in the temporal bone, assembled in a complex maze called the **bony labyrinth**.
- This odd shaped bony space is filled with a watery fluid called **perilymph** and is divided into the following parts: **vestibule**, **semicircular canals**, and **cochlea**.
- The vestibule is adjacent to the oval window between the semicircular canals and the cochlea .

- The specialized membrane receptors for balance and equilibrium are located in the three semicircular canals and the vestibule.
- The three half-circle semicircular canals are oriented at right angles to one another .
- Within each canal is a specialized receptor called a **crista ampullaris**, which generates a nerve impulse when you move your head.
- The sensory cells in the cristae ampullaris have hair like extensions that are suspended in the end lymph
- The sensory cells are stimulated when movement of the head causes the endo lymph to move, thus causing the hairs to bend.
- Nerves from other receptors in the vestibule join those from the semicircular canals to form the vestibular nerve, a division of the acoustic nerve or cranial nerve VIII .
- Eventually, nervous impulses passing through this nerve reach the **cerebellum** and **medulla**.
- Other connections from these areas result in impulses reaching the **cerebral cortex**.
- The organ of hearing, which lies in the snail shaped cochlea, is the organ of **Corti**. It is surrounded by endo lymph filling the membranous cochlea or cochlear duct, which is the membranous tube within the bony cochlea.
- Specialized hair cells on the organ of Corti generate nerve impulses when they are bent by the movement or endo lymph set in motion by sound waves

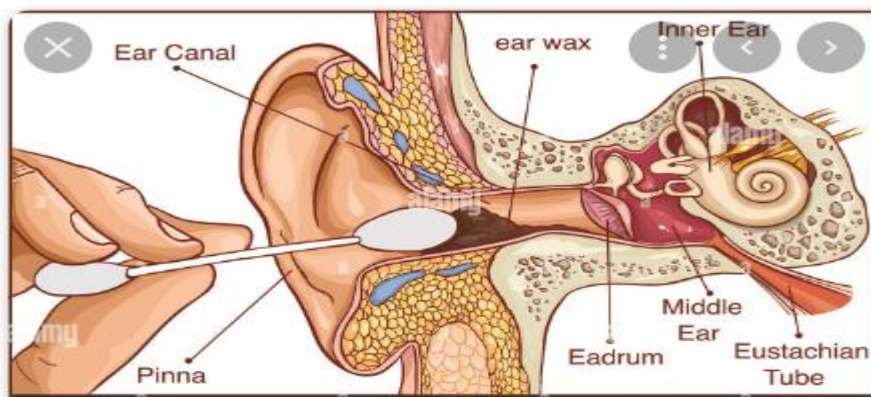


Figure 2.8: Figure showing parts of human ear

The Taste Receptors

- The chemical receptors that generate nervous impulses resulting in the sense of taste are called taste buds.
- About 10,000 of these microscopic receptors are found on the sides of much larger structure on the tongue called papillae and also as portions of other tissues in the mouth and throat.
- Nervous impulses are generated by specialized cells in taste buds, called gustatory cells.
- They respond to dissolved chemicals in the saliva that bathe the tongue and mouth tissues .
- Only four kinds of taste sensations—sweet, sour, bitter, and salty—result from stimulation of taste buds.
- All other flavors result from a combination of taste bud and olfactory receptor stimulation.
- In other words, the myriads of tastes recognized are not tastes alone but tastes plus odors.
- For this reason a cold that interferes with the stimulation of the olfactory receptors by odors from foods in the mouth markedly dulls taste sensations.
- Nervous impulses generated by stimulation of taste buds travel primarily through two cranial nerves (VII and IX) to end specialized taste area of the cerebral cortex.

The smell receptors

- The chemical receptors responsible for the sense of smell are located in a small area of epithelial tissue in the upper part of the nasal cavity .
- The location of the olfactory receptors is somewhat hidden, and we are often forced to forcefully sniff air to smell delicate odors.
- Each olfactory cell has a number of specialized cilia that sense different chemicals and cause the cell to respond by generating a nervous impulse.
- To be detected by olfactory receptors, *chemicals must be dissolved* in the watery mucus that lines the nasal cavity.

- Although the olfactory receptors are extremely sensitive (that is, stimulated by even very slight odors), they are also easily fatigued—a fact that explains why odors that are at first very noticeable are not sensed at all after a short time.
- After the olfactory cells are stimulated by odor-causing chemicals, the resulting nerve impulse travels through the olfactory nerves in the olfactory bulb and tract and then enters the thalamic and olfactory centers of the brain, where the nervous impulses are interpreted as specific odors
- The pathways taken by olfactory nerve impulses and the area where these impulses are interpreted are closely associated with areas of the brain important in memory and emotion.
- For this reason, we may retain vivid and long-lasting memories of particular smells and odors
- Temporary reduction of sensitivity to smells often results from colds and other nasal infections.
- Progressive reduction of the sense of smells often seen in smokers because of the damaging effects the pollutants in tobacco smoke.
- In olfaction, as with all the special senses, advancing age often brings a structural degeneration that result in reduced function.
- It is no wonder that many older adults become isolated and depressed when their contact with the outside world, the special senses, is gradually lost.

Introduction to Endocrine System

The endocrine system is the second great controlling system of the body. Along with the nervous system, it acts to coordinate and direct the activities of the bodies' cells. It works by means of chemical messengers called hormones. Glands of body are composed predominantly of epithelial tissue, which used to secrete hormones

Table 2.2: Comparison of features of the endocrine system and nervous system

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Feature	Endocrine system	Nervous system
Overall function	Maintain homeostasis	Maintain homeostasis
Control	Virtually all tissue	Muscles and glandular tissue only
Effectors cell	Target cells (throughout the body)	In muscle and glandular cells only
Chemical messenger	Hormone	Neurotransmitter
Secreted by	Glandular epithelial cells	Neurons
Distance travel	Long(bywayofcirculating blood)	Short(across microscopic
Speed & action duration	Slow to appear long lasting effect	Fast, short lived

Types of glands

Endocrine: its secretions have intracellular, but

Exocrine glands: its secretions have extra cellular effect

The **endocrine system** is a collection of glands whose function is to regulate multiple organs within the body to

- ✓ Meet the growth and reproductive needs of the organism and
- ✓ Respond to fluctuations within the internal environment, including various types of stress.

Hormones

Are chemical messengers of the endocrine system. Which are released directly into the blood stream & carried to the tissue that they affect, called Target tissues. All hormones are extremely potent, i.e., they are effective in very small quantities. Hormones chemically fall in two categories.

- 1.) **Proteins:** All hormones **except** those of adrenal cortex & the sex glands are proteins.
- 2.) **Steroids:** are hormones derived from lipids & produced by the adrenal cortex & sex glands.
 - The blood reaches all cells of the body, but only certain cells respond to specific hormones

- Only cells that have receptors for a given hormone will respond to that hormone these cells make up what is called the target tissue.

The Endocrine Glands and Their Hormones

The endocrine system consists of the glands that secrete hormones. Most endocrine glands, like exocrine glands, are made of epithelial tissue. Although they have no ducts, they have an extensive blood vessel network. pancreas and the sex glands, have other non-endocrine functions as well, but hormone secretion is one of their main functions

Glands of ES

- The endocrine glands include
 - ✓ Pituitary
 - ✓ Thyroid
 - ✓ Parathyroid
 - ✓ Adrenal
 - ✓ Pineal
 - ✓ Thymus glands
 - ✓ Pancreas and gonads (ovaries and testes).

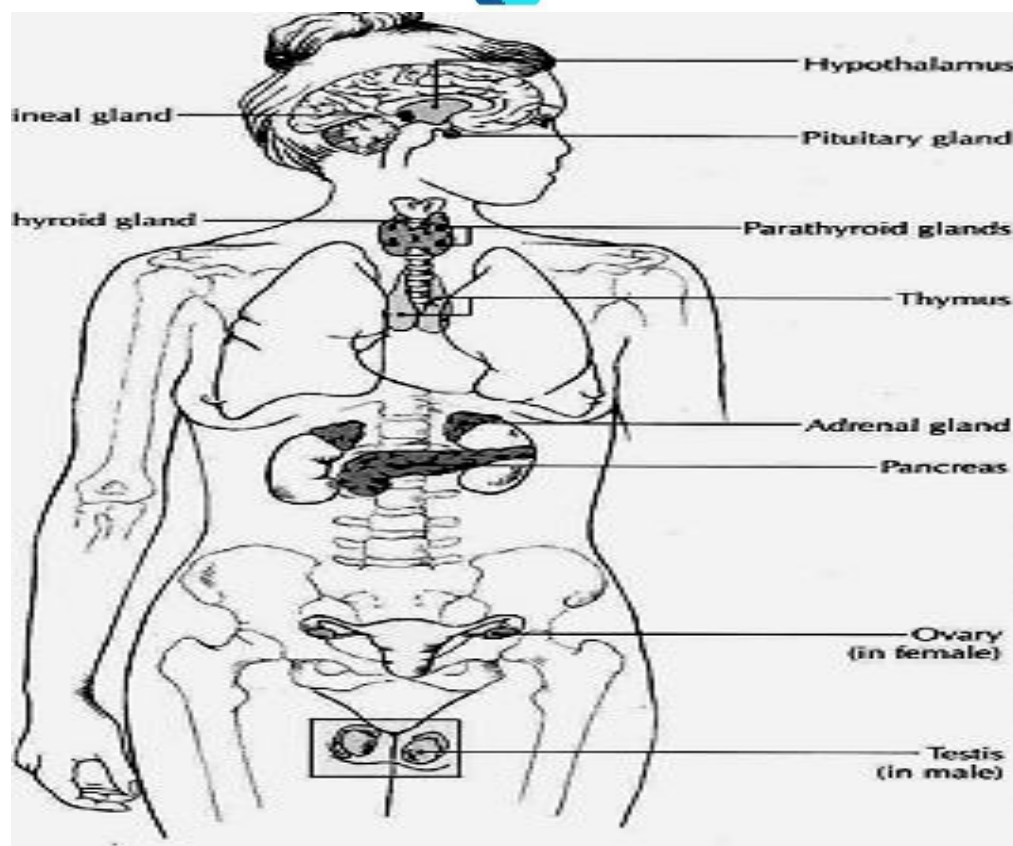


Figure 2.10: Figure showing Glands of the endocrine systems

In addition to dedicated endocrine glands, there are endocrine cells within organs whose primary function is not endocrine. These include cells within the heart that produce atrial natriuretic peptide, liver cells that produce insulin-like growth factor type I (IGF-I), cells within the kidney that produce erythropoietin, and numerous cell types within the gastrointestinal tract that produce gastrointestinal hormones.

Pituitary Gland

Pituitary gland is known as *hypophysis* and called *the master gland*. Approximately size of 1.2 to 1.5 cm across, & weighs 0.5gm & Located on the ventral surface of the brain, resting within the sella turcica of the sphenoid bone. Hangs from the inferior surface of hypothalamus by infundibulum – stem-like stalk it has two separate divisions called: Anterior and Posterior pituitary gland

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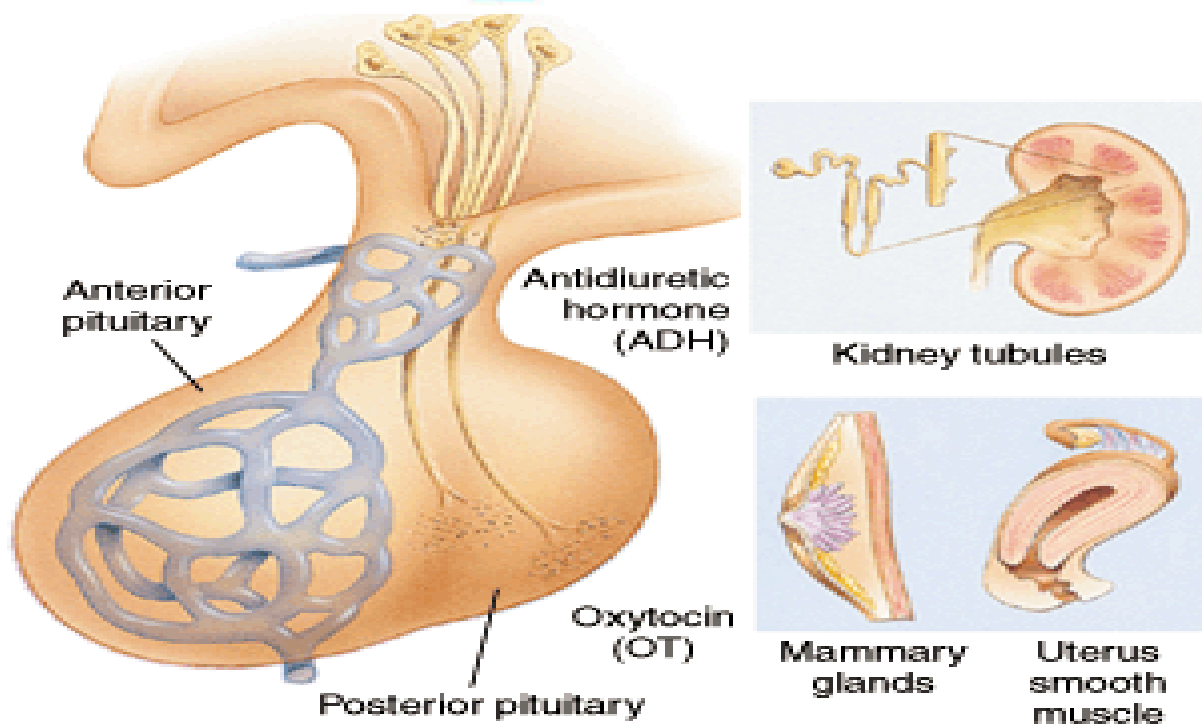


Figure 2.11: Figure showing parts of pituitary gland and hormones released

A. Anterior pituitary (Adenohypophysis)

it has no nerve connection to hypothalamus, but is connected to it by complex of blood vessels called hypothalamo-hypophyseal portal system, w/c transports hypothalamic regulating hormones to the glandular cells of Adenohypophysis. The Anterior lobe basically secretes six hormones

Hormones of Anterior lobe

GH (Growth hormone) – stimulate growth of bones & muscles by accelerating amino acid transport into the cells.

- ✓ Also known as **somatotrophin** (STH)
- ✓ TSH(Thyroid Stimulating Hormone) – stimulates thyroid gland
- ✓ FSH(Follicle Stimulating Hormone) – Stimulate production of ova & sperm
- ✓ LH (Luteinizing Hormone) – Stimulates testosterone production in males & promotes maturation of ovarian follicles to secrete estrogen in females, w/c is responsible for ovulation & formation of corpus luteum.
- ✓ ACTH (Adreno Cortico Tropic hormone) -Stimulate Adrenal cortex
- ✓ Prolactin(PRL): stimulates milk secretions in the breast of a lactating mother

B. Posterior pituitary (Neurohypophysis)

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- ✓ Release hormone made by the hypothalamus
- ✓ Nerve fibers arise from cell bodies in the hypothalamus & end in the posterior lobe bundle – hypothalamohypophyseal tract
- ✓ Serve as storage & release site for anti – diuretic hormone (ADH) &
- ✓ Oxytocin (OT) in to blood stream, which is controlled by nervous stimulation

Functions of Hormones of anterior pituitary

ADH- prevent large volume of urine formation here by helping the body conserve water

Oxytocin: Cause milk ejection from lactating mother. Also stimulate contraction of uterine muscle during child birth.

Table 2.3: Types of Hormones, their source organs & Specific Actions

Hormone	Source	Target	Principal
GH (STH)	Adenohypophysis	General	Promotes growth by stimulating.
PRL (lactogenic)	“ “	Mammary glands	Promotes milk secretion by
Thyroid stimulating hormone (TSH)	“ “	Thyroid gland	Stimulates development and secretion in the thyroid gland
Adenocorticotrophic hormone (ACTH)	“ “	Adrenal cortex	promotes dev't and secretion in
Hormone	Source	Target	Principal function
Follicular stimulating	Adenohypophysis	Gonads glands	Female – promotes dev't of
Leutinizing hormone (LH)	“ “	Gonads glands (primary sex	Male – promotes dev't of testis –
Melanocyte stimulating hormone	“ “	Skin	Female – triggers ovulation secretion. Promote dev't of corpus luteum. Male – stimulates production



			of testosterone /masculinization/ May stimulate production of melanin pigment in skin.
Anti Diuretic hormone (ADH)	Neurohypophysis	Kidney	- Promotes water retention by kidney tubules.
Oxytocin (OT)	“ “	Uterus	- Stimulates
Hormone	Source	Target	Principal function
Melatonin	Pineal gland	Adenohypophysis	Inhibit LH secretion Sleep-wake cycle & Person's mood eg, winter depression
T3 & T4	Thyroid gland	General	increase rate of
Calcitonin (CT)	“ “	Bone tissue	increases calcium storage in bone lowering blood ca^{2+} levels
Parathormone (PTH)	Parathyroid gland	Bone tissue	Increases calcium removal from the storage in bone Increase absorption of calcium by intestines Increase blood ca^{2+} levels
Aldosterone (mineralocorticoid)	Adrenal cortex (Zona	Kidney	Promote conservation of
Hormone	Source	Target	Principal function

Cortisol (hydrocortisol)	Adrenal cortex	General	Influence metabolism of
Adrenal androgen	Adrenal cortex (zona reticularis)	Sex organ	May support sexual functions
Thymosin	Thymus gland	T-Lymphocytes	Stimulate production of specialized
Atrial natriuretic Peptide (ANP)	Heart (Atrium)	Kidney	Promote the loss of sodium from the body by means of the urine

The Cardiovascular System

Introduction

The cardiovascular system consists of heart and blood vessels. The heart pumps blood and Blood vessels allow blood to circulate to all parts of the body

Function of the cardiovascular system

- Deliver oxygen and nutrients and
- Remove carbon dioxide and other waste products

The Heart

- Is cone-shaped organ about the size of a loose fist
- Location
 - ✓ Thorax between the lungs
 - ✓ Extends from the level of the second rib to about the level of the sixth rib
 - ✓ Slightly lie to left of the midline
 - ✓ Superior surface of diaphragm
 - ✓ Anterior to the vertebral column,
 - ✓ Posterior to the sternum

The Heart is bordered:

- ✓ Laterally by the lungs
- ✓ Posteriorly by the vertebral column
- ✓ Anteriorly by the sternum

✓ Rests on the diaphragm inferiorly

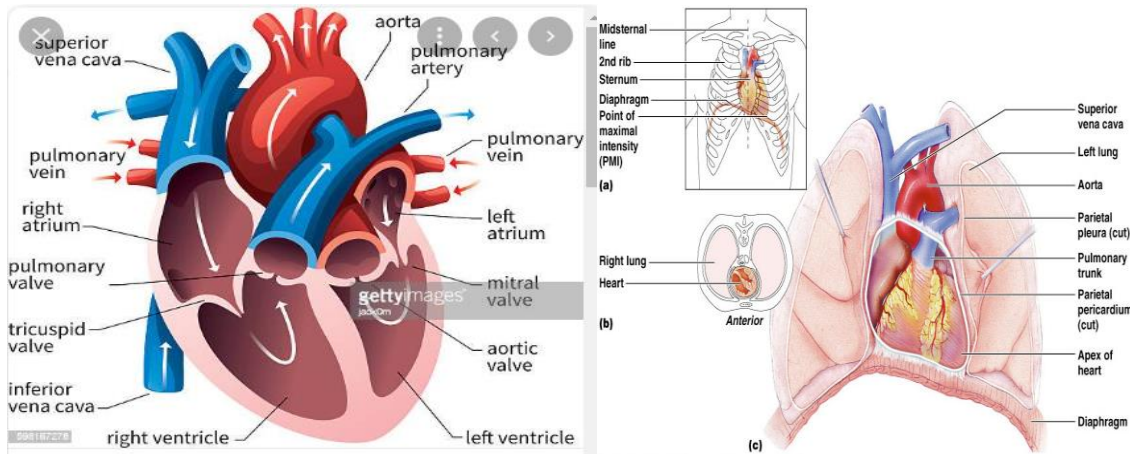


Figure 2.12: Figure showing human heart location and borders

Coverings of the Heart

Human heart is covered by the membrane called pericardium. *Pericardium* Covers the heart and large blood vessels attached to the heart. There is the space between these layers of pericardium which is called pericardium space/cavity which are filled with fluid.

Pericardium has two Layers

A. *Visceral pericardium*

- Innermost layer
- Directly on the heart

B. *Parietal pericardium*

- on top of the visceral pericardium

The Function of the Pericardium

- Protects and anchors the heart
- Prevents overfilling of the heart with blood
- Allows for the heart to work in a relatively friction-free environment

Heart Wall

The wall of human heart has three layers as follow :-

- Epicardium***

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- ✓ Outermost layer
- ✓ Fat to cushion heart
- **Myocardium**
 - ✓ Middle layer
 - ✓ Primarily cardiac muscle
- **Endocardium**
 - ✓ Innermost layer
 - ✓ Thin and smooth
 - ✓ Stretches as the heart pumps

Two sides of Heart and a Partition

Human heart has two parts and these parts of heart are separated from each other by a partition called the septum. The upper part of this partition is called interatrial septum while the larger the lower portion is called interventricular septum. The septum, like the heart wall, consists largely of myocardium.

- A. Right side
- B. Left side

Chambers of Heart

The heart has four chambers namely atriums/ upper chambers receiving deoxygenated blood from coronary sinus, superior and inferior vena cava. Left atrium-receive oxygenated blood from pulmonary vein. Ventricles/ lower chambers which can pump deoxygenated blood to pulmonary artery and Left ventricle-pumps oxygenated blood to aorta.

Atria of the Heart

Atria are also called the receiving chambers of the heart and the human heart has two atria (Right atria & Left atria)

- Each atrium has a protruding auricle
- **Pectinate muscles** mark atrial walls
- Blood enters right atria from superior and inferior venae cavae and coronary sinus
- Blood enters left atria from pulmonary veins
- Their main function is to receive deoxygenated and oxygenated blood and deliver to ventricles.

Ventricles of the Heart

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Ventricles are the discharging chambers of the heart. Human heart has two ventricles which made up of **Papillary muscles** and **trabeculae carneae** muscles which mark ventricular walls

1. **Right ventricle** pumps blood into the pulmonary trunk/artery
2. **Left ventricle** pumps blood into the aorta
 - Their main function is to pump the blood into lung and whole parts of body.

The Valves of Heart

The heart consists of four chambers, two atria (upper chambers) and two ventricles (lower chambers). There is a valve through which blood passes before leaving each chamber of the heart. The valves prevent the backward flow of blood. These valves are actual flaps that are located on each end of the two ventricles (lower chambers of the heart). They act as one-way inlets of blood on one side of a ventricle and one-way outlets of blood on the other side of a ventricle. Normal valves have three flaps, except the mitral valve, which has two flaps. The four heart valves include the following:

- **Tricuspid valve:** located between the right atrium and the right ventricle
- **Pulmonary valve:** located between the right ventricle and the pulmonary artery
- **Mitral valve:** located between the left atrium and the left ventricle
- **Aortic valve:** located between the left ventricle and the aorta

Functions of Heart Valves

- **Tricuspid valve** – prevents blood from flowing back into the right atrium when the right ventricle contracts
- **Bicuspid (mitral) valve** – prevents blood from flowing back into the left atrium when the left ventricle contracts
- **Pulmonary semilunar valve** – prevents blood from flowing back into the right ventricle
- **Aortic semilunar valve** – prevents blood from flowing back into the left ventricle

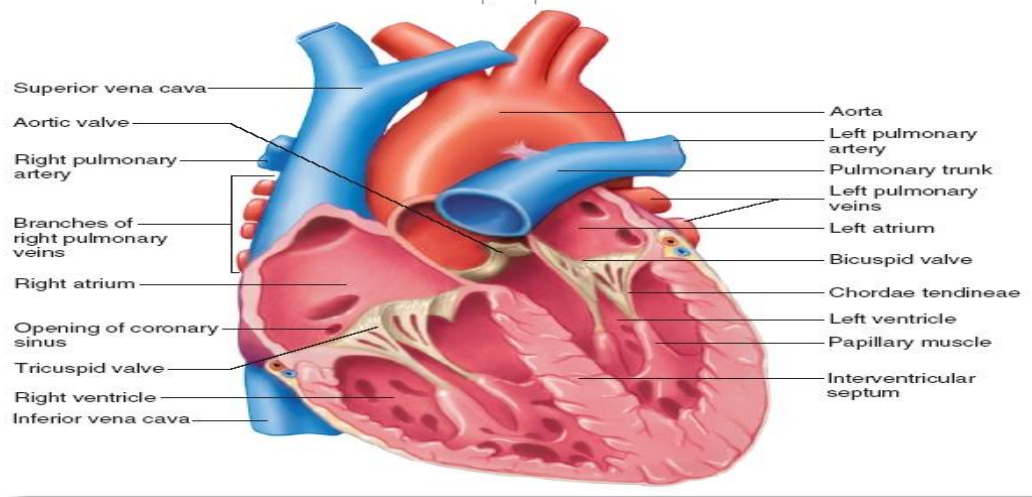


Figure 2.13: Figure showing parts of heart valve and functions

Blood Supply to the Myocardium

The myocardium must have its own blood vessels to provide oxygen and nourishment and to remove waste products. The arteries that supply blood to the muscle of the heart are called the **right** and **left coronary arteries**. These arteries, which are the first branches of the aorta, arise just above the aortic semilunar valve. They receive blood when the heart relaxes. After passing through capillaries in the myocardium, blood drains into the cardiac veins and finally into the coronary (venous) sinus for return to the right atrium.

Physiology of the Heart

Although the right and left side of the heart are separated from each other, they work together. The blood is squeezed through the chambers by a contraction of heart muscle beginning in the thin-walled upper chambers, the atria, followed by a contraction of the thick muscle of the lower chambers, the ventricles. This active phase is called **systole**, and in each case it is followed by a resting period known as **diastole**. The contraction of the walls of the atria is completed at the time the contraction of the ventricles begins. Thus, the resting phase (diastole) begins in the atria at the same time as the contraction (systole) begins in the ventricles. After the ventricles have emptied, both chambers are relaxed for a short period of time as they fill with blood.

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Cardiac cycle

Cardiac cycle refers to all events associated with blood flow through the heart. Cardiac cycle is the sequence of events as blood enters the atria, leaves the ventricles and then starts over.

Cardiac Cycle is alternating periods of systole and diastole. Each cycle takes an average of 0.8 seconds.

- **Systole** – contraction of heart muscle
- **Diastole** – relaxation of heart muscle

One heartbeat = one cardiac cycle

- Atria contract and relax
- Ventricles contract and relax

Phases of the Cardiac Cycle

1. Rest

- Both atria and ventricles in diastole
- Blood is filling both atria and ventricles due to low pressure conditions

2. Ventricular filling(Atrial Systole): mid-to-late diastole

- Heart blood pressure is low as blood enters atria (passively) and flows into ventricles
- AV valves are open, then atrial systole occurs
- **Right atrium contracts**
 - Tricuspid valve opens
 - Blood fills right ventricle
- **Left atrium contracts**
 - Bicuspid valve opens
 - Blood fills left ventricle

3. Isovolumetric Ventricular Contraction

- Increased pressure in the ventricles causes the AV valves to close.
 - ✓ Creates the first heart sound (lub)
- Atria go back to diastole(atria relax)
- No blood flow as semilunar valves are closed as well

4. Ventricular Ejection

Interventricular pressure overcomes aortic pressure

- ✓ Semilunar valves open

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- ✓ Blood is ejected

Right ventricle contracts

- Tricuspid valve closes
- Pulmonary semilunar valve opens
- Blood flows into pulmonary artery

Left ventricle contracts

- Bicuspid valve closes
- Aortic semilunar valve opens
- Blood pushed into aorta

1. Isovolumetric Ventricular Relaxation

- Interventricular pressure drops below aortic pressure
 - ✓ Semilunar valves close = second heart sound (dup)
- Pressure still hasn't dropped enough to open AV valves so volume remains same (isovolumetric)

Cardiac Cycle Influenced by:

- Exercise
- Parasympathetic nerves
- Sympathetic nerves
- Cardiac control center
- Body temperature
- Potassium ions
- Calcium ions

The Conduction System of the Heart

The cardiac cycle is regulated by specialized areas in the heart wall that forms the conduction system of the heart. Two of these areas are tissue mass called nodes; the third is a group of fibers called the Atrioventricular bundle. The Sinoatrial node, which is located in the upper wall of the right atrium and initiates the heartbeat, is called the pacemaker. The second node, located in the interatrial septum at the bottom of the right atrium, is called the

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Atrioventricular node. The Atrioventricular bundle, also known as the bundle of His, is located at the top of the interventricular septum; it has branches that extend to all parts of the ventricle walls. Fibers travel first down both sides of the interventricular septum in groups called the right and left bundle branches. Smaller Purkinje fibers then travel in a branching network throughout the myocardium of the ventricles

The order in which the impulses travel is as follows:

1. The **sinoatrial node** generates the electric impulse that begins the heart beat
2. the excitation wave travels throughout the muscle of each atrium, causing it to contract.
3. **Atrioventricular node** is stimulated. The relatively slower conduction through this node allows time for the atria to contract and complete the filling of the ventricles.
4. The excitation wave travels rapidly through the **bundle of His** and then throughout the ventricular walls by means of the **bundle branches and Purkinje fibers**.

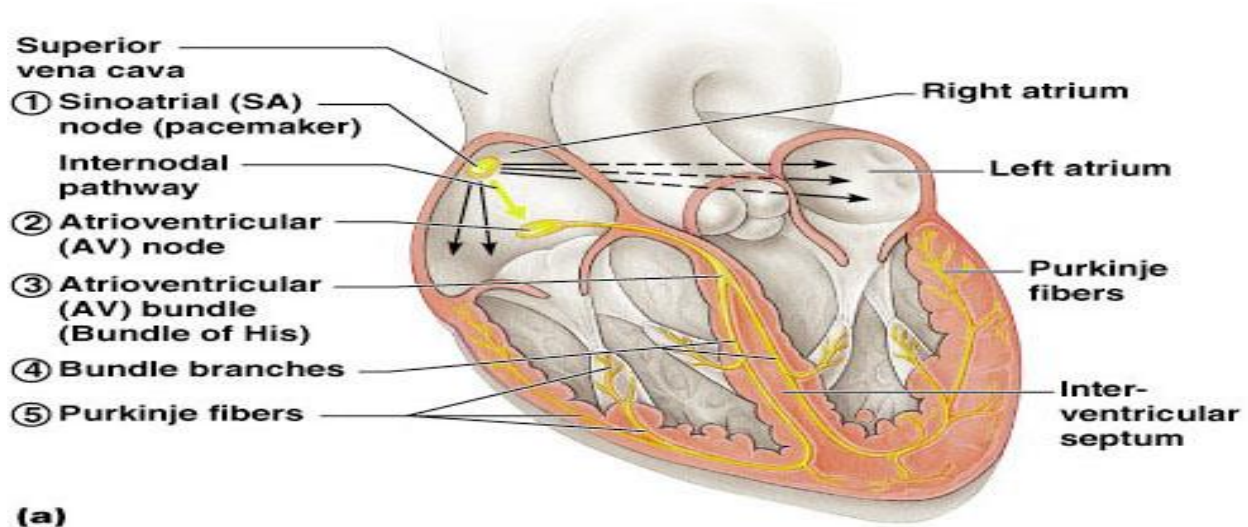


Figure 2.15: Figure showing Sequence of Excitation in Conduction System of the Heart

Heart Sounds

Heart Sounds are sounds produced associated with closing of heart valves(**lub** and **dub**)

- One cardiac cycle – two heart sounds

First sound (lub) occurs as AV valves close and signifies beginning of systole (contraction)

- When the ventricles contract, the tricuspid and bicuspid valves snap shut (systole)

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- Shorter than second sound

Second sound (dub) occurs when SL valves close at the beginning of ventricular diastole (relaxation)

-When the atria contract and the pulmonary and aortic valves snap shut **is longer and sharper.**

Some abnormal sounds called **murmurs** are usually due to faulty action of the valves. For example, if the valves fail to close tightly and blood leaks back, a murmur is heard. Another condition giving rise to an abnormal sound is the narrowing (stenosis) of a valve opening. The many conditions that can cause abnormal heart sounds include congenital defects, disease, and physiological variations. A murmur due to rapid filling of the ventricles is called a **functional (flow) murmur; such a murmur is not abnormal.** An abnormal sound caused by any structural change in the heart or the vessels connected with the heart is called an **organic murmur.**

Video link: https://www.youtube.com/watch?v=zNHI-l_c-ls

Electrocardiogram (ECG)

Is the device used to recorded electrical activity of heart. The following letters are used to represent the heart conductive activities and contractibility to record and interpret electrical activity of heart on ECG.

- **P** wave corresponds to depolarization of SA node
- **QRS** complex corresponds to ventricular depolarization
- **T** wave corresponds to ventricular repolarization
- Atrial repolarization record is masked by the larger **QRS** complex

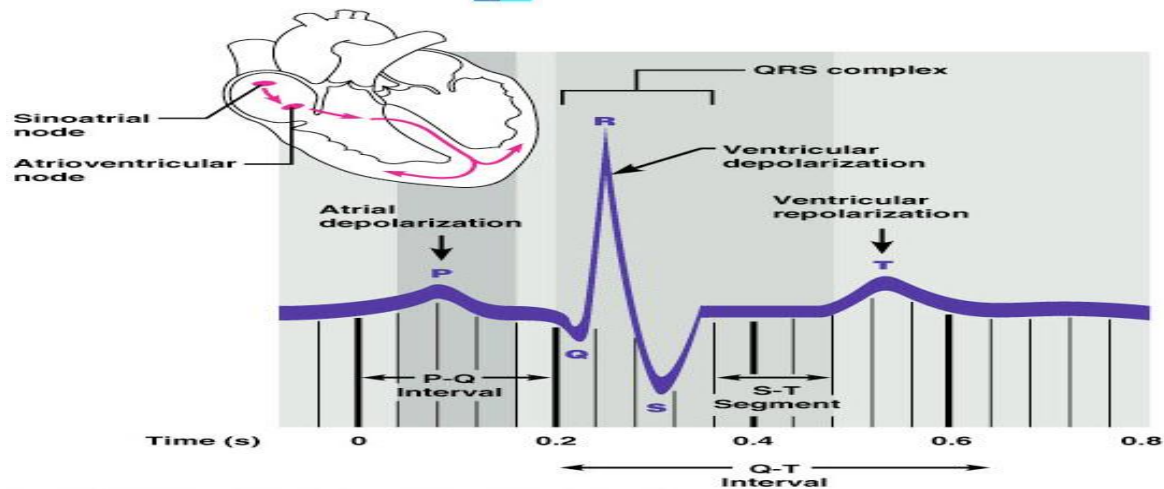


Figure 2.16: Figure showing electrical activity of heart conduction System of the Heart

Blood vessels and circulation

Is a closed pathway that carries blood from the heart to cells and back to the heart. Blood vessels have three layers

Three layers (tunics)

1. Tunic intima
 - Endothelium
 - Inner layer of vessels
2. Tunic media
 - Smooth muscle
 - Controlled by sympathetic nervous system
 - Middle layer of the vessels
3. Tunic externa
 - Mostly fibrous connective tissue
 - Outer layer of vessels

Types of blood vessel

- Arteries
- Arterioles
- Capillaries

- Venues
- Veins

Arteries and Arterioles

Arteries

- Strongest of the blood vessels
- Carry blood away from the heart under high pressure
 - ✓ Vasoconstriction
 - ✓ Vasodilation s

Aorta: Takes blood from the heart to the body & Largest artery in our body

Coronary arteries: Supply blood to heart muscle

Arterioles: Small branches of arteries

Veins and Venules

Veins: Are weakest vessels of our body which carries blood from parts of body to heart under no pressure.

- Does not move very easily
- Skeletal muscle contractions help move blood
- Sympathetic nervous system also influences pressure
- Valves prevent backflow of blood in this vessels

E.g

- Superior and inferior vena cava
 - Largest veins
 - Carry blood into right atrium

Venules: Small vessels formed when capillaries merge

Capillaries: allow for exchanges between the blood and body cells, or between the blood and air in the lung tissues. The capillaries connect the arterioles and Venules.

Major heart associated vessels

Aorta: Largest artery that carries oxygenated blood away from the heart to other body parts and leaves left ventricle

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Pulmonary arteries: are the only arteries that carry deoxygenated blood from heart to lung for oxygen exchange and leave right ventricle.

Vena cava: the largest vein of our body that carries deoxygenated blood from entire body to heart and enters right atrium.

Pulmonary veins: Are the only veins that carry oxygenated blood from lung to heart & enter left atrium

Vessels **returning blood to the heart** include: Superior and inferior venae cava & Right and left pulmonary veins

Vessels conveying **blood away from the heart** include: Pulmonary trunk, which splits into right and left pulmonary arteries and aorta

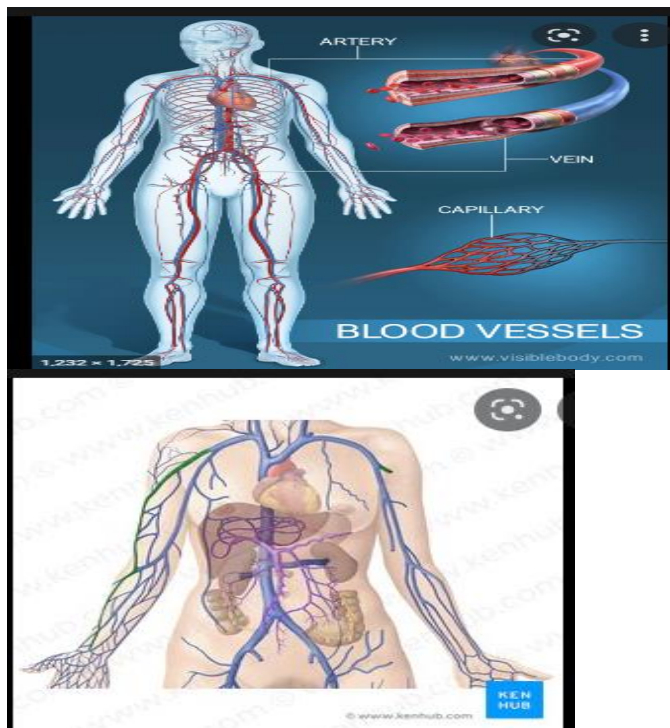


Figure 2.17: Figure showing arterial and venous passes ways in the body

Systemic Veins

Superficial Veins: are veins that found near the surface of the skin. The most important of these superficial veins are in the extremities. These include the following:

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The veins on the back of the hand and at the front of the elbow. Those at the elbow are often used for removing blood samples for test purposes, as well as for intravenous injections. The largest of this group of veins are the cephalic, the basilic, and the median cubital veins. The saphenous veins of the lower extremities, which are the longest veins of the body

- The great saphenous vein begins in the foot and extends up the medial side of the leg, the knee, and the thigh.
- It finally empties into the femoral vein near the groin.

Deep Veins: The deep veins tend to parallel arteries and usually have the same names as the corresponding arteries. *Examples* of these include the femoral and the iliac vessels of the lower part of the body and the brachial, axillary, and subclavian vessels of the upper extremities. However, exceptions are found in the veins of the **head and the neck**, the jugular veins drain the areas supplied by the carotid arteries. Two brachiocephalic (innominate) veins are formed, one on each side, by the union of the subclavian and the jugular veins. (**Remember** there is only one brachiocephalic artery).

Superior Vena Cava

The veins of the head, neck, upper extremities, and chest all drain into the superior vena cava, which goes to the heart. It is formed by the union of the **right and left brachiocephalic veins**, which drain the head, neck, and upper extremities. The **azygos vein** drains the veins of the chest wall and empties into the superior vena cava just before the latter empties into the heart.

Inferior Vena Cava

The inferior vena cava, which is much longer than the superior vena cava, returns the blood from the parts of the body below the diaphragm. It begins in the lower abdomen with the union of the two common iliac veins. It then ascends along the back wall of the abdomen, through a groove in the posterior part of the liver, through the diaphragm, and finally through the lower thorax to empty into the right atrium of the heart.

Circulatory Routes or Circuits

All the vessels together may be subdivided into two groups or circuits:

- pulmonary and
- Systemic which including coronary circulation

A. Pulmonary Circulation

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Carry blood to and from the lungs. They include the pulmonary artery and its branches to the capillaries in the lungs, as well as the veins that drain those capillaries. The pulmonary arteries carry blood low in oxygen from the right ventricle, while the pulmonary veins carry blood high in oxygen from the lungs into the left atrium. This circuit functions to eliminate carbon dioxide from the blood and replenish its supply of oxygen. It involves the circulation of blood from right atrium → right ventricle → **pulmonary artery trunk** → pulmonary arteries → lungs → pulmonary veins → heart (left atrium)

B. Systemic circulation

It is the largest circulatory route. It takes oxygenated blood from the left ventricle through the aorta to all parts of the body, including some lung tissue (not air sac or alveolus) and returns the deoxygenated blood to the right atrium, through the systemic veins; the superior vena cava, the inferior vena cava, and the coronary sinus.

It has several subdivisions.

Two of the several subdivisions are the **coronary circulation** and the **hepatic portal system/circulation**.

It involves the circulation of blood from left atrium → left ventricle → aorta → arteries → arterioles → capillaries → venules → veins → vena cava → heart (right atrium).

Coronary circulation is the functional blood supply to the heart muscle itself. It involves the circulation of blood from aorta → ascending aorta → Rt & Lt coronary artery → coronary sinus → right atrium

Hepatic portal system

Collection of veins carrying blood to the liver which involves the circulation of blood from aorta → abdominal aorta (unpaired) → hepatic artery → capillaries → inferior vena cava

Structure and Functions of the Respiratory System

Respiratory System: is the system that brings oxygen into the body and removes carbon dioxide and other gases (breathing/respiration). Breathing consists of two phases, inspiration and expiration

1. Inspiration- the process of taking in air (O₂)
2. Expiration- the process of blowing out air (CO₂)

Components of Respiratory system

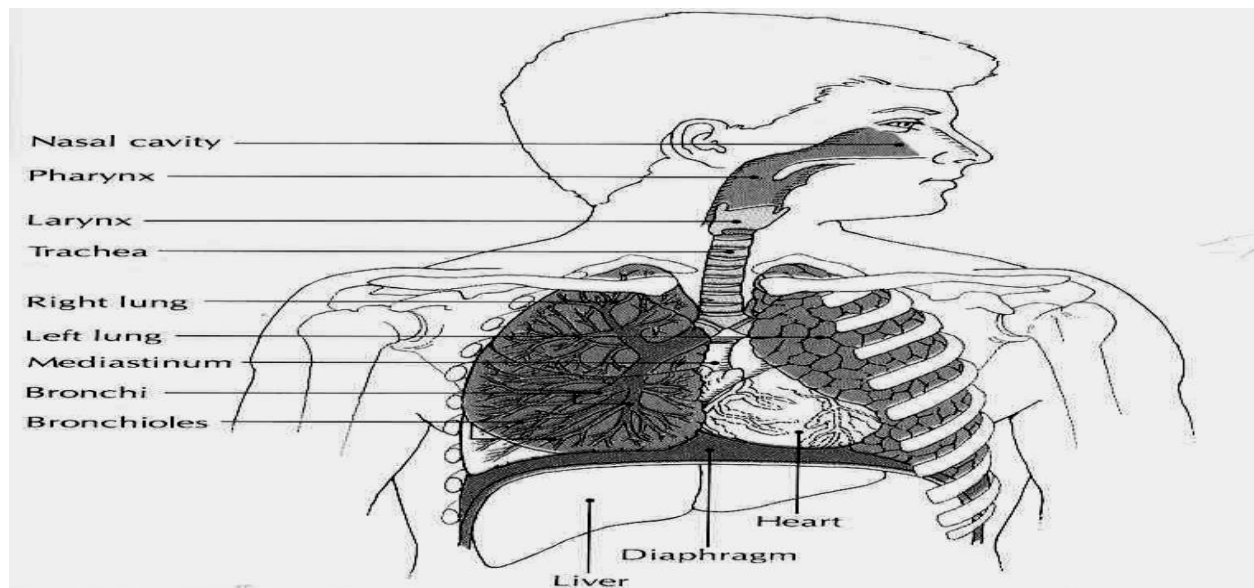


Figure 2.18: Figure showing Components of Respiratory system

Respiration can be classified as

- **External respiration:** gas exchange between air and blood (what can be exposed to the outside of the body)
- **Internal respiration:** gas exchange between blood and tissues (what cannot be exposed to the outside of the body)
- **Cellular respiration:** oxygen used to produce ATP (energy) and carbon dioxide

General Functions of the Respiratory System is :-

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- Air Distributor
- Gas exchanger
- Filters, warms, and humidifies air
- Influences speech
- Allows for sense of smell

Table 2.4: Organs in the Respiratory System

Structure	Function
Nose / nasal cavity	✓ Warms, moistens, & filters air as it is inhaled
Pharynx (throat)	✓ Passageway for food and air-leads to trachea
Larynx	✓ The voice box, where vocal chords are located
Trachea (windpipe)	✓ Keeps the windpipe "open" trachea is lined with fine hairs called <i>cilia</i> which filter air ✓ Before it reaches the lungs(larynx to bronchi)
Bronchi	✓ Two branches at the end of the trachea, each lead to a lung
Bronchioles	✓ A network of smaller branches leading from the bronchi into the ✓ Lung tissue & ultimately to air sacs
Alveoli	✓ The functional respiratory units in the lung where gases are exchanged

Classification of the Respiratory System

Upper respiratory tract (outside thorax)

- Nose
- Nasal Cavity

Upper respiratory tract is located between the roof of the mouth and the cranium, are the two spaces known as the nasal cavities. These two spaces are separated from each other by a partition called nasal septum.

Sinuses: These are air-filled spaces within the skull bones. Serve to reduce weight of the skull and give your voice a certain tone

Pharynx: Carries air into the respiratory tract and foods and liquids into the digestive system. The Upper portion located immediately behind the nasal cavity is called the nasopharynx. The middle section located behind the mouth is called the oropharynx, and the

lowest portion is called the laryngeal pharynx. This last section opens into the larynx toward the front and into the esophagus toward the back.

Larynx: is located between the pharynx and the trachea. It has a framework of cartilage that protrudes in the front of the neck and sometimes is referred to as the Adam's apple. The larynx is considerably larger in the male than in the female; hence, the Adam's apple is much more prominent in the male. At the upper end of the larynx are the vocal cords, which serve in the production of speech. A difference in the size of the larynx is what accounts for the difference between the male and female voices; because a man's larynx is larger than a woman's, his voice is lower in pitch. The nasal cavities, the sinuses, and the pharynx all serve as resonating chambers for speech,

Components of upper respiratory tract

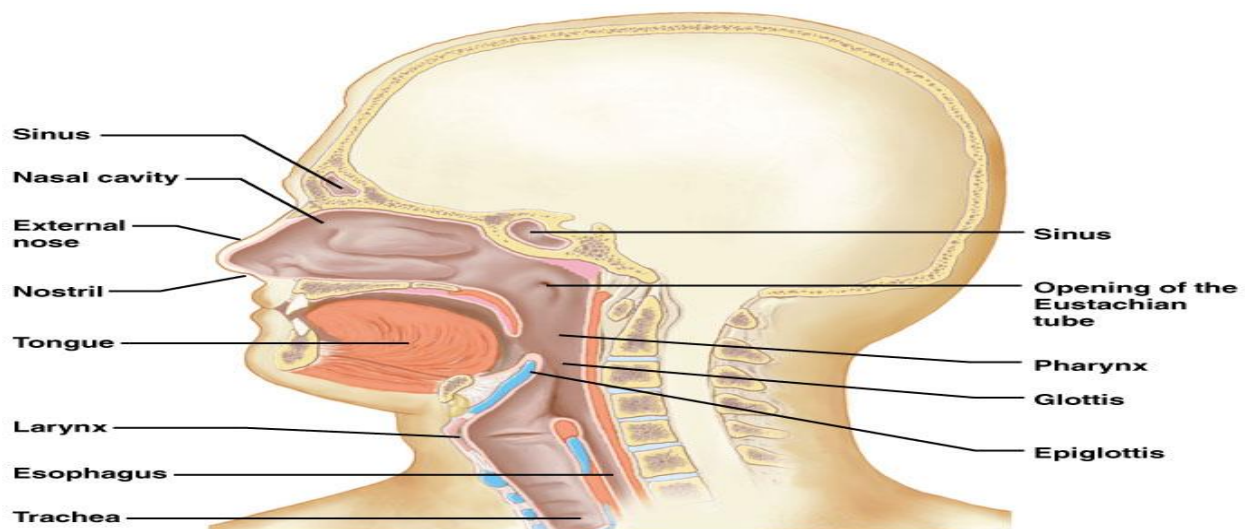


Figure 2.19: Figure showing Components of upper respiratory tract

Function of Upper Respiratory Tract

- Passageway for respiration
- Receptors for smell

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- Filters incoming air to filter larger foreign material
- Moistens and warms incoming air
- Resonating chambers for voice (voice box)

Lower respiratory tract (within thorax)

Trachea: is a tube that extends from the lower edge of the larynx to the upper part of the chest above the heart. It has a framework of cartilages to keep it open. These cartilages, shaped somewhat like a tiny horseshoe or the letter C, are found along the entire length of the trachea. All the open sections of these cartilages are at the back so that the esophagus can bulge into this section during swallowing. The purpose of the trachea is to conduct air between the larynx and the lungs.

Bronchial tree Includes *Bronchi* and *Bronchioles*. The right bronchus is considerably larger in diameter than the left and extends downward in a more vertical direction. Therefore, if a foreign body is inhaled, it is likely to enter the right lung. Each bronchus enters the lung at a notch or depression called the *hilus* or *hilum*. The blood vessels and nerves also connect with the lung in this region. The bronchi subdivide again and again, forming progressively smaller divisions called *bronchioles*. At the end of each of the smallest subdivisions of the bronchial tree there is the millions of sacs called alveolus, which is the place where gas exchange take place.

Lungs: Are the organs in which external respiration takes having right and left) which are located on each side which is extending from diaphragm to clavicles. It is a cone-shaped organ which is divided into lobes by fissures as right lung has three lobes and the left lung has two lobes. The membranes surrounding the lungs is called the pleura

Components of the Lower Respiratory Tract

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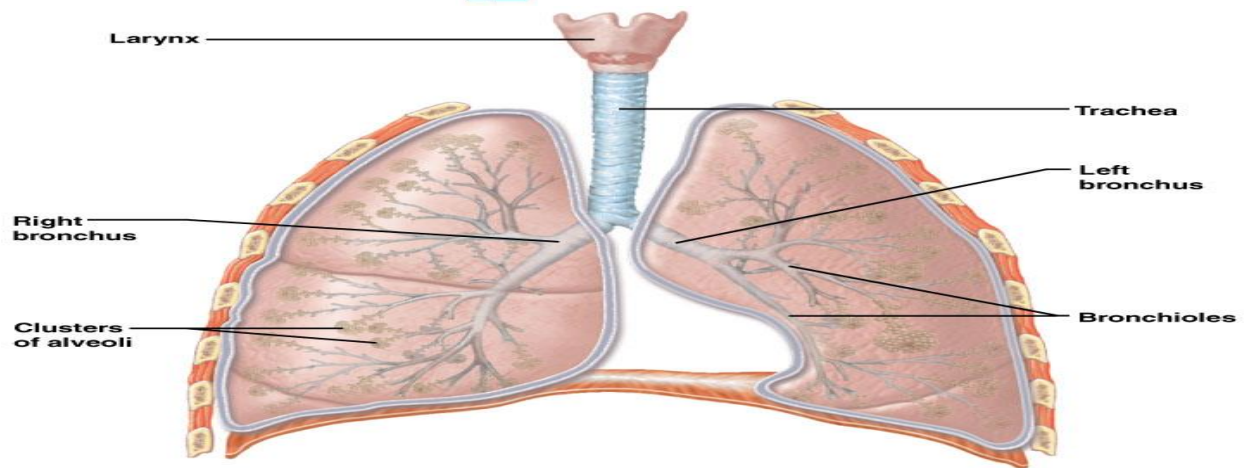


Figure 2.20: Figure showing Components of the Lower Respiratory tract

Functions of lower respiratory tract

- **Larynx:** maintains an open airway, routes food and air appropriately, assists in sound production
- **Trachea:** transports air to and from lungs
- **Bronchi:** branch into lungs
- **Lungs:** transport air to alveoli for gas exchange
- **Alveoli:** Gas exchange occurs

Exchange of gases (ventilation): is the movement of air into and out of the lungs, as in breathing. There are two phases of ventilation.

Inhalation is the drawing of air into the lungs which is characterized by:

- Increase size in thorax
- Chest expand
- Diaphragm contract and flattened
- Intercostal muscles contract
- Sternum raised
- Abdominal muscle relaxed

2. Exhalation is the expulsion of air from the lungs which is characterized by:

- ✓ Decrease size in thorax
- ✓ Chest relax
- ✓ Diaphragm relax
- ✓ Intercostal muscles relax

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- ✓ Sternum lowered
- ✓ Abdominal muscle contracted

Respiratory Volumes

Under normal conditions, the average adult takes 12 to 15 breaths a minute. A breath is one complete respiratory cycle that consists of one inspiration and one expiration. An instrument called a spirometer is used to measure the volume of air that moves into and out of the lungs, and the process of taking the measurements is called spirometry. Respiratory (pulmonary) volumes are an important aspect of pulmonary function testing because they can provide information about the physical condition of the lungs.

Tidal volume: The amount of air moved into or out of the lungs in quiet, relaxed breathing with average value=500 cc

Vital capacity: The volume of air that can be expelled from the lungs by maximum exhalation following maximum inhalation with average value=4800 cc

Residual volume: The volume of air that remains in the lungs after maximum exhalation with average value=1200 cc

Total lung capacity: the total volume of air that can be contained in the lungs after maximum inhalation with average value =6000 cc

Functional residual capacity: The amount of air remaining in the lungs after normal exhalation with average value -2400

Regulation of respiration

Regulation of respiration depends primarily on the respiratory control centers located in the medulla and pons of the brain stem. Nerve impulses from the medulla are modified by the centers in the pons. Respiration is regulated so that the levels of oxygen, carbon dioxide, and acid are kept within certain limits. The control centers regulate the rate, depth, and rhythm of respiration. From the respiratory center in the medulla, motor nerve fibers extend into the spinal cord. From the cervical (neck) part of the cord, these nerve fibers continue through the phrenic nerve to the diaphragm. The diaphragm and the other muscles of respiration are voluntary in the sense that they can be regulated by messages from the higher brain centers, notably the cortex. It is possible for a person to deliberately breathe more rapidly or more

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slowly or to hold his breath and not breath at all for a time. The chemoreceptors are found in structures called the carotid and aortic bodies, as well as outside the medulla of the brain stem. The carotid bodies are located near the bifurcation of the common carotid arteries, while the aortic bodies are located in the aortic arch. These bodies contain many small blood vessels and sensory neurons, which are sensitive to decreases in oxygen supply as well as to increases in carbon dioxide and acidity (H^+). Impulses are sent to the brain from the receptors in the carotid and aortic bodies. The receptor cells outside the medulla are affected by the concentration of hydrogen ion in cerebrospinal fluid (CSF) as determined by the concentrations of carbon dioxide in the blood

Structure and Functions of the Digestive System

Definition: It is the system that allows your body to obtain substances required to sustain life. The digestive system is used for breaking down food into nutrients which then pass into the circulatory system and are taken to where they are needed in the body. Digestion is the breakdown of large organic molecules into their component parts: carbohydrates into monosaccharide's, proteins into amino acids, and triglycerides into fatty acids and glycerol. Digestion consists of mechanical digestion, which involves mastication and mixing of food, and chemical digestion, break down/hydrolyze of complex food macromolecules into molecules small enough to be absorbable

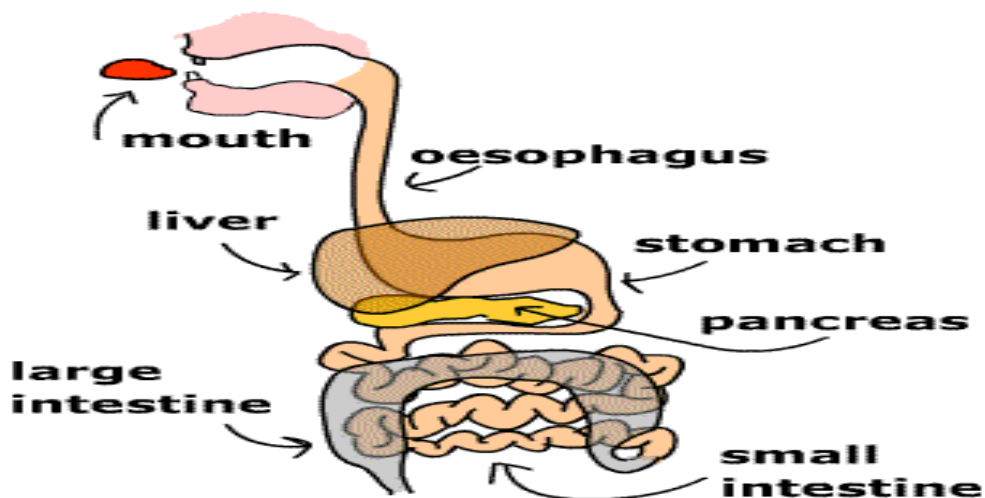


Figure 2.21: Figure showing organs of digestive systems

General Function of the Digestive System

- Ingestion.
- Mastication
- Peristalsis
- Mixing
- Enzyme Secretion.
- Absorption
- Elimination/egestion

Classification of digestive system

Based on purpose the digestive system may be divided into two groups of organs:

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The digestive tract/organs: a continuous passageway beginning at the mouth, where food is taken in, and terminating at the anus. E.g. mouth, esophagus, stomach, small intestine, large intestine and rectum.

The accessory organ: which are necessary for the digestive process but are not a direct part of the digestive tract. They release substances into the digestive tract through ducts. E.g. Liver, gall bladder, and pancreas

The Walls of the Digestive Tract

- **Mucosa** (superficial) inner layer of epithelial, connective and muscular tissues that faces lumen
- **Sub mucosa:** loose connective tissue with **blood** and **lymph vessels** and **submucosal plexus** of the **enteric nervous system**. **Muscularis:** layers of smooth muscle (superficial circular and deeper longitudinal) responsible for motility which is innervated by the **myenteric plexus** of the **enteric nervous system**
- **Serosa** (deep): Strong connective tissue membrane that maintains the structural integrity of the alimentary canal (visceral layer of the peritoneum)

Layers of the Alimentary Canal Wall

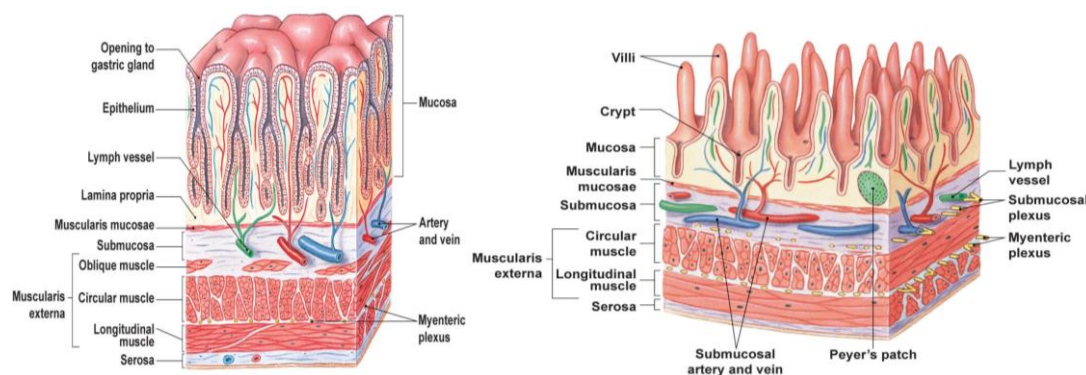


Figure 2.22: Figure showing layers of the Alimentary Canal Wall

Peritoneum

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The abdominal cavity is lined with a thin, shiny serous membrane that also covers most of the abdominal organs called peritoneum. The portion of this membrane that lines the abdomen is called the parietal peritoneum; that covering the organ is called the visceral peritoneum. In addition to these single layered portions of the peritoneum there are a number of double-layered structures that carry blood vessels, lymph vessels, and nerves, and sometimes act as ligaments supporting the organs which is called mesentery plexus

The Digestive Tract

The digestive tract is sometimes called the alimentary tract, derived from a Latin word that means "food". It is more commonly referred to as the gastrointestinal (GI) tract because of the major importance of the stomach and intestine in the process of digestion.

The tract includes:

- Mouth
- Pharynx
- Esophagus
- Stomach
- Small intestine
- Large intestine

The Mouth: The mouth, also called the *oral cavity*, is where a substance begins its travels through the digestive tract. In the oral cavity there is a muscular organ called the **tongue**, which is used for chewing and swallowing, and is one of the principal organs of speech. The tongue has on its surface a number of special organs, called *taste buds*, by means of which taste sensations (bitter, sweet, sour, or salty) can be differentiated. The oral cavity also contains the **teeth**. A child between 2 and 6 years of age has 20 teeth; an adult with a complete set of teeth has 32. Among these, the cutting teeth, or incisors, occupy the front part of the oral cavity, whereas the larger grinding teeth, the molars, are in the back. It has three digestive functions:

1. To receive food, a process called *ingestion*
2. To prepare food for digestion
3. To begin the digestion of starch.

Teeth

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The teeth are the hardest substances in the human body. Besides being essential for chewing, the teeth play an important role in speech. Parts of the teeth include:

- **Enamel:** The hardest, white outer part of the tooth. Enamel is mostly made of calcium phosphate, a rock-hard mineral.
- **Dentin:** A layer underlying the enamel. It is a hard tissue that contains microscopic tubes. When the enamel is damaged, heat or cold can enter the tooth through these paths and cause sensitivity or pain.
- **Pulp:** The softer, living inner structure of teeth. Blood vessels and nerves run through the pulp of the teeth.
- **Cementum:** A layer of connective tissue that binds the roots of the teeth firmly to the gums and jawbone.
- **Periodontal ligament:** Tissue that helps hold the teeth tightly against the jaw.

A normal adult mouth has 32 teeth, which (except for wisdom teeth) have erupted by about age 13:

- **Incisors (8 total):** The middlemost four teeth on the upper and lower jaws.
- **Canines (4 total):** The pointed teeth just outside the incisors.
- **Premolars (8 total):** Teeth between the canines and molars.
- **Molars (8 total):** Flat teeth in the rear of the mouth, best at grinding food.
- **Wisdom teeth or third molars (4 total):** These teeth erupt at around age 18, but are often surgically removed to prevent displacement of other teeth.

The Salivary Glands: Are a pairs of glands that secrete mucus and enzyme called saliva that function as accessory organs. The saliva also contains a watery mixture contains mucus and an enzyme called **salivary amylase**, which begins the digestive process by converting starch to sugar. The main function of the saliva are:

- ✓ To moisten the food and facilitate the processes of chewing, or *mastication*, and *swallowing*, or *deglutition*.
- ✓ Saliva helps keep the teeth and mouth clean and reduce bacterial growth. For example:

The parotid glands, the largest of the group, are located below and in front of the ear.

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The submandibular, or submaxillary, glands are located near the body of the lower jaw

The sublingual glands are under the tongue.

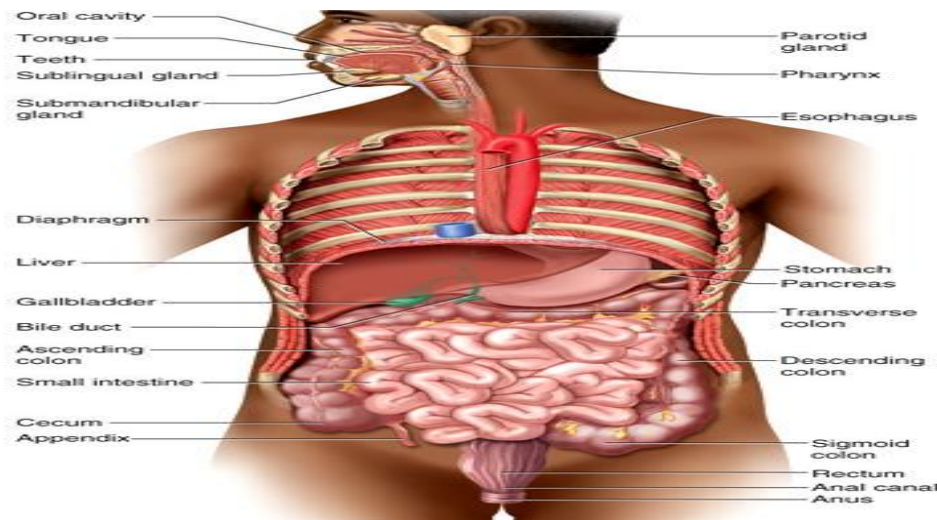


Figure 2.23: Figure showing layers of the Alimentary Canal Wall

The Pharynx and Esophagus (20 cm)

The pharynx is commonly referred to as the throat. The oral part of the pharynx is visible when you look into an open mouth and depress the tongue which is called oropharynx. In swallowing, a small portion of chewed food mixed with saliva, called a bolus, is pushed by the tongue into the pharynx, swallowing occurs rapidly by an involuntary reflex action. At the same time, the soft palate and uvula are raised to prevent food and liquid from entering the nasal cavity, and the tongue is raised to seal the back of the oral cavity. The entrance of the trachea is guarded during swallowing by a leaf-shaped cartilage, the epiglottis, which covers the opening of the larynx. The swallowed food is then moved by peristalses into esophagus, a muscular tube about 25cm (10 inches) long that carries food into the stomach. No additional digestion occurs in the esophagus.

Function: to take food from mouth to stomach by muscular action called peristalsis. Before joining the stomach, the esophagus must pass through the diaphragm. It passes through a space in the diaphragm called the esophageal hiatus

The Stomach is an expanded J-shaped organ in the upper left region of the abdominal cavity. it has an inner oblique (angled) layer that aids in grinding food and mixing it with digestive

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juices. The left-facing arch of the stomach is the greater curvature, whereas the right surface forms the lesser curvature. Each end of the stomach is guarded by a muscular ring, or sphincter, that permits the passage of substances in only one direction. Between the esophagus and the stomach is the lower esophageal sphincter (LES). This valve has also been called cardiac sphincter because it separates the esophagus from the region of the stomach that is close to the heart. Between the distal, or far, end of the stomach and the small intestine is the pyloric sphincter. The region of the stomach leading into this sphincter is called the pylorus, is important in regulating how rapidly food moves into the small intestine. The stomach serves as a storage pouch, absorption (alcohol) digestive organ, and churn/kill bacteria in food.

- When the stomach is empty, the lining forms many folds called **rugae**.
- These folds disappear as the stomach expands.
- Special cells in the lining of the stomach secrete substances that mix together to form gastric juice, the two main components of which are:

Hydrochloric acid (HCL): Is a strong acid that softens the connective tissue in meat and destroys foreign organisms.

Pepsin: a protein-digesting enzyme. This enzyme is produced in an inactive form and is activated only when food enters the stomach and HCL is produced. The semi-liquid mixture of gastric juice and food that leaves the stomach to enter the small intestine is called **chyme**.

Parts of stomach

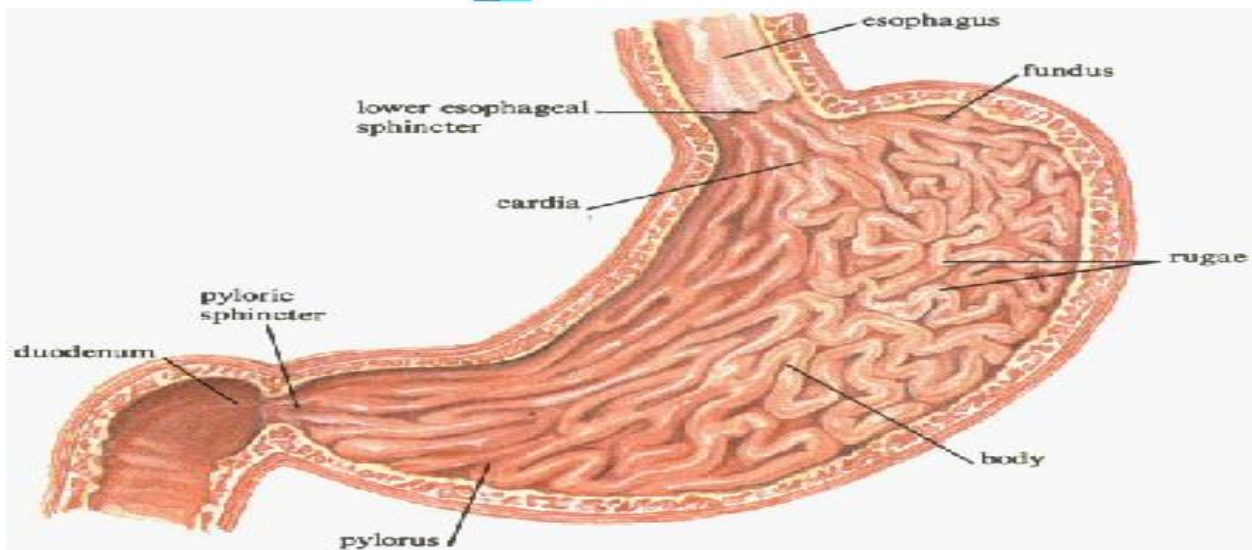


Figure 2.24: Figure showing layers of the parts of stomach

Small Intestine

The small intestine has three parts: the duodenum, jejunum, and ileum. It helps to further digest food coming from the stomach. It absorbs nutrients (vitamins, minerals, carbohydrates, fats, proteins) and water from food so they can be used by the body. The small intestine is the longest part of the digestive tract. It is known as the small intestine because, it is smaller in diameter, with an average width of about 2.5 cm (1 inch).

- When relaxed to its full length, the small intestine is about 6 m (20 feet) long.
- Is the part of digestive tract in which majority of absorption and digestion occurs

Parts of small intestine

Based on function the small intestine is divided in to three parts:

Duodenum: is the shortest and proximal part of small intestine (25 cm). Majority of our body digestion takes place. Secretes the enzymes responsible for the digestion of protein and carbohydrate. Hepatic and pancreatic secretions (**bile** and **pancreatic juice**) enters which are used for fat digestion and neutralizing the chyme respectively.

Jejunum: Is the middle part of small intestine (250cm) and majority of absorption takes place in it. It has tiny fingerlike projections called villi lining it, which increase the surface area for absorbing nutrients. Each villi itself has tiny fingerlike projections called **microvillus**, which further increase the surface area for absorption.

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Ileum: Is the last and longest portion of the small intestine (360 cm) and it has fewer villi and basically compacts the leftovers to pass through the **caecum** into the large intestine.

Structural Anatomy of Small Intestine

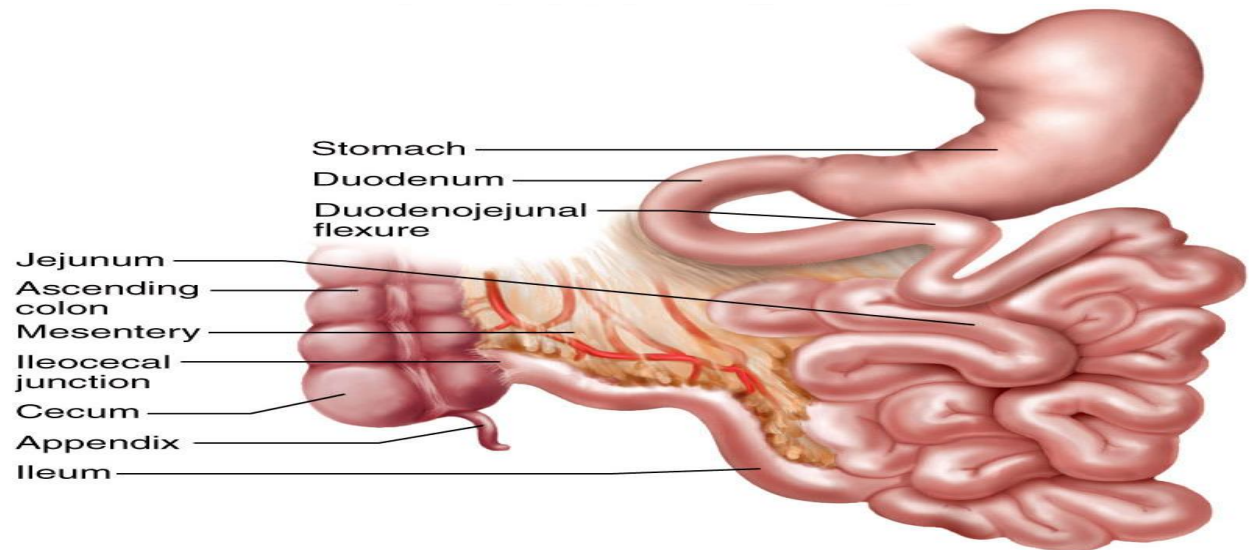


Figure 2.25: Figure showing Structural Anatomy of Small Intestine

Large Intestine

The large intestine is the last part of the gastrointestinal (GI) tract, the long, tube-like pathway that food travels through your digestive system. It follows from the small intestine and ends at the anal canal, where food waste leaves your body. The large intestine, also called the large bowel, is where food waste is formed into poop, stored, and finally excreted. It includes the colon, rectum and anus.

More specifically:

- About 1.5 meters (5feet) long accepts what small intestines don't absorb
 - Is about 6.5 cm (2.5 inches) in diameters
 - Is the part of digestive tract which is :
 - Used to absorb water from the waste material leftover and
 - Used to produce vitamin K and some B vitamins using the helpful bacteria that live here.
 - Concentrate wastes

Parts of large intestine

- **Cecum**
- **Colon**
 - ✓ **Ascending colon:** It is the part of colon that extends upward along the right side of the abdomen toward the liver.
 - ✓ **transverse colon:** It is the part of colon that bends across the abdomen
 - ✓ **Descending colon:** it is the part of transverse colon downward on the left side of the abdomen to the pelvis.
 - ✓ **Sigmoid colon:** the lower part of the colon bends posteriorly in an s shape and continues downward in to rectum.
- **Rectum-** is the part of large intestine that serves as a temporary storage area for indigestible or unabsorbable food residue.
- **Anal canal-** A narrow portion of the distal large intestine which leads to the outside of the body through an opening called the **anus**. The involuntary muscles within the walls of the large intestine propel solid waste material, called **feces or stool**, toward the rectum. This material is then eliminated from the body by both voluntary and involuntary muscle actions, a process called **defecation**.

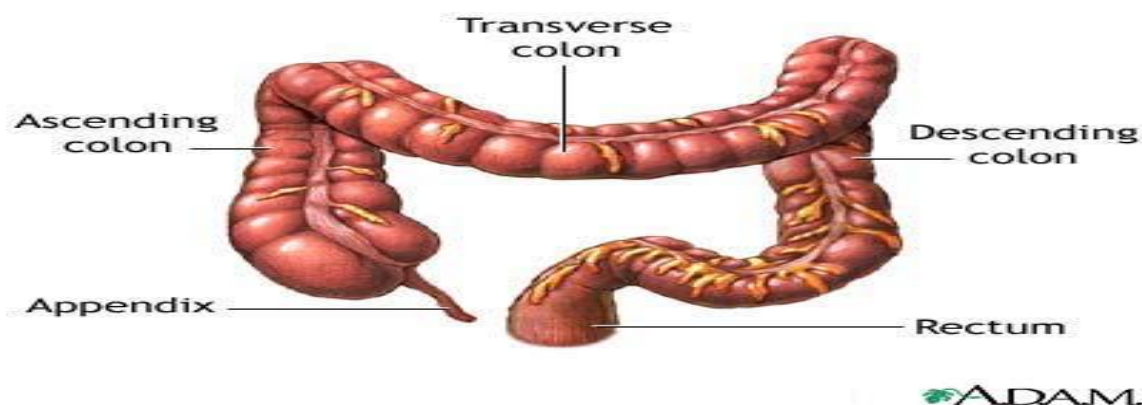


Figure 2.26: Figure showing parts of large Intestine

The Accessory Structures

The Liver

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- The liver, often referred to by the word root *hepat*, is the largest glandular organ of the body .
- It is located in the upper right portion of the abdominal cavity under the dome of the diaphragm.

The lower edge of a normal-sized liver is level with the lower margin of the ribs

- The human liver is the same reddish brown color as the animal liver
- It has a large right lobe and a smaller left lobe; the right lobe includes two inferior smaller lobes.
- The liver is supplied with blood through two vessels: the portal vein and the hepatic artery.
- These vessels deliver about 1 1/2 quarts of blood to the liver every minute.

The hepatic artery carries oxygenated blood, whereas the portal system of veins carries blood that is rich in the end products of digestion

Function of liver

- ✓ Production of bile
- ✓ Storage of glucose - glycogen
- ✓ Storage of vitamins, b12, a, d, e, k
- ✓ Bilirubin gives stool its characteristic dark color
- ✓ Removes toxins from blood
- ✓ Manufactures blood proteins such as albumin, globulins, and clotting factors
- ✓ The synthesis of urea, a waste product of protein metabolism
- ✓ The main digestive function of the liver is the production of bile.
- ✓ The salts contained in bile act like a detergent to emulsify fat, that is, to break up fat into small droplets that can be acted on more effectively by digestive enzymes.
- ✓ Bile also aids in the absorption of fat from the small intestine.
- ✓ Bile leaves the lobes of the liver by two ducts that merge to form the common hepatic duct.

After collecting bile from the gallbladder, this duct, now called common bile duct, delivers bile into the duodenum

Structure of liver

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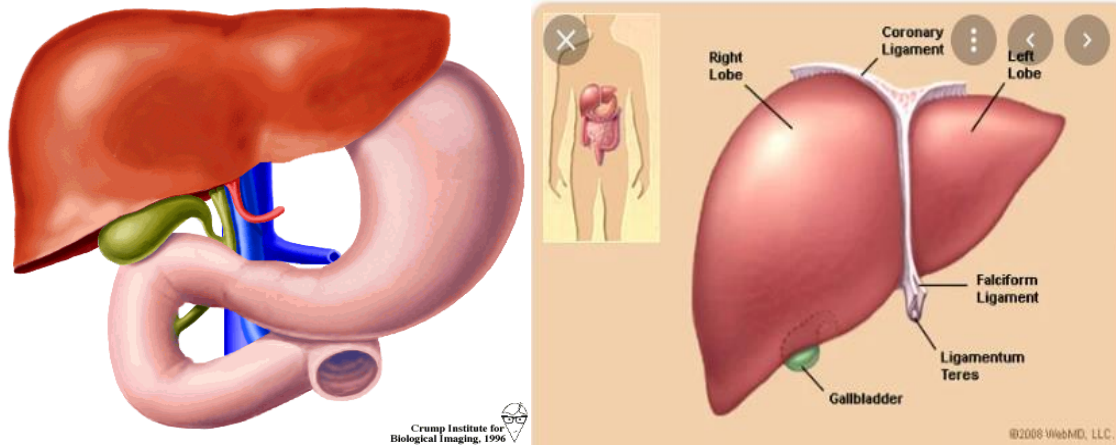


Figure 2.27: Figure showing Structure of liver

The Gallbladder: Is a muscular sac on the inferior surface of the liver that serves as a storage pouch for bile. When chyme enters the duodenum, the gallbladder contracts, squeezing bile through the cystic duct and into the common bile duct leading to the duodenum.

The Pancreas: It is a long gland that extends from the duodenum to the spleen. The pancreas produces enzymes that digest fats, proteins, carbohydrates, and nucleic acids. The protein digesting enzymes are produced in inactive forms, which must be converted to active forms in the small intestine by other enzymes. The pancreas also produces large amounts of alkaline fluid, which neutralizes the chyme in the small intestine, thus protecting the lining of the digestive tract. These juices collect in a main duct that joins the common bile duct or empties into the duodenum near the common bile duct. Most persons also have an additional smaller duct that opens into the duodenum. In some cases of gallbladder disease, infection may extend to the pancreas and cause abnormal activation of the pancreatic enzymes. In either circumstance, the pancreas suffers destruction by its own juice, and the outcome can be fatal; this condition is known as acute pancreatitis. The pancreas also functions as an endocrine gland, producing the hormones **insulin** and **glucagons** that regulate sugar metabolism. These secretions of the islets cells are released directly into the blood.

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Structure of pancreas

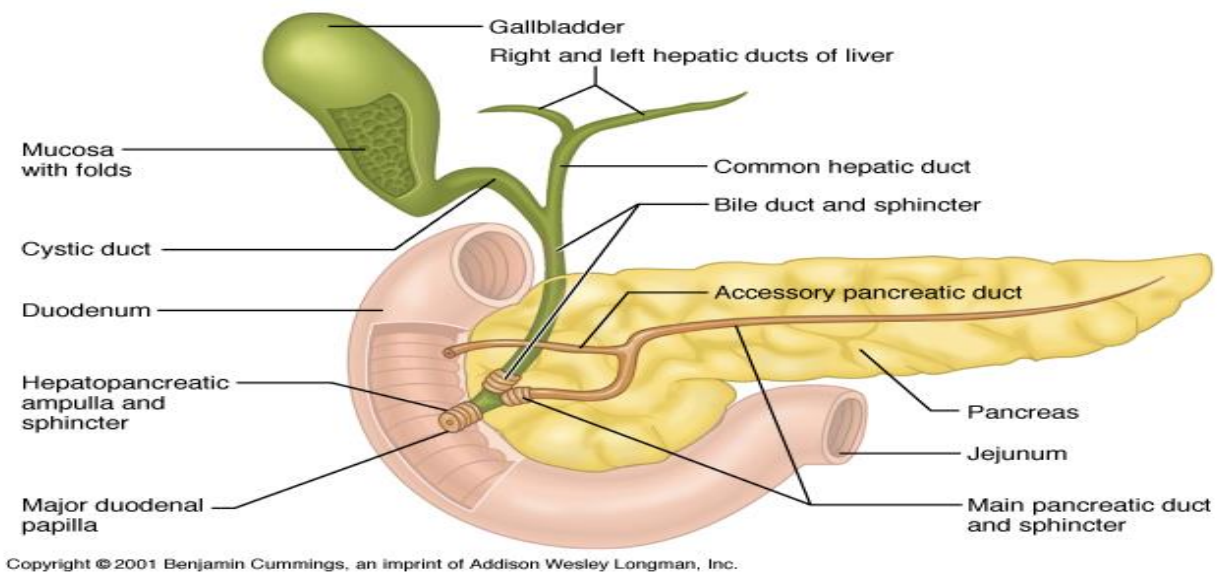


Figure 2.28: Figure showing Structure of the pancreas

Digestion and absorption of carbohydrates fats and proteins

Digestion: Is a complex process that occurs in the alimentary canal, consists of physical and chemical changes that prepare food for absorption.

Mechanical digestion: breaks food into tiny particles, mixes them with digestive juices, moves them along the alimentary canal, and finally eliminates the digestive wastes from the body. E.g. Chewing or mastication, swallowing or deglutition, peristalsis, and defecation are the main processes of mechanical digestion

Chemical digestion: breaks down large, non-absorbable food molecules—molecules that are able to pass through the intestinal mucosa into blood and lymph. Chemical digestion consists of numerous chemical reactions catalyzed by enzymes in saliva, gastric juice, pancreatic juice, and intestinal juice

Chemical Digestion

- **Saliva:** Amylase-Starch (Polysaccharide)-Maltose (disaccharide)
- **Gastric Juice:** protease (Pepsin) plus hydrochloric acid -Proteins Partially digested proteins

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- **Pancreatic Juice:** Protease (trypsin) and Lipase-Proteins (intact or partially digested Peptides).
 - Fats emulsified by bile-Fatty acids, amino acids and glycerol
- **Pancreatic Juice:** Amylase-Starch-Maltose
- **Intestinal Juice:** Peptidases-Peptides-Amino acids
- **Intestinal Juice:** Sucrase- Sucrose (cane sugar-Glucose and fructose(simple sugars))
- **Intestinal Juice:** Lactase- Lactase (Milk sugar)-Glucose and galactose
- **Intestinal Juice:** Maltase-Maltase (malt sugar)-(Simple sugars Glucose

Regulation of the Digestive System

Both nervous and chemical mechanisms regulate the movement, secretion, absorption, and elimination processes digestive system. Some of the nervous control is local, occurring as the result of local reflexes within the enteric plexus, and some is more general, mediated largely by the parasympathetic division of the ANS through the vagus nerve. The digestive tract produces a number of hormones, such as gastrin, secretin, and others, which are secreted by endocrine cells of the digestive system and carried through the circulation to target organs of the digestive system or to target tissues in other systems. These hormones help regulate many gastrointestinal tract functions as well as the secretions of associated glands such as the liver and pancreas.

Structure and Functions of the Urinary System

Definition: The urinary system maintains an appropriate fluid volume by regulating the amount of water that is excreted in the urine. Other aspects of its function include regulating the concentrations of various electrolytes in the body fluids and maintaining normal pH of the blood.-is the system that removes and eliminates waste products from the body. It is also called the excretory system of the body because of its functions to remove and eliminate waste products from the body. The principal function of the urinary system is to maintain the volume and composition of body fluids within normal limits. One aspect of this function is to rid the body of waste products that accumulate as a result of cellular metabolism, and, because of this, it is sometimes referred to as the excretory system.

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Major functions of the urinary system

- Excretion of wastes
- Hormonal production(rennin-angiotensin and erythropoietin)
- Acid base balancing

The urinary system consists of:

1. **Two kidneys:** this organ extracts wastes from the blood, balance body fluids and form urine.
2. **Two Ureters:** this tube conducts urine from the kidneys to the urinary bladder
3. **Urinary bladder:** this reservoir receives and stores the urine brought to it by the two ureters.
4. **Urethra:** this tube conducts urine from the bladder to the outside of the body for elimination.

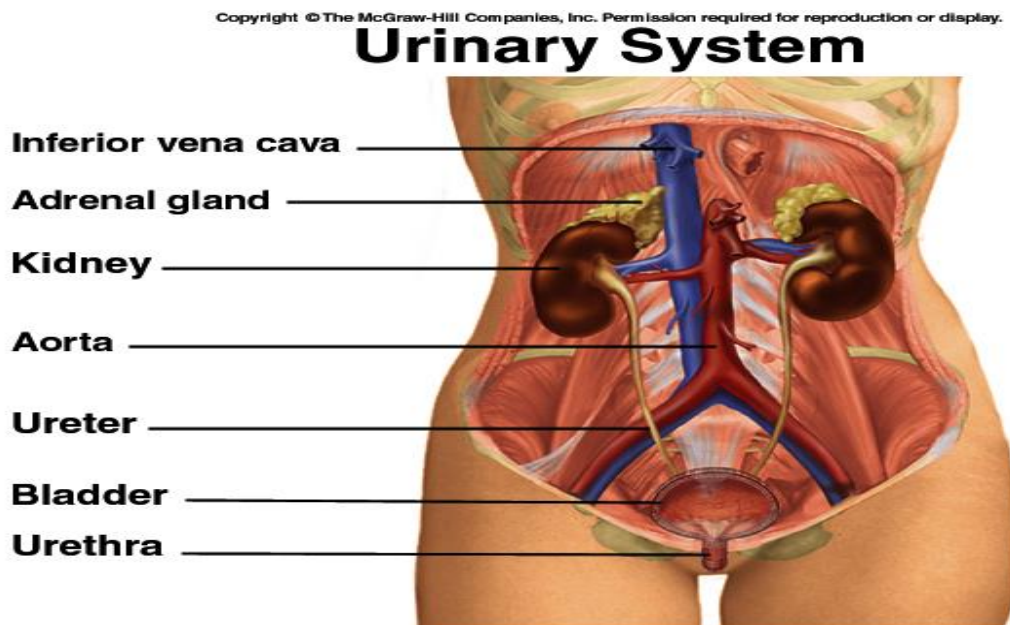


Figure 2.29: Figure showing urinary system

The external anatomy of kidney

A pair of reddish brown, bean shaped organ located in the posterior wall of the abdominal region, one in each side of the vertebra column. They usually span between T12 to L3. They are protected at least partially by the last pair of ribs and capped by the adrenal gland. The

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bean shape of the kidney is medially concave and laterally convex. On the medial concave border is the **hilus** (small indented area) where blood vessels, nerves & ureters enter and leave the kidney.

The internal anatomy of kidney

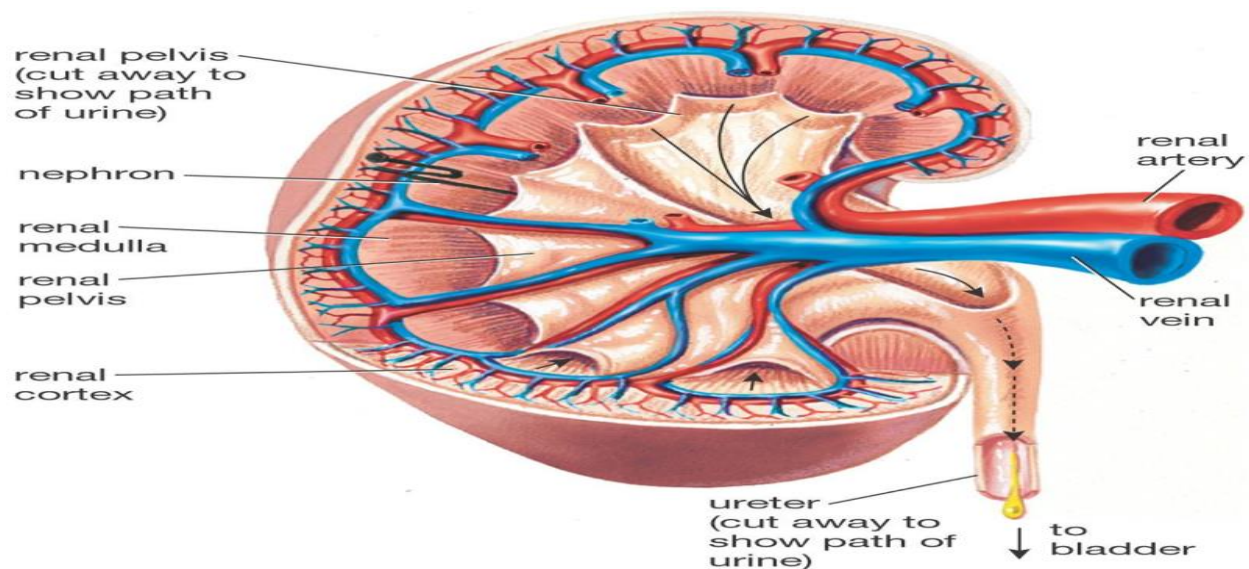
A Sagittal section of the kidney reveals three distinct regions of the kidney called pelvis, medulla and cortex (from inside out).

Renal pelvis: Is the large collecting space with in the kidney formed from the expanded upper portion of the ureters and the inner region of the kidney.

Renal medulla is the middle portion of the kidney. It consists of 8 to 18 renal pyramids, which are longitudinally striped, one cone shaped area.

- The base of each pyramid is adjacent to the outer cortex.
- The apex of each renal pyramid ends in papilla, which opens to a minor calyx.
- Pyramids contain tubules and collecting ducts of the nephron.
- Tubules involved in transportation and re-absorption of filtered materials.

Renal cortex is the outermost portion of the kidney and it is divided in to two region the outer *cortical* and the *inner juxtamedullary* region. The cortical tissue that penetrates between pyramids forms **Renal Columns**. **The renal columns** composed of mainly collecting tubules.



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Figure 2.30: Figure showing parts of the kidney

Blood circulation: Blood is supplied to the kidneys by renal artery and drainage is by renal vein

The nephron

The nephron is **the functional unit of the kidney**. This means that each separate nephron is where the main work of the kidney is performed. A nephron is made of two parts: a renal corpuscle, which is the initial filtering component, and, a renal tubule that processes and carries away the filtered fluid.

Nerve supply:

- By renal plexus of autonomic nervous system
- Is the basic functional unit of the each kidney
- Is an independent urine-forming unit.
- Each kidney contains approximately one million nephrons.

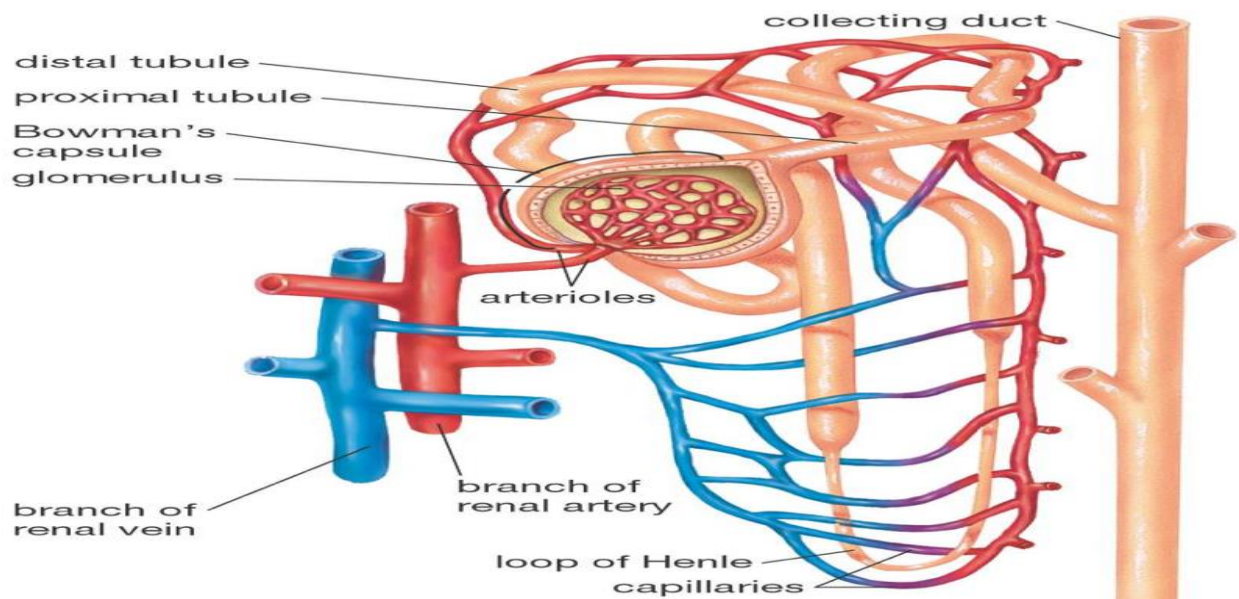


Figure 2.31: Figure showing nephrons

Urine Formation

The kidneys filter unwanted substances from the blood and produce urine to excrete them. There are three main steps of urine formation: glomerular filtration, reabsorption, and

secretion. These processes ensure that only waste and excess water are removed from the body. More specifically, the processes in urine formation are includes:

1. Blood filtration, every day the kidneys filter 1700 Liter of blood
2. Tubular re-absorption
3. Tubular secretion

Average Comparison of filtration, re-absorption and excretion, variation in urine composition will occur during variation in the daily diet, fluid intake, weather and exercise

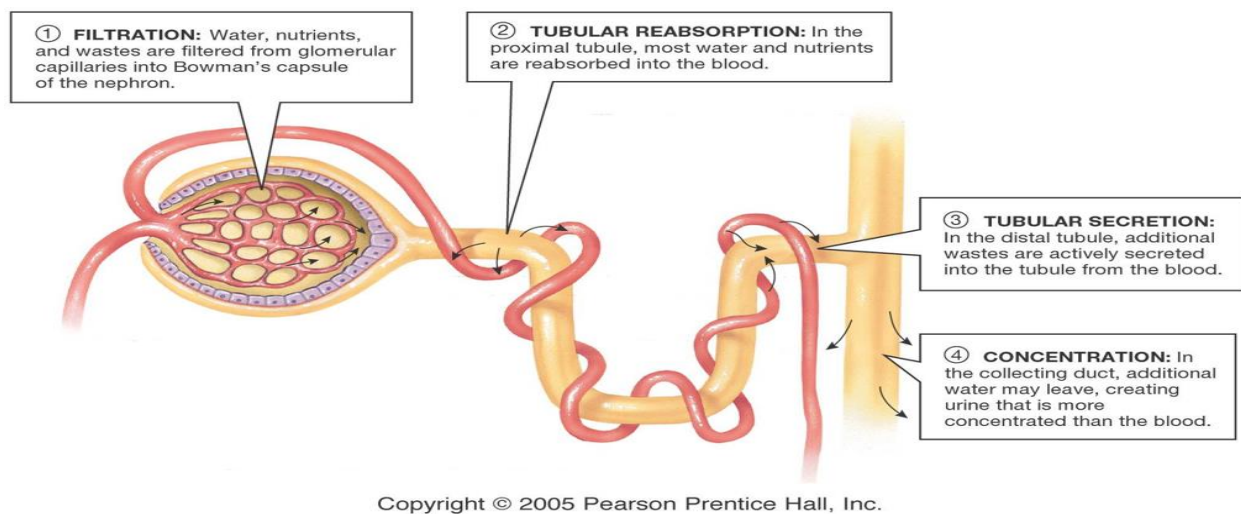


Figure 2.32: Figure showing Urine Formation

The major functions of the kidneys

- Elimination of wastes
- Regulation of total body water balance.
- Control of the chemical composition of the blood and other body fluid
- Control of acid base balance
- Filter blood plasma
- Regulate blood volume, pressure
- Regulate fluid osmolality
- Synthesize calcitriol (Vitamin D)
- Detoxify free radicals, drugs
- Gluconeogenesis
- Secrete rennin
- Secrete erythropoietin (EPO)

Ureters

It is a tube that carries urine from the kidney to the bladder. It transport urine from the renal pelvis to the urinary bladder. Each ureter is a small tube, about 25 cm long that carries urine from the renal pelvis to the urinary bladder. It descends from the renal pelvis, along the posterior abdominal wall, which is behind the parietal peritoneum, and enters the urinary bladder on the posterior inferior surface. The wall of the ureter consists of three layers. The outer layer, the fibrous coat, is a supporting layer of fibrous connective tissue. The middle layer, the muscular coat, consists of the inner circular and outer longitudinal smooth muscle. The main function of this layer is peristalsis: to propel the urine. The inner layer, the mucosa, is transitional epithelium that is continuous with the lining of the renal pelvis and the urinary bladder. This layer secretes mucus, which coats and protects the surface of the cells.

Urinary Bladder

The urinary bladder is a temporary storage reservoir for urine. It is located in the pelvic cavity, posterior to the symphysis pubis, and below the parietal peritoneum. The size and shape of the urinary bladder varies with the amount of urine it contains and with the pressure it receives from surrounding organs. It is a hollow, muscular organ that collects urine from the ureters and store until (temporarily) it is excreted.

- It usually accumulates 300 to 400 ml of urine but it can expand as much twice.
- It is located on the floor of the pelvic cavity
- Like the kidneys and ureters, it is retroperitoneal (behind the peritoneum).
- In males it is anterior to the rectum and above the prostate gland.
- In females, it is located somewhat lower, anterior to the uterus and upper vagina.

Has three opening and layers (two from ureters and one urethra)

- Outer layer-tunica serosa: Loose connective tissue
- Middle layer-tunica Muscularis: Smooth muscle and elastic fibres
- Inner layer-tunica mucosa: Lined with transitional epithelium

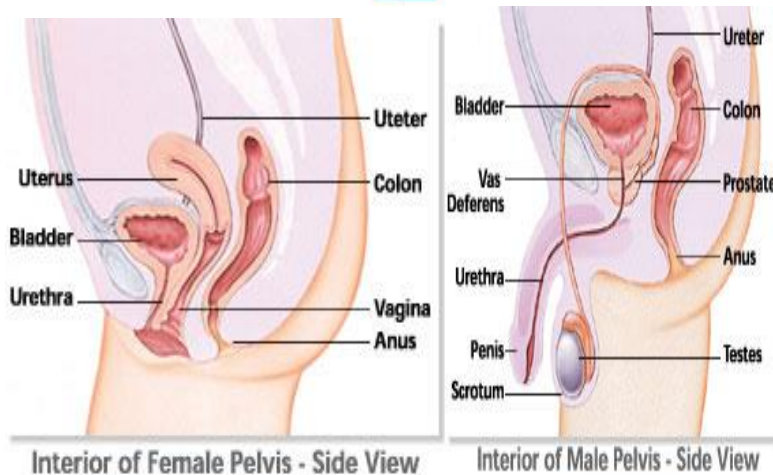


Figure 2.33: Figure showing parts of Urinary Bladder

Urethra

The urethra is the tube that lets urine leave your bladder and your body. If you were assigned male at birth, your urethra passes through your prostate and into your penis. If you were assigned female at birth, your urethra is much shorter.

Urethra:

- Is a tube of smooth muscle lined with mucosal layer.
- It joins the bladder at its inferior surface and transport urine out side the body during urination.
- It is 4 c.m in female and 12-14 c.m in length in male.
- In females it opens between vagina and clitoris.
- In male it pass through prostate, membranous portion (pelvic diaphragm muscle), spongy portion (that pass through corpus spongusos) and open at the tip of penis.

Structure and Functions of the Reproductive System

The human reproductive system includes the male reproductive system which functions to produce and deposit sperm; and the female reproductive system which functions to produce egg cells, and to protect and nourish the fetus until birth. Reproduction is means of sexual intercourse produces new human beings and hereditary traits to be passed from both parents to their children's to produce and deliver **sperm** to the female reproductive tract-in males and to produce **ova** and carrying the developing **embryo**- in females.

The male reproductive system

- The male reproductive organs is divided in to two:-
 - External reproductive organs
 - ✓ Penis
 - ✓ scrotum
 - Internal reproductive organs
 - ✓ The testes
 - ✓ The ducts
 - ✓ Epididymis
 - ✓ Vas deferens
 - ✓ Ejaculatory duct
 - ✓ Urethra
 - ✓ The accessory glands
 - ✓ Seminal vesicle
 - ✓ Prostate
 - ✓ Bulbourethral glands

Male internal reproductive organs

Tastes: Are paired male reproductive organs (gonads), which produce sperm. During fetal life, tests are formed just below the kidneys inside the abdomino-pelvic cavity. By third fetal month it starts to descend and by the seventh month of fetal life it passes through the inguinal canal. The inguinal canal is a passageway leading to scrotum. Each testis is oval-shaped measuring 4.5 c.m. long, 2.5 c.m wide in adult. It is enclosed in fibrous sac called ***Tunica Albuginea***. The sac extends in to a testis to divide the testis in to lobules. Next to tunica albuginea is ***Tunica Vaginalis***, which is a continuation of membrane of abdomino-pelvic cavity.

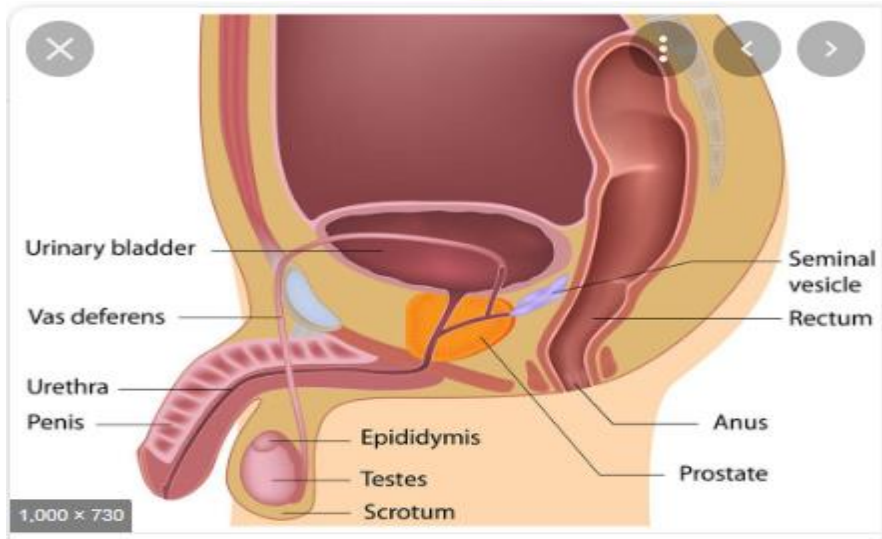


Figure 2.34: Figure showing internal reproductive organs of male

Genital ducts

Seminiferous tubules: Are site for spermatozoa production. Each test contains 800 lightly coiled somniferous Tubules which produce thousands of sperm each second.

Epididymis: Cord-like structure at the back of testes each connected to one of the vas deference & place for maturation.

Vas-deferens: A passage and storage place for sperm and each ends at the base of prostate, joined by the seminal vesicle.

Ejaculatory duct: Is the place at which ducts deference joins to the duct of seminal vesicle which is about 2 c.m. long. They receive secretion from the seminal vesicles and pass through the prostate where they receive additional secretion

Urethra: It is the final section of the reproductive system. It leads from the urinary bladder through the prostate gland and to the tip of the penis. Its reproductive function is to transport semen out of penis.

The accessory glands

Provide the bulk of semen

- **Seminal vesicle:** Secretes fluid (Fructose and prostaglandins) that nourishes and enables sperm to move.
- **Prostate gland:** Secretes an alkaline fluid that neutralizes the acidity.

- **Bulbourethral (Cowper's) glands:** Secrete a lubricant
- **Semen:** it is a combination of sperm & fluid which contains:
 - 300-500 million sperm
 - Sperm food
 - pH buffers
- Allows sperm to survive for a couple of days inside female's body (hostile environment)
- **The sperm:** is one of the smallest cells in the body. For complete development each sperm need 2 months. Normally 300 to 500 million sperms are released during ejaculation. A male who releases 20 to 30 million normal sperms tends to be infertile and contains head mitochondria/middle part and tail

Male external reproductive organ

Penis: is an extension from the perineal area of male. It is soft and erectile tissue. It has two main functions namely carrying urine through urethra to the outside during urination and it transports semen through the urethra during ejaculation. In addition to urethra penis contains three cylindrical strands of erectable tissue.

The scrotum: is a paunch of skin that hangs between the thighs. The tests complete their descent in to the scrotum shortly before or after birth. Because the tests hang in scrotum outside the body their temperature is cooler than the body temperature by 3 Degree Fahrenheit. This lower temperature is needed for sperm production and survival, under the skin of scrotum.

Hormonal regulation in the male

Follicular Stimulating Hormone (FSH) and **Leutinizing Hormone (LH)** produced by the anterior pituitary gland are chiefly responsible for stimulating spermatogenesis and testosterone secretion. Follicular Stimulating Hormone (FSH) and Leutinizing Hormone (LH) affect only tests whereas; Testosterone affects not only spermatogenesis but also sex organ development and appearance of secondary male sexual characteristics.

Female Reproductive System

Like male reproductive organs, female reproductive organs are divided in to two

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- **External Organs** which includes:
 - ✓ Mons pubis,
 - ✓ Labia majora,
 - ✓ Labia minora,
 - ✓ Vestibular glands,
 - ✓ Clitoris and
 - ✓ Vestibule of vagina, which collectively called *vulva*.
- **Internal organs** which includes:
 - ✓ Ovary
 - ✓ Uterus
 - ✓ Vagina

External Organs

The mons pubis

- Mound of fatty tissue covers symphysis pubis
- It is covered with hair at puberty.

Labia majora

- Are two longitudinal folds of skin that forms the outer border of vulva.
- It contains fat, smooth muscle, areolar tissue, sebaceous glands & sensory receptors.
- At puberty covered with hair.

Labia minora

- Is pink tissue folds between vestibule and labia majora;
- Have no hair;
- Have many oil glands;
- darken if sexually aroused
- Labia minora and labia majora surround vaginal & urethral orifices.

The clitoris

- Is a small erectile organ at the upper end of vulva below the mons pubis, where the two folds of labia minora meet. Like the penis it contain many nerve endings, hence it is very sensitive par and rich in blood supply and nerve endings

The vestibule

- Is a space between the two labia minora.
- Its floor contains the greater vestibular glands and the opening for the urethra & vagina.
- During sexual arousal the greater and lesser vestibular gland secrete alkaline mucous for lubrication to aid penetration.

Urethral Meatus: Found between clitoris and vagina

Perineum

- It is a diamond shaped region bounded anteriorly by symphysis pubis, posteriorly by coccyx and laterally by ischeal tuberosity and found between anus and vagina

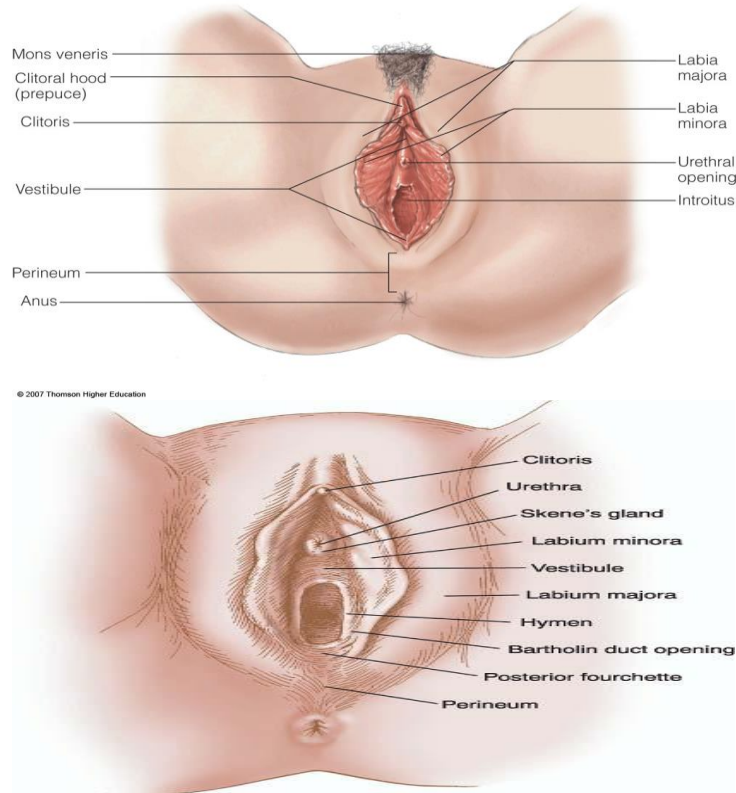


Figure 2.35: Figure showing female reproductive organs

Females internal reproductive organs

Vagina

The vagina is an elastic, muscular canal with a soft, flexible lining that provides lubrication and sensation. The vagina connects the uterus to the outside world. The vulva and labia form the entrance, and the cervix of the uterus protrudes into the vagina, forming the interior end. The vagina receives the penis during sexual intercourse and also serves as a conduit for menstrual flow from the uterus. During childbirth, the baby passes through the vagina (birth canal).

It is:

- ✓ 3-4 inch, thin-walled accordion-like tube from the introitus to the cervix, tilted back;

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- ✓ organ of intercourse and canal for menses and babies
- ✓ First 1/3 contains many nerve endings,
- ✓ Inner 2/3 has little nerves
- ✓ It lies behind urinary bladder and rectum & anterior to rectum and anus.
- ✓ Its wall is mainly composed of smooth muscle & fibroelastic connective tissue.

Uterus

Uterus/womb is an inverted pear-shaped muscular organ of the female reproductive system, located between the bladder and the rectum. It functions to nourish and house a fertilized egg until the fetus, or offspring, is ready to be delivered. The uterus has four major regions: the fundus is the broad curved upper area in which the fallopian tubes connect to the uterus; the body, the main part of the uterus, starts directly below the level of the fallopian tubes and continues downward until the uterine walls and cavity begin to narrow; the isthmus is the lower, narrow neck region; and the lowest section, the cervix, extends downward from the isthmus until it opens into the vagina. The uterus is 6 to 8 cm (2.4 to 3.1 inches) long; its wall thickness is approximately 2 to 3 cm (0.8 to 1.2 inches). The width of the organ varies; it is generally about 6 cm wide at the fundus and only half this distance at the isthmus. The uterine cavity opens into the vaginal cavity, and the two make up what is commonly known as the birth canal.

Fundus: The upper, dome shaped part

Body: The tapering middle portion

Cervix: The body terminates to narrow portion

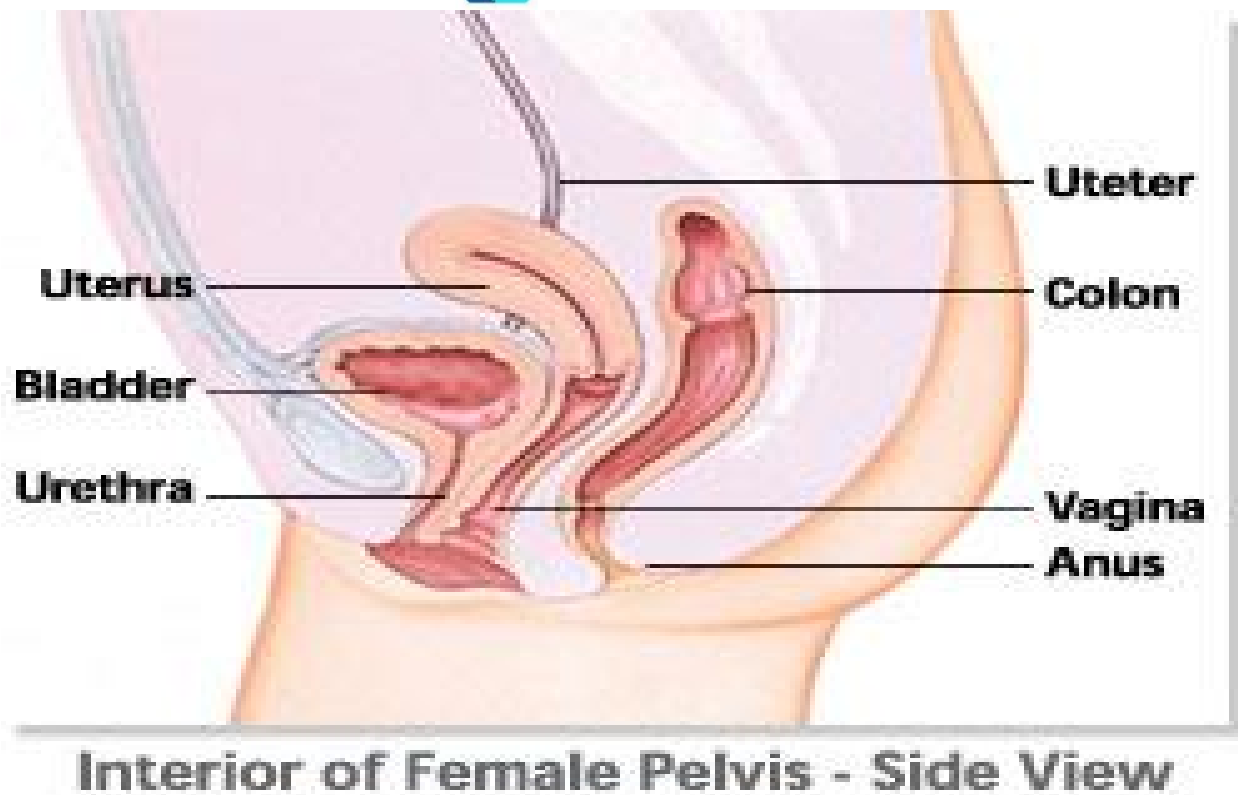


Figure 2.36: Figure showing female internal reproductive organs

Fallopian Tubes (oviducts)

One of two long, slender tubes that connect the ovaries to the uterus. Eggs pass from the ovaries, through the fallopian tubes, to the uterus. In the female reproductive tract, there is one ovary and one fallopian tube on each side of the uterus having:

- 4-inch long trumpet shaped tubes
- conveys the oocyte to the uterus
- Is a site where tubal ligation is done for female sterilization
- It has 3 distinct portions
 - ✓ **Ampulla:** typical site of fertilization
 - ✓ **Infundibulum:** has fimbriae surrounding the ovaries to collect an egg upon release

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✓ **Isthmus:** opens in to the uterus

Ovaries

The ovaries are small, oval-shaped glands located on either side of your uterus. They produce and store your eggs (also called ovum) and make hormones that control your menstrual cycle and pregnancy. During ovulation, one of your ovaries releases an egg. If a sperm fertilizes this egg, you can become pregnant.

- On average 3 cm in length, 2 cm in breadth & 1 cm in width and weighing 4–8 g.
- Produce the female sex hormones (progesterone and estrogen) and also release the ovum cyclically.
- Contain 250,000 ova each

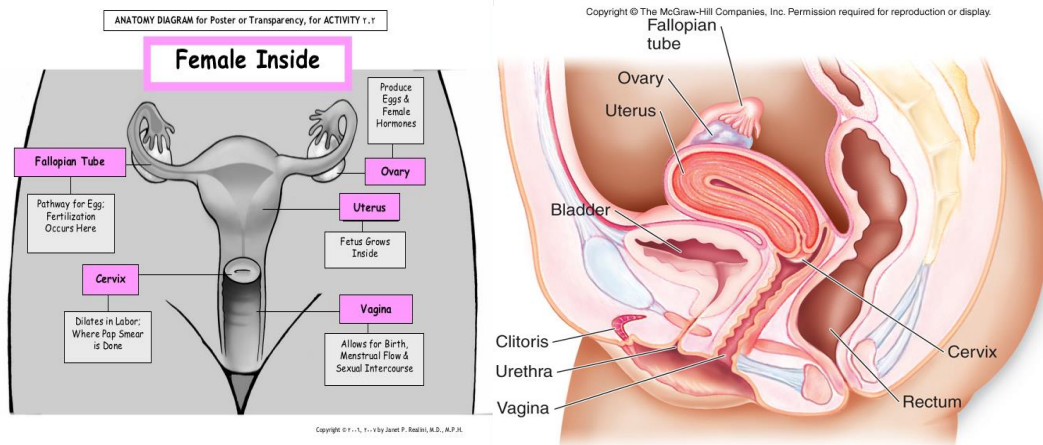


Figure 2.37: Figure showing fallopian tube and ovaries

Hormonal regulation

In females, FSH and LH cause estrogen and progesterone to be produced. They regulate the female reproductive system which is divided into the ovarian cycle and the menstrual cycle. Menopause occurs when the ovaries lose their sensitivity to FSH and LH and the female reproductive cycles slowly stop.

The Female Menstrual Cycle

The menstrual cycle is the time from the first day of a woman's period to the day before her next period. The length of the menstrual cycle varies from woman to woman, but the average is to have periods every 28 days. Regular cycles that are longer or shorter than this, from 21

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to 40 days, are normal. Is the shedding and tearing down of lining of uterus and rebuild for next month in the absence of fertilization/pregnancy. Menstrual cycle – lasts about 24 to 35 days, average is 28 days

Normal Cycle

- Menstrual blood is predominantly arterial, and usually asymptomatic
- Cycle length: 21-35 days
- Flows for: 3-7 days
- Amount does not exceed 80ml

Phases of Maturation Cycle

- Menstrual cycle has four phases:
 - Follicular phase
 - Ovulation phase
 - Luteal phase
 - Menstrual phase

Follicular phase

- ✓ begins after menstruation ends;
- ✓ lasts 6-13 days;
- ✓ ovarian follicles begin to ripen
- estrogen promotes development of endometrium to 2-5 millimeters thick

Ovulation phase

- ✓ Around day 14
- ✓ An ovum is released due to fsh and lh that have ripened primary follicles; one follicle matures completely (secondary follicle) and ruptures, releasing the egg to be caught by the fimbriae

Luteal phase: corpus luteum forms on the ovary where the secondary follicle ruptured; it secretes progesterone and estrogen for 10-12 days to further develop the endometrium to 4-6 millimeters thick; without fertilization, the progesterone and estrogen levels signal to the hypothalamus to decrease LH and the corpus luteum deteriorates and estrogen and progesterone drop significantly

Menstrual phase: endometrial buildup is expelled through uterine contractions for 3-7 days; volume of menses is about 2-4 tablespoons of fluid/80 ml

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Fluid and Electrolyte Balance

The composition of body fluids is an important factor in homeostasis. The human body functions when the following conditions are kept within a narrow range of normal value in body temperature, Electrolytes, blood PH and Blood volume. Whenever the volume or chemical makeup of these fluids deviates even slightly from normal the body results different diseases and metabolic disturbance. The constancy of body fluids is maintained in ways that include the following:

1. The thirst mechanism, which maintains the volume of water at a constant level.
2. Kidney activity, which regulates the volume and composition of body fluids.
3. Hormones, which serve to regulate fluid volume and electrolytes.
4. Regulators of PH, including buffers, respiration and kidney function.

Elements of the body

The largest single constituent of the body is water, which is 60 % of the total body weight. The correct proportion of water and electrolytes in the water and proper acid base balance are necessary for life to exist. Loss of 10% of total body water usually produce lethargy, fever and dryness on mucous membrane and a 20% loss is fatal

Body fluids

All body fluids are either intracellular (inside the cell) or extra cellular (out of the cell) fluids. Intracellular fluid constitutes 2/3 of all body fluid. Extra cellular fluids found as interstitial fluid (the immediate environment of body cells), blood plasma and lymph, cerebrospinal, synovial, fluids of the eye & ear, pleural, pericardial, peritoneal, gastrointestinal and glomerular filtrate of the kidney. The most important and abundant fluids are the interstitial & blood plasma. The interstitial fluid occupies the space around body cells. It is derived from blood plasma. The most important difference between the plasma and interstitial fluid is the presence of soluble protein in plasma and they're near absence in the interstitial fluid. Under normal condition capillaries are impermeable to proteins. The concentration of water in the

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interstitial fluid is slightly higher than the concentration of water in plasma. The plasma proteins are responsible for this difference

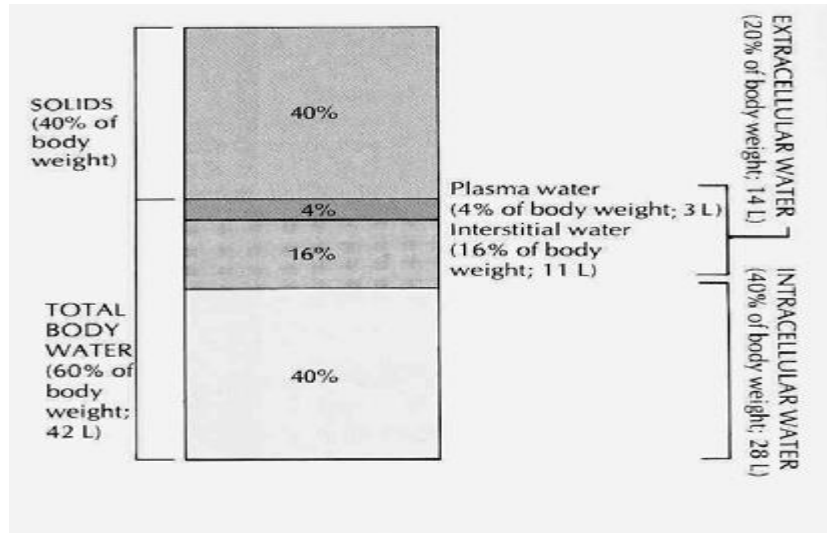


Figure 2.38: Figure showing body fluid composition

Movement of water

Movement of water from one body part to another is controlled by two forces hydrostatic pressure & Osmotic pressure. Hydrostatic pressure: it is the force exerted by a fluid against the surface of the compartment containing fluid. Osmotic pressure: Is the pressure that must be applied to a solution on one side of a selectively permeable membrane to prevent the Osmotic flow of water across the membrane from a compartment of pure water. When there is shift in the pressure of water towards the interstitial space, accumulation of fluid in the space occur. This phenomenon is called edema. Edema is abnormal accumulation of water with in the interstitial compartment. Such accumulation of water produces distention of the tissue which appears as puffiness on the surface of the body. Causes of edema may be plasma protean leakage decreased protein synthesis, increased capillary or venous hydrostatic pressure, obstructed lymphatic vessels and inflammatory reaction.

Water intake & out put

Most water is taken in to the body by drinking and a smaller amount enters as part of food and an even smaller amount is the product of oxidation of food in cells. The important

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mineral solutes (electrolytes) of the body enter the body through food or drink. Under normal condition water is taken in to and excreted from the body, so it matches to maintain homeostasis. Drinking of water is regulated by nervous mechanism (thirst center in the brain) together with hormonal mechanism (Antidiuretic hormone). Kidneys are the organs regulated by homeostatic feedback response they are responsible for excreting most of the water from the body.

Electrolytes

Electrolytes are compounds that dissociate in to ions when in solutions. Acids, bases & salts are electrolytes. Most electrolytes are dissolved in the body fluids. However, some are found attached to proteins and other places. The most physiologically important electrolytes are the cations (Na^+ , k^+ , ca^{2+} mg^{2+} and H^+) and anions bicarbonates (HCO_3^-), chloride (cl^-) phosphate (HP042) & sulfate (SO42^-)

Functions

- Necessary for cell metabolism & contribute to body structure.
- Facilitate movement of water between the body compartments
- Together with the soluble proteins, they maintain the hydrogen ion
- Concentration (acid-base balance)
- Sodium, potassium, chlorides and magnesium are crucial to the production and maintenance of membrane potentials (nerve & muscle potentials)

Acid –Base Balance

Acid – base balance mean the regulation of hydrogen ion in the body fluids, especially in the extra cellular fluids. Any molecule that dissociates in solution to release a hydrogen (H^+) ion is called an acid. Any molecule capable of accepting a hydrogen ion is a base. The hydrogen ion concentration is measured by PH scale. It affects every chemical reaction and process in the body. Enzymes, hormones and the distribution of ions can all be affected by the concentration of hydrogen ion. The PH of the blood and interstitial fluid is maintained between 7.35 and 7.45. An increase or decrease of PH by a few tenths of unit can be disastrous. Homeostatic maintenance of an acceptable PH range in the extra cellular fluid is accomplished by three mechanisms:

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- Specific chemical buffer system of the body fluids (react very rapidly, in less than a second)
- Respiratory regulation (reacts rapidly in seconds to minutes)
- Renal regulation (reacts slowly, in minutes to hours)

Buffer system: To buffer mean to neutralize. Weak acids and weak bases act as a buffer system. Buffering agents acts rapidly. In this case addition of H^+ result an equilibrium shift.

The most common are:

- Acid – base buffer system.
- Bicarbonate buffer system
- Phosphate buffer system.
- Protein buffer system: - The most abundant & important in body cells and with in plasma because of it's high concentration

Respiratory Regulation: An increase in carbon dioxide concentration in the body varies PH of the body. Therefore, the respiratory regulation works by elimination of carbon dioxide from the body

Renal Regulation: The body normally consumes more acid producing food than base producing therefore; it must not only adjust PH but also excrete H^+ . This task is accomplished in renal tubules, where hydrogen & ammonium ions are secreted in to urine, when H^+ is excreted sodium is exchanged.

Acid-Base Balance

Proper physiological functioning depends on a very tight balance between the concentrations of acids and bases in the blood. Acid-balance balance is measured using the pH scale. A variety of buffering systems permits blood and other bodily fluids to maintain a narrow pH range, even in the face of perturbations. A buffer is a chemical system that prevents a radical change in fluid pH by dampening the change in hydrogen ion concentrations in the case of excess acid or base. Most commonly, the substance that absorbs the ions is either a weak acid, which takes up hydroxyl ions, or a weak base, which takes up hydrogen ions.

Buffer Systems in the Body

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The buffer systems in the human body are extremely efficient, and different systems work at different rates. It takes only seconds for the chemical buffers in the blood to make adjustments to pH. The respiratory tract can adjust the blood pH upward in minutes by exhaling CO_2 from the body. The renal system can also adjust blood pH through the excretion of hydrogen ions (H^+) and the conservation of bicarbonate, but this process takes hours to days to have an effect. The buffer systems functioning in blood plasma include plasma proteins, phosphate, and bicarbonate and carbonic acid buffers. The kidneys help control acid-base balance by excreting hydrogen ions and generating bicarbonate that helps maintain blood plasma pH within a normal range. Protein buffer systems work predominantly inside cells.

Protein Buffers in Blood Plasma and Cells

Nearly all proteins can function as buffers. Proteins are made up of amino acids, which contain positively charged amino groups and negatively charged carboxyl groups. The charged regions of these molecules can bind hydrogen and hydroxyl ions, and thus function as buffers. Buffering by proteins accounts for two-thirds of the buffering power of the blood and most of the buffering within cells

Hemoglobin as a Buffer

Hemoglobin is the principal protein inside of red blood cells and accounts for one-third of the mass of the cell. During the conversion of CO_2 into bicarbonate, hydrogen ions liberated in the reaction are buffered by hemoglobin, which is reduced by the dissociation of oxygen. This buffering helps maintain normal pH. The process is reversed in the pulmonary capillaries to re-form CO_2 , which then can diffuse into the air sacs to be exhaled into the atmosphere. This process is discussed in detail in the chapter on the respiratory system

Phosphate Buffer

Phosphates are found in the blood in two forms: sodium hydrogen phosphate ($\text{Na}_2\text{H}_2\text{PO}_4^-$), which is a weak acid, and sodium monohydrogen phosphate ($\text{Na}_2\text{HPO}_4^{2-}$), which is a weak base. When $\text{Na}_2\text{HPO}_4^{2-}$ comes into contact with a strong acid, such as HCl , the base picks up a second hydrogen ion to form the weak acid $\text{Na}_2\text{H}_2\text{PO}_4^-$ and sodium chloride, NaCl .

When $\text{Na}_2\text{HPO}_4^{2-}$ (the weak acid) comes into contact with a strong base, such as sodium

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hydroxide (NaOH), the weak acid reverts back to the weak base and produces water. Acids and bases are still present, but they hold onto the ions

Self-Check

Musculo Skeletal System

Instruction: Read each questions carefully and write your answer

- Describe classification of bony skeleton
- Classify and list bones of skull
- Classify and list bones of vertebral column
- Name the bones of shoulder grid
- Classify and list bones of upper limb
- Name the bones of pelvic grid
- Classify and list bones of lower limb

Part II:

Instruction: Read each questions carefully and select the best answer

1. Cartilage is
 - A. Infection in the bones
 - B. Swelling & stiffness in a joint
 - C. Tough flexible cushion between two bones
 - D. Curvature of the spine
2. A bone is supplied with nutrients by
 - A. Yellow Bone Marrow
 - B. Red Bone Marrow
 - C. Calcification
 - D. Blood Vessels
3. What part of the skeletal system consists of the skull, breastbone, ribs and vertebrae?
 - A. Systematic
 - B. Vertebral

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- C. Axial
- D. Appendicular
- 4. The appendicular skeleton consist of what parts?
 - A. A Head, sternum, ribs and vertebrae
 - B. B Hands, feet, legs, hips and arms
 - C. C Feet, head, legs, ribs and arms
 - D. D Hips, head, toes and fingers
- 5. The fibrous bands that connects two bones in a joint are
 - A. Cartilage
 - B. Tendons
 - C. Ligaments
 - D. String
- 6. The process in which cartilage is replace by bone is called what?
 - A. Synovial Fluid
 - B. Ossification
 - C. Compact bone
 - D. Fracture
- 7. Break in the bone is called
 - A. Fracture
 - B. Bursitis
 - C. Sprain
 - D. Torn cartilage
- 8. How do muscles work together?
 - A. Stretch and pull
 - B. Up and down
 - C. Contraction and Extension
 - D. Right and left**

Neurologic System

Instruction: Read each questions carefully and write your answer

Part I: Short Answer Questions

1. List and explain the classification of neurologic systems
2. Describe common sense organs and their functions
3. Discuss components of central nerves system
4. Write components of peripheral nervous system

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Part II: MCQ

Instruction: Read each questions carefully and select the best answer

1. The term central nervous system refers to the:
 - A) Autonomic and peripheral nervous systems
 - B) Brain, spinal cord, and cranial nerves
 - C) Brain and cranial nerves
 - D) Spinal cord and spinal nerves
 - E) Brain and spinal cord
2. The peripheral nervous system consists of:
 - A) Spinal nerves only
 - B) The brain only
 - C) Cranial nerves only
 - D) The brain and spinal cord
 - E) The spinal and cranial nerves
3. Which of these cells are not a type of neuroglia found in the CNS:
 - A) Astrocytes
 - B) Microglia
 - C) Schwann cells
 - D) Ependymal cells
 - E) Oligodendrocytes
4. The Schwann cells form a myelin sheath around the:
 - A) Dendrites
 - B) Cell body
 - C) Nucleus
 - D) Axon
 - E) Nodes of Ranvier
5. The neuron processes that normally receives incoming stimuli are called:
 - A) Axons

- B) Dendrites
 - C) Neurolemmas
 - D) Schwann cells
 - E) Satellite cells
6. Collections of nerve cell bodies inside the PNS are called:
- A) Ganglia
 - B) Tracts
 - C) Nerves
 - D) Nuclei
 - E) Tracts or ganglia
7. Which of the following best describes the waxy-appearing material called myelin:
- A) An outer membrane on a neuroglia cell
 - B) A lipid-protein (lipoprotein) cell membrane on the outside of axons
 - C) A mass of white lipid material that surrounds the cell body of a neuron
 - D) A mass of white lipid material that insulates the axon of a neuron
 - E) A mass of white lipid material that surrounds the dendrites of a neuron
8. A neuron with a cell body located in the CNS whose primary function is connecting other Neurons is called :
- A) Efferent neuron
 - B) Afferent neuron
 - C) Interneuron
 - D) Glial cell
 - E) Satellite cell
9. White matter refers to myelinated fibers in the:
- A) CNS
 - B) PNS
 - C) ANS
 - D) SNS
 - E) Both ANS and SNS
10. Impulse conduction is fastest in neurons that are:
- A) Myelinated
 - B) Unmyelinated

- C) Sensory
- D) Motor
- E) Cerebral

Endocrine System

Part I: MCQ

Instruction: Read each questions carefully and select the best answer

1. The level of hormone in the blood is regulated by the homeostasis mechanism is known as?
 - A. Negative feedback
 - B. Positive feedback
 - C. Neutral feedback
 - D. None of the above
2. What is known as Adenohypophysis and is characterized as the glandular tissue?
 - A. Thyroid gland
 - B. Anterior pituitary
 - C. Posterior lobe
 - D. Pituitary gland
3. Also known as Neurohypophysis, that stores and releases antidiuretic hormone ADH and oxytocin?
 - A. Thyroid gland
 - B. Anterior pituitary
 - C. Posterior lobe
 - D. Pituitary gland
4. Which of the following is known as the master gland?
 - A. Thyroid gland
 - B. Anterior pituitary
 - C. Posterior lobe
 - D. Pituitary gland
5. What are the hormones that anterior pituitary release or produce?
 - A. Thyroid-stimulating hormone or thyrotropin (TSH)

- B. Antidiuretic hormone or vasopressin (ADH)
 - C. Adrenocorticotrophic hormone (ACTH)
 - D. Follicle-stimulating hormone (FSH)
6. What are the hormones that posterior lobe in the pituitary gland release or produce?
- A. Thyroid-stimulating hormone or thyrotrophic (TSH)
 - B. Antidiuretic hormone or vasopressin (ADH)
 - C. Adrenocorticotrophic hormone (ACTH)
 - D. Follicle-stimulating hormone (FSH)
7. What is the function of Antidiuretic hormone or vasopressin (ADH)?
- A. Regulation of urinary output
 - B. Inducement of labor in pregnant women by stimulating contractions in the uterus
 - C. Role in blood pressure regulation
 - D. Promotion of milk secretion from the mammary glands

Cardiovascular System

Part I: MCQ

Instruction: Read each questions carefully and select the best answer

1. The spike phase of the action potential of the sinoatrial node pacemaker cells of the heart is caused by:
 - (A) Opening of voltage-gated Na^+ channels
 - (B) Opening of voltage-gated Ca^{2+} channels
 - (C) Closure of voltage-gated K^+ channels
 - (D) Opening of voltage-gated Cl^- channels
 - (E) Closure of voltage-gated Ca^{2+} channels
2. Choose the correct sequence of action potential conduction along the conductive tissues of the heart:
 - (A) SA node → AV node → Bundle of His → Purkinje fibers → Bundle branches
 - (B) SA node → AV node → Bundle of His → Bundle branches → Purkinje fibers
 - (C) SA node → AV node → Bundle branches → Bundle of His → Purkinje fibers
 - (D) SA node → AV node → Purkinje fibers → Bundle of His → Bundle branches

- (E) AV node → SA node → Bundle of His → Bundle branches → Purkinje fibers
3. These cells are known as the primary pacemakers of the heart:
- (A) Cells of the sinoatrial (SA) node
 - (B) Cells of the atrioventricular (AV) node
 - (C) Fibers of the bundle of His
 - (D) Fibers of the left and right bundle branches
 - (E) Purkinje fibers
4. In the epithelial cells of the kidney collecting ducts, the Na^+/K^+ ATPase is localized to the _____ membrane
- (A) Apical
 - (B) Basolateral
5. Which of the following terms describes the body's ability to maintain its normal state?
- (A) Anabolism
 - (B) Catabolism
 - (C) Tolerance
 - (D) Homeostasis
 - (E) Metabolism
6. Which of the following best describes the human body's defense mechanism against environmental bacteria?
- (A) Hair in the nose
 - (B) Mucous membranes
 - (C) Osteoblasts
 - (D) Saliva
 - (E) Tears
7. Which cells in the blood do not have a nucleus?
- (A) Lymphocyte
 - (B) Monocyte
 - (C) Erythrocyte

- (D) Basophil
(E) Neutrophil
8. Which of the following is flexible connective tissue that is attached to bones at the joints?
- (A) Adipose
(B) Cartilage
(C) Epithelial
(D) Muscle
(E) Nerve
9. Which of the following allows air to pass into the lungs?
- (A) Aorta
(B) Esophagus
(C) Heart
(D) Pancreas
(E) Trachea
10. Which of the following is the body cavity that contains the pituitary gland?
- (A) Abdominal
(B) Cranial
(C) Pleural
(D) Spinal
(E) Thoracic
11. Which of the following closes and seals off the lower airway during swallowing?
- (A) Alveoli
(B) Epiglottis
(C) Larynx
(D) Uvula
(E) Vocal cords
12. Which of the following is located beneath the diaphragm in the left upper quadrant of the abdominal cavity?
- (A) Appendix

- (B) Duodenum
 - (C) Gallbladder
 - (D) Pancreas
 - (E) Spleen
13. Which of the following anatomical regions of abdomen lies just distal to the sternum?
- (A) Epigastric
 - (B) Hypochondriac
 - (C) Hypogastric
 - (D) Lumbar
 - (E) Umbilical
14. Which of the following cavities are separated by the diaphragm?
- (A) Abdominal and pelvic
 - (B) Cranial and spinal
 - (C) Dorsal and ventral
 - (D) Pericardial and pleural
 - (E) Thoracic and abdominal

Respiratory System

Part II: MCQ

Instruction: Read each questions carefully and select the best answer

1. Which of the following is not part of the upper respiratory system?
 - A. Nose
 - B. Oral cavity
 - C. Pharynx
 - D. Trachea
 - E. Nasal meatus
2. Which of the following is a passageway for air, food and water?
 - A. Pharynx
 - B. Larynx
 - C. Paranasal sinuses

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- D. Trachea
E. Esophagus
3. This structure prevents food or water from entering the trachea.
- A. Arytenoid cartilage
B. Epiglottis
C. Nasopharynx
D. Thyroid cartilage
4. During swallowing, which structures rises?
- A. Pharynx
B. Esophagus
C. Trachea
D. Palatine tonsils
E. Primary bronchi
5. These are triangular pieces of mostly hyaline cartilage located at the posterior and superior border of the cricoid cartilage.
- A. Corniculate cartilage
B. Arytenoids cartilage
C. Cricotracheal cartilage
D. Cuneiform cartilage
E. Laryngeal cartilage
6. This is located anterior to the oesophagus and carries air to the bronchi.
- A. Trachea
B. Larynx
C. Nasopharynx
D. Pharynx
E. None of the above
7. This is the primary gas exchange site
- A. Trachea
B. Bronchiole

- C. Nasal sinuses
- D. Alveolus
- E. Bronchus

Digestive Systems

Part II: MCQ

Instruction: Read each questions carefully and select the best answer

Which of the following processes is the primary function of the mouth?

- A. Ingestion
- B. Secretion
- C. Mixing and propulsion
- D. Absorption
- E. None of the above

Which of the following accessory organs produces a fluid to soften food?

- A. Teeth
- B. Salivary glands
- C. Liver
- D. Gallbladder
- E. Pharynx

Which of the following accessory organs produces a fluid that functions to emulsify dietary fats?

- A. Teeth
- B. Salivary glands
- C. Liver
- D. Gallbladder
- E. Pharynx

Which of the following accessory organs stores bile?

- A. Teeth
- B. Salivary glands
- C. Liver
- D. Gallbladder
- E. Pharynx

This layer of the GI tract is composed of areolar connective tissue containing blood and lymph vessels.

- A. Mucosa



- B. Lamina propria
- C. MALT
- D. Muscularis
- E. Epithelium

This layer functions by secreting a lubricating fluid.

- A. Serosa
- B. Submucosal
- C. Muscularis
- D. Mucosa
- E. MALT

These are composed of prominent lymphatic nodules that function in the immune response.

- A. Mucosa
- B. Lamina propria
- C. MALT
- D. Submucosa
- E. Serosa

Urinary Systems

Part II: MCQ

Instruction: Read each questions carefully and select the best answer

1. Which is not a major function of the kidney?
 - A. Regulation of blood ionic composition
 - B. Regulation of blood cell size
 - C. Regulation of blood volume
 - D. Regulation of blood pressure
2. The formation of a new glucose molecule is termed as _____.
 - A. Glycolysis
 - B. Gluconeogenesis
 - C. Glucosamine
 - D. Glucagon

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- E. Glycine
3. Which of the following is a waste product normally excreted by the kidneys?
- A. Urea
 - B. Glucose
 - C. Insulin
 - D. Cholesterol
 - E. Carbon dioxide
4. Name the smooth dense irregular connective tissue that is continuous with the outer coat of the ureter.
- A. Adipose capsule
 - B. Renal capsule
 - C. Renal hilus
 - D. Renal cortex
 - E. Renal medulla
5. What do we call the portion of the kidney that extends between the renal pyramids?
- A. Renal columns
 - B. Renal medulla
 - C. Renal pelvis
 - D. Calyces
6. Pick the option that states the correct order of the blood flow.
- A. Renal artery - segmental artery - interlobular artery - peritubular capillaries - afferent arterioles
 - B. Interlobular arteries - arcuate arteries - glomerular capillaries - arcuate veins
 - C. Arcuate veins - arcuate arteries - glomerular capillaries - renal vein
 - D. Interlobar veins - afferent arterioles - efferent arterioles - glomerular capillaries
 - E. Renal vein - segmental arteries - interlobar arteries - efferent arterioles
7. Which of these is the correct order of the filtrate flow?
- A. Glomerular capsule - PCT - loop of Henle - DCT - collecting duct
 - B. Loop of Henle - glomerular capsule - PCT - DCT - collecting duct

- C. Ascending limb of the loop - PCT - DCT - collecting duct
 - D. Collecting duct - DCT - PCT - loop of Henle - glomerular capsule
 - E. PCT - glomerular capsule - DCT - collecting duct - loop of Henle
8. Name the structure of the nephron that reabsorbs the most substances.
- A. Proximal convoluted tubule
 - B. Glomerular capsule
 - C. Loop of Henle
 - D. Collecting duct
9. The structure of the nephron that filters blood is termed as _____.
- A. Glomerular capsule
 - B. Loop of Henle
 - C. Ascending limb
 - D. Collecting duct
 - E. Renal corpuscle
10. Which of the following term refers to the entry of substances into the body from the filtrate?
- A. Reabsorption
 - B. Filtration
 - C. Secretion
 - D. Excretion
11. Name the layer of filtration membrane that is composed of collagen fibers and proteoglycans in a glycoprotein matrix.
- A. Glomerular endothelial cells
 - B. Basal lamina
 - C. Pedicels
 - D. Filtration slits
 - E. Slit membrane

12. Which of these terms is associated with the process that takes place when a substance passes from the fluid in the tubular lumen through the apical membrane and then across the cytosol into the interstitial fluid?
- Paracellular reabsorption
 - Transcellular reabsorption
 - Apical reabsorption
 - Active transport
13. Once fluid enters the proximal convoluted tubule, it is called ____.
- Na⁺ loop fluid
 - K⁺ concentration
 - tubular fluid
 - None of the above

Reproductive System

Part II: MCQ

Instruction: Read each questions carefully and select the best answer

- This structure protects and regulates the temperature of the testes
 - Dartos muscle
 - Cremaster muscle
 - Tunica albuginea
 - Scrotum
 - Tunica vaginalis
- This structure is the site of sperm production
 - Vas deferens
 - Seminiferous tubules
 - Albuginea
 - Epididymis
- These cells may eventually become spermatozoa
 - Sertoli cells
 - Sustentacular cells
 - Spermatogenic cells
 - Chief cells

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- E. Speciation cells
5. These cells secrete testosterone.
- A. Sertoli cells
 - B. Spermatogenic cells
 - C. Leydig cells
 - D. Oogonia
 - E. Chief cells
7. The straight tubules in the testis lead into the:
- A. Efferent ducts
 - B. Afferent ducts
 - C. Rete testis
 - D. Ductus epididymis
 - E. Epididymis
8. The function of the epididymis is
- A. Sperm maturation
 - B. Produce sperm
 - C. Spermatid storage
 - D. Provide nutrition to sperm
 - E. Absorption of calcium
9. This is formed by the union of the duct from the seminal vesicle and the ampulla of the vas deferens.
- A. Urethra
 - B. Spermatid cord
 - C. Inguinal canal
 - D. Ejaculatory duct
 - E. Prostate
10. This lies posterior to the bladder and anterior to the rectum and secretes an alkaline, fructose filled fluid.
- A. Prostate
 - B. Cowper's glands
 - C. Seminal glands

- D. Spongy urethra
- E. Prostatic urethra

Fluid Electrolyte and Acid Base Balance

Part II: MCQ

Instruction: Read each questions carefully and select the best answer

1. How much of the total volume of body fluid is intracellular fluid?
 - A. 10%
 - B. B.50%
 - C. C. 33%
 - D. D. 66%
 - E. E. 99%
2. 80% of the extracellular fluid is
 - A. Plasma
 - B. Cytosol
 - C. Interstitial fluid
 - D. Lymph
 - E. Bile
3. This is the largest single component of the human body.
 - A. Skin
 - B. Water
 - C. Blood
 - D. Organs
 - E. Electrolytes
4. This is produced when electrons are accepted by oxygen during cellular respiration.
 - A. Anions
 - B. Cations
 - C. Metabolic water
 - D. Lipids
 - E. Carbohydrates
5. This occurs when water loss is greater than water gain.
 - A. Dehydration
 - B. Evaporation
 - C. Precipitation
 - D. Insensible loss
 - E. Perspiration
6. The response of the body to decreasing blood pressure will NOT cause which of the following?
 - A. Dehydration
 - B. Formation of angiotensin II



- C. Stimulate the kidneys to secrete renin
 - D. Formation of ADH
 - E. Increased vasoconstriction
7. This is the main factor that determines body fluid volume.
- A. Thirst centre
 - B. Fluid balance
 - C. Urinary salt loss
 - D. Compartmentalizing
 - E. Perspiration
8. Which of the following is used to promote Na^+ reabsorption by the kidneys?
- A. Antidiuretic hormone
 - B. ANP
 - C. Aldosterone
 - D. Parathyroid hormone
 - E. Renin
9. Which of the following is used to promote water reabsorption by the kidneys?
- A. Antidiuretic hormone
 - B. ANP
 - C. Aldosterone
 - D. Parathyroid hormone
 - E. ACE
10. Natriuretic is:
- A. Decreased Na^+ levels in urine
 - B. Decreased Cl^- levels in urine
 - C. Increased K^+ levels in urine
 - D. Increased PO_4^- levels in urine
 - E. None of the above

Unit Two: Causes of Diseases

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Structure, function and multiplication of microorganisms
- Causes of disease
- Infectious diseases
- Basic components of disease transmission

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Define Causes of Diseases
- Identify Infectious Diseases
- Differentiate Basic components of disease transmission
- Have basic understanding about structure, function and multiplication of microorganisms

1. Basic Concepts of Causes of disease

Disease can be communicable (those having causative organism like malaria, measles, And Typhoid fever) or non-communicable (those have nonspecific causative organisms like coronary artery disease, accidents, and Hypertension)

2. Structure, function and multiplication of microorganisms

- ✓ Prokaryotes and eukaryotes
- ✓ Bacteria
- ✓ Virus
- ✓ Rickettsia
- ✓ Chlamydia
- ✓ Mycoplasma, actinomycetes,
- ✓ Fungi
- ✓ Protozoa
- ✓ Helminthes
- ✓ Parasitology
- ✓ Immunology

Level of structural organization of the body

The human body has different structural levels of organization, starting with atoms molecules and compounds and increasing in size and complexity to cells, tissues, organs and the systems that make up the complete organism

Subatomic Particles: Electrons, protons, and neutrons

Atom: Hydrogen atom, lithium atom.

Molecule: Water molecule, glucose molecule.

Macromolecule: Protein molecule, DNA molecule

Organelle: Mitochondrion, Golgi apparatus, nucleus

Cell: Muscle cell, nerve cell

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Tissue: Epithelia, connective, muscle and nerve

Organ: Skin, femur, heart, kidney

Organ System: Skeletal system, digestive system.

Organism: Human

Common terminologies

Cell: The smallest independent units of life.

All life depends on the many chemical activities of cells. Some of the basic functions of cell are: growth, metabolism, irritability and reproduction.

Tissue: tissue is made up of many similar cells that perform a specific function. The various tissues of the body are divided in to four groups. These are epithelial, connective, nervous and muscle tissue.

Organ: - Is an integrated collection of two or more kinds of tissue that works together to perform specific function. For example: Stomach is made of all type of tissues

System: Is a group of organs that work together to perform major function. For example: Respiratory system contains several organs.

Organism level: - The various organs of the body form the entire organism.

All descriptions in human anatomy are expressed in relation to the anatomical position. Is the standard reference position of the body used to describe the position & relations of various anatomical structures. To be in Anatomical position, individuals (the body) should:

- ✓ Stand erect
- ✓ Eyes looking directly forward
- ✓ Upper limb by the sides
- ✓ Palms directed forward
- ✓ Lower limbs lie parallel (together)
- ✓ Feet directed anteriorly (the toes directed forward)

3. Prokaryotes and eukaryotes

All living cells can be divided into two groups:

I. Prokaryotic cells:

Simple cells

Single-celled organisms

(E. g. bacteria and blue-green algae)

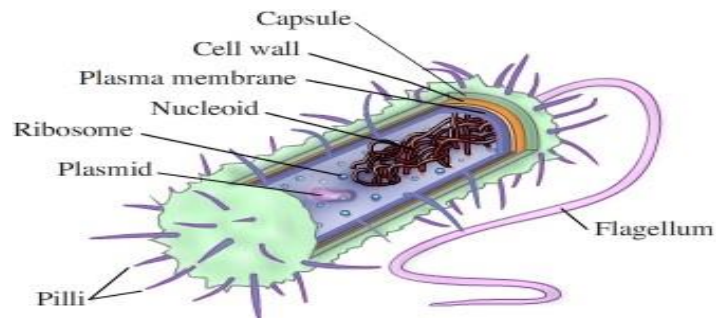


Figure 2.1: Sample Prokaryotic Bacterial Cell

II. Eukaryotic cells:

- ✓ More complex cells
- ✓ Single-celled organisms
- ✓ Compose multi-cellular organisms (e.g. fungi, plants and animals)

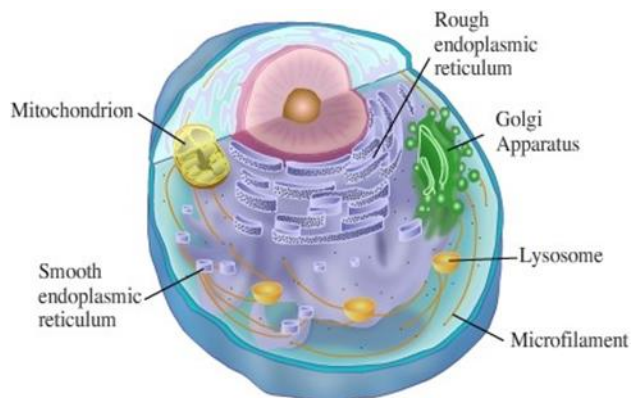


Figure 2.2: Sample Eukaryotic animal Cell

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Table 1.1: Cellular Features and Functions of Prokaryotes & Eukaryotes

Feature	Function	Prokaryotes	Eukaryotes
Cell (plasma) membrane	Regulate material entering and exiting cell	All	All
DNA	Stores genetic material	All	All
Cell wall	Protect cell, provide shape	All	Some (plants)
Cytoplasm	Fluid inside cell	All	All
Nucleus	Houses DNA	None	All
Ribosomes	Site of protein synthesis	All	All
Flagella	Aid cell in locomotion	Some	Some
Mitochondria	Site of ATP synthesis	None	All
Endoplasmic Reticulum	Synthesis of proteins and lipids	None	All
Golgi apparatus	Storage and packaging of substances	None	All
Lysosomes & Peroxisomes	Digest particles	None	All
Vacuoles	Storage of material	Some	Some
Plasmids	Small pieces of DNA that can exit the cell	Some	None
Plastids	Contain food or pigments	None	Some (plants)

4. Bacteria

One of the very first organisms to evolve on earth was probably a unicellular organism, similar to modern bacteria. Ever since then, life has evolved into a multitude of life forms over many millennia. However, we can still trace our ancestry back to this single-celled organism.

Today, bacteria are considered as one of the oldest forms of life on earth. Even though most bacteria make us ill, they have a long-term, mutual relationship with humans and are very much important for our survival. But before we elaborate on its uses, let us know the structure of bacteria, its classification, and the bacteria diagram in detail.

Definition

Bacteria are unicellular organisms belonging to the prokaryotic group where the organisms lack a few organelles and a true nucleus.

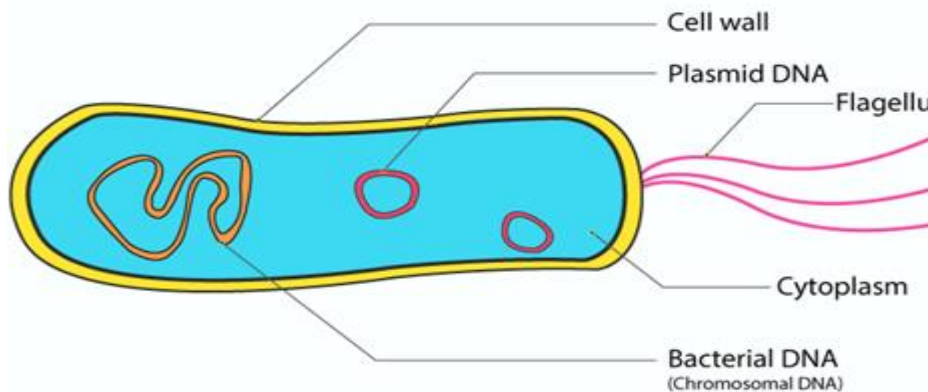


Figure 2.3: Structure of a typical bacterial cell with its different parts

5. Ultrastructure of a Bacteria Cell

The structure of bacteria is known for its simple body design.

Bacteria are single-celled microorganisms with the absence of the nucleus and other cell organelles; hence, they are classified as prokaryotic organisms.

They are also very versatile organisms, surviving in extremely inhospitable conditions.

Another fascinating feature of bacteria is their protective cell wall, which is made up of a special protein called peptidoglycan.

Useful Bacteria

Not all bacteria are harmful to humans. There are some bacteria which are beneficial in different ways. Listed below are few benefits of bacteria:

2. Convert milk into curd – Lactobacillus or lactic acid bacteria
3. Ferment food products – Streptococcus and Bacillus

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4. Help in digestion and improving the body's immunity system – Actinobacteria, Bacteroidetes, Firmicutes, Proteobacteria
5. Production of antibiotics, which is used in the treatment and prevention of bacterial infections – Soil bacteria

Harmful Bacteria

There are bacteria that can cause a multitude of illnesses. They are responsible for many of the infectious diseases like pneumonia, tuberculosis, diphtheria, syphilis, tooth decay. Their effects can be rectified by taking antibiotics and prescribed medication.

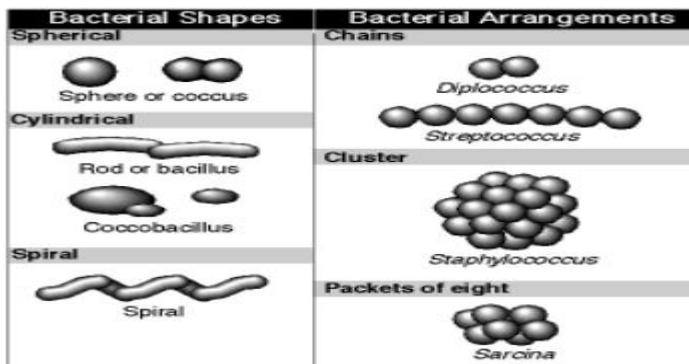


Figure 2.4: Shapes and Arrangements of Bacteria

6. Virus

A virus can be simply defined as an obligate intracellular parasite. Each viral particle, or virion, consists of a single nucleic acid, RNA or DNA, encoding the viral genome surrounded by a protein coat, and is capable of replication only within the living cells of bacteria, animals or plants. Viruses are classified into different orders and families by consideration of the type of nucleic acid present (RNA or DNA), whether the nucleic acid is single- or double-stranded, and the presence or absence of an envelope. Virus tropism: Viruses are the most abundant and diverse pathogens on earth. Millions of years of evolution, in close proximity to their hosts, has resulted in highly precise mechanisms in which they target and infect host cells.

E,g,

- ✓ Epstein-Barr virus (EBV)

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- ✓ Human Immunodeficiency Virus) HIV
- ✓ Influenza
- ✓ Rhinovirus
- ✓ COVID-19



Figure 2. 5: Figure showing different types of virus

7. Rickettsia

The rickettsia is a diverse collection of obligately intracellular Gram-negative bacteria found in ticks, lice, fleas, mites, chiggers, and mammals. They include the genera Rickettsia, Ehrlichia, Orientia, and Coxiella. These zoonotic pathogens cause infections that disseminate in the blood to many organs.

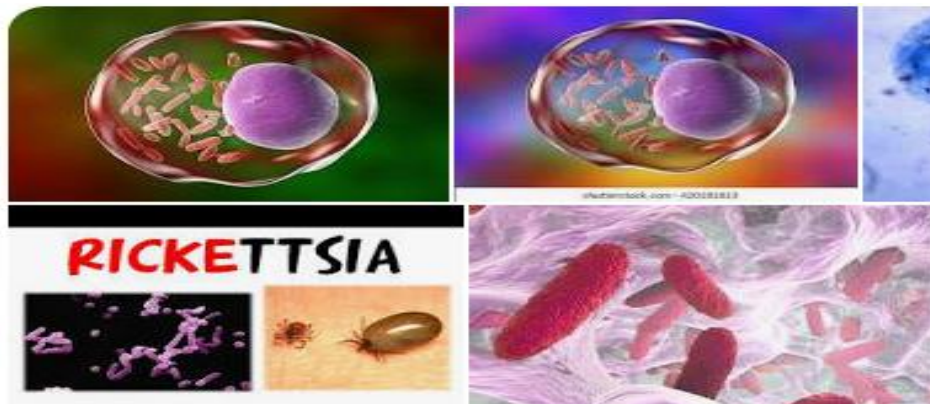


Figure 5: Figure showing Rickettsia

8. Protozoa

Protozoa are single celled organisms. They come in many different shapes and sizes ranging from an Amoeba which can change its shape to Paramecium with its fixed shape and complex structure. They live in a wide variety of moist habitats including fresh water, marine

environments and the soil. Some are parasitic, which means they live in other plants and animals including humans, where they cause disease. Plasmodium, for example, causes malaria. They are motile and can move by:

Cilia: Tiny hair like structures that cover the outside of the microbe.

Flagella: Long thread-like structures that extend from the cell surface.

Amoeboid movement: The organism moves by sending out pseudopodia, temporary protrusions that fill with cytoplasm that flows from the body of the cell.



Figure 2.6: Figure showing protozoan

9. Helminth

Helminth is a general term meaning worm. The helminths are invertebrates characterized by elongated, flat or round bodies. In medically oriented schemes the flatworms or platyhelminths (platy from the Greek root meaning “flat”) include flukes and tapeworms. Roundworms are nematodes (nemato from the Greek root meaning “thread”). These groups are subdivided for convenience according to the host organ in which they reside, e.g., lung flukes, extraintestinal tapeworms, and intestinal roundworms.

10. Paracytology

Parasitology is the study of parasites, their hosts, and the relationship between them. As a biological discipline, the scope of parasitology is not determined by the organism or environment in question but by their way of life. A parasite is an organism that live on or within another organism called the host. These include organisms such as Plasmodium

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species, the protozoan parasite which causes malaria, Leishmania, unicellular organisms which cause leishmaniasis, Entamoeba and Giardia, which cause intestinal infections (dysentery and diarrhoea), Multicellular organisms and intestinal worms (helminths) such as Schistosoma species, wuchereria bancrofti, Necator americanus (hookworm) and Taenia spp. (tapeworm), Ectoparasites such as ticks, scabies and lice

11. Parasite

Parasite an organism living in, on, or with another organism in order to obtain nutrients, grow, or multiply often in a state that directly or indirectly harms the host



Figure 2. 7: Figure showing sample mosquito parasite

12. Immunology

The word immunity was derived from the Latin word “immunis” meaning exempt. Immunology is the branch of biomedical science that deals with the response of an organism to antigenic challenge and its recognition of what is self and what is not. It deals with the defence mechanisms including all physical, chemical and biological properties of the organism that help it to combat its susceptibility to foreign organisms, material, etc.

Immunology deals with physiological functioning of the immune system in states of both health and disease as well as malfunctions of the immune system in immunological disorders like allergies, hypersensitivities, immune deficiency, transplant rejection and autoimmune disorders.

Immunology deals with physical, chemical and physiological characteristics of the components of the immune system in vitro, in situ, and in vivo. Immunology has a vast array of uses in several disciplines of science and medical science.

Classification

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The immune system is divided into those which are:

- I. Innate immunity
- II. Adaptive immunology

I. Innate immunity

The innate system of immunity is on evolutionary terms, the older system that forms the first line of defense. It is non-specific and the resistance is static (it does not improve with repeated exposure and there is no memory on subsequent exposures). This includes physical defences such as skin & epithelial surfaces, cilia, acidic gastric contents, fever etc. Others are biochemical defenses such as soluble - lysozyme, acute phase reactants and complement, fibronectin, interferons. Cellular components include natural killer cells, RES phagocytes.

II. Adaptive immunology

The adaptive system is the second line of defence and is activated once the innate system has been overwhelmed. It is specific to the infective agent and can store the information about the invader as memory to show an enhanced response to subsequent challenge.



Figure 2. 8: Figure showing organs of the immune systems

13. Infectious Diseases

Infectious diseases are illnesses caused by harmful organisms (pathogens) that get into your body from the outside. Pathogens that cause infectious diseases are viruses, bacteria, fungi, parasites and, rarely, prions. You can get infectious diseases from other people, bug bites and contaminated food, water or soil.

types of infectious diseases?

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Infectious diseases can be viral, bacterial, parasitic or fungal infections. There's also a rare group of infectious diseases known as transmissible spongiform encephalopathies (TSEs).

Viral infections: Viruses are a piece of information (DNA or RNA) inside of a protective shell (capsid). Viruses are much smaller than your cells and have no way to reproduce on their own. They get inside your cells and use your cells' machinery to make copies of themselves.

Bacterial infections: Bacteria are single-celled organisms with their instructions written on a small piece of DNA. Bacteria are all around us, including inside of our body and on our skin. Many bacteria are harmless or even helpful, but certain bacteria release toxins that can make you sick.

Fungal infections: Like bacteria, there are many different fungi. They live on and in your body. When your fungi get overgrown or when harmful fungi get into your body through your mouth, your nose or a cut in your skin, you can get sick.

Parasitic infections: Parasites use the bodies of other organisms to live and reproduce. Parasites include worms (helminths) and some single-celled organisms (protozoa).

Common infectious diseases caused by bacteria:

- ✓ Salmonella
- ✓ Tuberculosis
- ✓ Whooping cough (pertussis)
- ✓ Chlamydia
- ✓ Gonorrhea
- ✓ Urinary tract infections (UTIs)

Common infectious diseases caused by fungi:

- ✓ Fungal nail infections.
- ✓ Vaginal candidiasis
- ✓ Oral Thrush

Common infectious diseases caused by parasites:

- ✓ Giardiasis
- ✓ Toxoplasmosis

- ✓ Hookworms
- ✓ Pinworms

Chain of Disease Transmission

Chain of disease transmission is a logical order of events/series of events which must occur in order for disease to be transmitted and causing infection. It is the series that is essential to the development of the infectious agents and propagation of disease. In order to understand the process of disease progression, we shall now go through the so called chain of disease transmission. There are six successive events implicated in the chain of disease transmission

1. Infectious agent (Ethologic or causative agent)
2. Reservoir
3. Portal of exit
4. Mode of transmission
5. Mode of entry
6. Successive host

Infectious Agent

It can be an organism (Virus bacteria, rickettsia, protozoan helminth, Fungus or arthropod) or physical/chemical/ agent (toxin or poison)

Reservoir of infection

- A living (human being, plant, animal or arthropod) or non living (soil, water etc) in which an infectious agent normally lives, transforms and multiplies on which it primarily for survive and where it produce itself in such a way that it can be passed to (transmitted to) new susceptible host.

Portal of exit: Site on reservoir through which an infectious agent escapes from the reservoir.

Examples

- ✓ **GIT** – Typhoid fever, Ascariasis dysentery
- ✓ **Skin and mucus membrane**-syphilis
- ✓ **RT** – TBC

Made of transmission

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Mechanism by which an infectious agent transferred from reservoir or infected host to new host Two main type of mode transmission

A. Direct transmission

Immediate transfer of infectious agent from infected host or reservoir to an appropriate portal of entry on the susceptible host. Some of the ways of direct transmission are

- ✓ Direct vertical – Transplacental syphilis, HIV
- ✓ Direct contact – contact of skin, mucosa, Conjunctiva with infectious agent
- ✓ Direct touching, kissing, sexual intercourse
- ✓ Direct projection – droplets of saliva created by expiratory activity

B. Indirect Transmission

It can take the following forms

Airborne transmission: Dissemination through a suitable portal of entry usually respiratory tract as particles dust and droplet nuclei E.g. TBC

Vehicle Borne transmission: Any non-living substance or objects by which an infectious agent can be transported and introduced in to the host through portal of entry

Vehicles includes: Food, milk, water, soil, fomites and contaminated objects such as towels, cooking and eating utensils syringe and needles, surgical instrument, biological products like b/d tissue organ etc.

Vector borne transmission

Infectious agent transferred from infected host or reservoir to susceptible host by vector

Vector is an organism which transfer agent to host

Route of entry:

Site on susceptible host through which an infectious agent get into it

The manner of entry is one of the factors which determine whether or not the infectious agent establishes the infection.

Susceptible host: A person or animal lacking of sufficient resistance to particular pathogenic agent to prevent the disease if or when exposed.

In order for transmission to be completed, the existence of susceptible host is necessary

It is one who is highly likely to acquire infection

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Self-check-1

Directions: Answer all the questions listed below.

Short answer Questions

Define Causes of Diseases

Define the following terminologies

1. Diseases
2. Illness
3. Sickness
4. Health
5. Environments
6. Agent
7. Host

What are the common microorganisms responsible to cause disease in human being?

What are the successive events implicated in the chain of disease transmission?

Identify Infectious Diseases

Differentiate Basic components of disease transmission

Unit Three: Identifying clients need to individualize nursing care

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Basic concept of nursing care
- History of nursing
- Nursing theories and models
- Level of skill development in Nursing
- Materials used for basic nursing care
- Purpose of basic nursing care
- Therapeutic communication
- Patient care unit
- Cleaning patient unit
- Ventilation and lighting of the patient room
- Collecting patient specimen
- Feeding a helpless patient
- Cold and heat application

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Define and list Basic concept of nursing care
- Have basic understanding about History of nursing
- Identify Nursing theories and models
- Understand Level of nursing skill development
- Define Basic Nursing care, purposes & Materials used
- Have basic understanding about Therapeutic communication
- Define Caring for the patient care unit and its cleaning
- Understand Ventilation and lighting of the patient room
- Have basic understanding on patient specimen collection
- Define and apply feeding of helpless patient
- Apply Cold and heat application based on indications
- Apply Aseptic techniques for invasive nursing procedures

3.1. Basic concept of nursing care

The nursing profession began with a genuine desire to serve and care for others, combined with a sense of compassion and commitment that entails the humanistic blend of scientific knowledge and the art of holistic practice focused on protection, promotion, and optimization of health and abilities; prevention of illness and injury; alleviation of suffering through the diagnosis and treatment of human responses; and advocacy in health care for individuals, families, communities, and populations.

Nurses work collaboratively with patients, patient families, and other health care professionals to develop and implement a plan of care, coordinate the patient's care and treatment provided by a professional health care team. The essence of nursing is an unconditional love for mankind. Nurses are key ingredients of health service team and the quality of service any hospital renders is hugely affected by their input.

It is assisting the individual, sick or well in the performance of those activities contributing to health or its recovery (to peaceful death) that he will perform unaided, if he had the necessary strength, will or knowledge and to do this in such a way as to help him gain independence as rapidly as possible (Virginia Henderson 1960).

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Nursing care refers to a range of care services provided by registered nurses, licensed practical nurses, and certified nursing assistants. The work that nurses do helps keep patients healthy and comfortable, and also prevents worsening or new conditions. Nursing care is provided in hospitals, doctor's offices, urgent care clinics, and residential facilities, like nursing homes. Nursing care can also be provided in the home. The services nursing care provides include many different things, but a few examples are administering intravenous fluids, inserting and changing catheters, and caring for wounds.

Regardless of specialty or type of nursing, all nurses follow a basic nursing process that forms the core of care for patients:

- **Assessment.** Nurses first assess their patients by using all the information available. This includes medical data as well as psychological, economic, lifestyle, and cultural factors. Nurses can provide the best care only when they have a wide range of information about patients.
- **Diagnosis.** Using the assessment, nurses then make clinical judgments about a patient's symptoms, medical conditions, and needs. The diagnosis goes well beyond simply naming a condition and includes recognizing all issues and needs that the patient has.
- **Planning.** The nurse then sets goals for the patient based on the assessment and clinical judgment, or diagnosis. A plan is formed to help the patient meet those goals, which may include reducing pain, increasing mobility, or addressing mental health needs.
- **Implementation.** With a plan in place the nurse and the nurse's team implements the plan and keeps a record of what is done for the patient and whether goals are met. The records are crucial for providing continuity of care.
- **Evaluation.** Evaluation is an ongoing process that the nurse uses to determine if the patient is meeting goals and if the patient's needs are met. The evaluation can be used to change the plan and how it is implemented.

Historical Background of Nursing

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In the early ages, much of the practice of medicine was integrated with religious practices. Before the development of modern nursing, women of nomadic tribes performed nursing duties, such as helping the very young, the old, and the sick, care-dwelling mothers practiced the nursing of their time. As human needs expanded, nursing development broadened; its interest and functions through the social climates created by religious ideologies, economics, industrial revolutions, wars, crusades, and education. In this way modern nursing was born. The intellectual revolution of the 18th and 19th centuries led to a scientific revolution. The dynamic change in economic and political situations also influenced every corner of human development including nursing. It was during the time of **Florence Nightingale** that modern nursing developed. She greatly modified the tradition of nursing that existed before her era. She also contributed to the definition of nursing "to put the patient in best possible way for nature to act." Since her time modern nursing development has rapidly occurred in many parts of the world.

History of Nursing in Ethiopia

Even though Ethiopia is one of the oldest countries in the world, introduction of modern medicine was very late. Health care of communities and families was done by Hakim (wogesha or traditional healers).

Around 1866 missionaries came to Eritrea, (one of the former provinces of Ethiopia) and started to provide medical care for very few members of the society. In 1908 Minilik II hospital was established in the capital of Ethiopia. The hospital was equipped and staffed by Russians. Later hospital building was continued which raised the need to train health auxiliaries and nurses. In 1949 the Ethiopian Red Cross, School of Nursing was established at Hailesellase I hospital in Addis Ababa. The training was given for three years. In 1954 Hailesellase I Public Health College was established in Gondar to train health officer, community health nurses and sanitarians.

During the regimen of 'Dergue', the former bedside and community health nursing training was changed to comprehensive nursing. An additional higher health professional training institution was also established in 1983 In Jimma.

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After the overthrow of the Dergue, the transitional government of Ethiopia developed a health policy that emphasizes health promotion, diseases prevention, and curative and rehabilitative health service with priority to the rural societies. As the result of the policy the training of public health nursing at the diploma level came in to existence since 1995. Additional public health higher training institutions were established at Dilla and Alemaya in 1996. The outputs of these training institutions are providing services all over the country.

Nursing theories and Models

Nursing theories are organized bodies of knowledge to define what nursing is, what nurses do, and why they do it. Nursing theories provide a way to define nursing as a unique discipline that is separate from other disciplines (e.g., medicine). It is a framework of concepts and purposes intended to guide nursing practice at a more concrete and specific level.

History of Nursing Theories

In 1860, Florence Nightingale defined nursing in her “Environmental Theory” as “the act of utilizing the patient’s environment to assist him in his recovery.”

In the 1950s, there is a consensus among nursing scholars that nursing needed to validate itself through the production of its own scientifically tested body of knowledge.

In 1952, Hildegard Peplau introduced her Theory of Interpersonal Relations that emphasizes the nurse-client relationship as the foundation of nursing practice.

In 1955, Virginia Henderson conceptualized the nurse’s role as assisting sick or healthy individuals to gain independence in meeting 14 fundamental needs. Thus her Nursing Need Theory was developed.

In 1960, Faye Abdellah published her work “Typology of 21 Nursing Problems,” which shifted the focus of nursing from a disease-centered approach to a patient-centered approach.

In 1962, Ida Jean Orlando emphasized the reciprocal relationship between patient and nurse and viewed nursing’s professional function as finding out and meeting the patient’s immediate need for help.

In 1968, Dorothy Johnson pioneered the Behavioral System Model and upheld the fostering of efficient and effective behavioral functioning in the patient to prevent illness.

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In 1970, Martha Rogers viewed nursing as both a science and an art as it provides a way to view the unitary human being, who is integral with the universe.

In 1971, Dorothea Orem stated in her theory that nursing care is required if the client is unable to fulfill biological, psychological, developmental, or social needs.

In 1971, Imogene King's Theory of Goal attainment stated that the nurse is considered part of the patient's environment and the nurse-patient relationship is for meeting goals towards good health.

In 1972, Betty Neuman, in her theory, states that many needs exist, and each may disrupt client balance or stability. Stress reduction is the goal of the system model of nursing practice.

In 1979, Sr. Callista Roy viewed the individual as a set of interrelated systems that maintain the balance between these various stimuli.

In 1979, Jean Watson developed the philosophy of caring, highlighted humanistic aspects of nursing as they intertwine with scientific knowledge and nursing practice.

Definition of key Terms

The development of nursing theory demands an understanding of selected terminologies, definitions, and assumptions.

Philosophy: These are beliefs and values that define a way of thinking and are generally known and understood by a group or discipline.

Theory: A belief, policy, or procedure proposed or followed as the basis of action. It refers to a logical group of general propositions used as principles of explanation. Theories are also used to describe, predict, or control phenomena.

Concept: Concepts are often called the building blocks of theories. They are primarily the vehicles of thought that involve images.

Models: Models are representations of the interaction among and between the concepts showing patterns. They present an overview of the theory's thinking and may demonstrate how theory can be introduced into practice.

Conceptual framework: A conceptual framework is a group of related ideas, statements, or concepts. It is often used interchangeably with the conceptual model and with grand theories.

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Proposition: Propositions are statements that describe the relationship between the concepts.

Domain: The domain is the perspective or territory of a profession or discipline.

Process: Processes are organized steps, changes, or functions intended to bring about the desired result.

Paradigm: A paradigm refers to a pattern of shared understanding and assumptions about reality and the world, worldview, or widely accepted value system.

Metaparadigm: A Metaparadigm is the most general statement of discipline and functions as a framework in which the more restricted structures of conceptual models develop. Much of the theoretical work in nursing focused on articulating relationships among four major concepts: person, environment, health, and nursing.

The Nursing Metaparadigm

Four major concepts are frequently interrelated and fundamental to nursing theory: person, environment, health, and nursing. These four are collectively referred to as metaparadigm for nursing.



Figure 3.1: Figure showing Nursing Metaparadigm

Person: Person (also referred to as Client or Human Beings) is the recipient of nursing care and may include individuals, patients, groups, families, and communities.

Environment: Environment (or situation) is defined as the internal and external surroundings that affect the client. It includes all positive or negative conditions that affect

the patient, the physical environment, such as families, friends, and significant others, and the setting for where they go for their healthcare.

Health: Health is defined as the degree of wellness or well-being that the client experiences. It may have different meanings for each patient, the clinical setting, and the health care provider.

Nursing: The nurse's attributes, characteristics, and actions provide care on behalf of or in conjunction with the client. There are numerous definitions of nursing, though nursing scholars may have difficulty agreeing on its exact definition. The ultimate goal of nursing theories is to improve patient care.

In 21st Century nursing is the glue that holds a patient's health care journey together. Across the entire patient experience, and wherever there is someone in need of care, nurses work tirelessly to identify and protect the needs of the individual. Beyond the time-honored reputation for compassion and dedication lies a highly specialized profession, which is constantly evolving to address the needs of society. From ensuring the most accurate diagnoses to the ongoing education of the public about critical health issues; nurses are indispensable in safeguarding public health.

The Concept of care in Nursing

Nursing programs prepare nurses for a higher level of clinical practice. Nurses learn about applying evidence-based research, critical thinking and scientific knowledge to the delivery of healthcare. They also gain deeper knowledge of health care and technology. However, caring is the foundation of nursing.

How is care defined? The Merriam Webster dictionary defines caring as “feeling or showing concern for or kindness to others.” Why is caring an important part of nursing? Patient care is not just about the medical aspect only. Patients may experience stress about their conditions, injuries, procedures, surgeries, or recovery. It is important for nurses to treat a patient's physical ailments as well as emotional responses and needs.

Therapeutic Communication

Therapeutic communication is an active process and interaction between a nurse and a patient that helps advance the physical and emotional health of the patient. The nurse uses

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various strategies to help the patient express their ideas and feelings in a manner that establishes respect and acceptance. This, in turn, enhances the patient's comfort levels, encourages a feeling of safety, and increases their trust in the nurse. That's because good therapeutic communication helps the patient feel that someone truly understands and cares for them.

The nurse benefits from therapeutic communication as well. Such interactions help the nurse establish rapport with the patient, understand where the patient is coming from, exchange valuable information, and come up with individualized health-care intervention strategies that benefit the patient. A nurse who practices effective therapeutic communication also benefits from the knowledge that they helped someone in need as a result. Therapeutic communication relies on two types of communication: verbal and nonverbal.

Benefits of therapeutic communication

- Increase accuracy of nursing diagnoses.
- Helps for collaborative decision-making with patients
- Improve patient care outcomes
- Improve patient and nurse satisfaction
- Reduce burnout levels

Therapeutic Communication Techniques

- Active Listening
- Sharing Observations
- Sharing Empathy
- Sharing Humor
- Sharing Feelings
- Using Silence
- Using Touch
- Providing Information
- Clarifying
- Asking relevant questions

- Summarizing
- Confronting
- Focusing the conversation
- Exploring
- Paraphrasing
- Restating
- Providing leads

Care of the Patient Unit and Equipment

The patient unit is the combination of space, furniture and material for personal use that patients have during their stay in a hospital center. It is a designated area of the hospital that provides a bedroom or a grouping of bedrooms with respective supporting facilities and services to provide adequate nursing care and clinical management of inpatients. It is an organized, operated, and maintained to function as a separate and distinct unit.

The patient unit is of three types:

1. Private room: It is a room in which only one patient be admitted
2. Semi private room: It is a patient unit which can accommodate two patients
3. Ward: It is a room, which can receive three or more patients

Hospital Bed

A **hospital bed** or **hospital cot** is a bed specially designed for hospitalized patients or others in need of some form of health care. These beds have special features both for the comfort and well-being of the patient and for the convenience of health care workers. Common features include adjustable height for the entire bed, the head, and the feet, adjustable side rails, and electronic buttons to operate both the bed and other nearby electronic devices.

Gatch bed: a manual bed which requires the use of hand racks or foot pedals to manipulate the bed into desired positions i.e. to elevate the head or the foot of the bed

- Most commonly found in Ethiopia hospitals
- Are less expensive and free of safety hazard
- Handles should be positioned under the bed when not in use

Side Rails

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- They are meant to prevent client falls
- It should be attached to both sides of the bed

Types of rails

Full rails – run the length of the bed

Half rails _ run only half the length of the bed and commonly attached to the pediatrics bed.

Bed Side Stand

It is a small cabinet that generally consists of a drawer and a cupboard area with shelves. Used to store the utensils needed for clients care. Includes the washbasin (bath basin, emesis (kidney) basin, bed pan and urinal. Has a towel rack on either sides or along the back. It is best for storing personal items that are desired nearby or that will be used frequently E.g. soap, shampoo, lotion

Over Bed Table

- The height is adjustable
- Can be positioned and consists of a rectangular, flat surface supported by a side bar attached to a wide base on wheels
- Alongside or over the bed or over a chair
- Used for holding the tray during meals, or care items when completing personal hygiene

The Chair

- Most basic care units have at least one chair located near the bedside
- For the use of the client, a visitor, or a care provider

Overhead Light (examination light)

- Is usually placed at the head of the bed, attached to either the wall or the ceiling
- A movable lamp may also be used
- Useful for the client for reading or doing close work
- Important for the nurse during assessment

Suction and Oxygen Outlets

- Suction is a vacuum created in a tube that is used to pull (evacuate) fluids from the body E.g. to clear respiratory mucus or fluids

- Oxygen is one of the gases frequently used for health care today. Oxygen is derived through a tube.

Electrical Outlets

Allow electrical equipment to connect to the electrical grid. The electrical grid provides alternating current to the outlet. Almost always available in the wall at the head of the bed

Sphygmomanometer

It is an instrument for measuring blood pressure, typically consisting of an inflatable rubber cuff which is applied to the arm and connected to a column of mercury next to a graduated scale, enabling the determination of systolic and diastolic blood pressure by increasing and gradually releasing the pressure in the cuff.

The blood pressure assessment tool has two types:

1. An aneroid
2. Mercury, which is frequently used during nursing assessment.

Call Light

A device used by a patient to signal his or her need for assistance from professional staff. It typically consists of a wireless remote control at the bedside, linked to a beeper, buzzer, cellular phone, chime, or light panel. Used for client's to maintain constant contact with care providers

Care of Patient Unit

Nursing staffs are not responsible for actual cleaning of dust and other dirty materials from hospital. However, it is the staff nurses' duty to supervise the cleaner who perform this job.

General rules for cleaning

- Dry dusting of the room is not advisable.
- Dusting should be done by sweeping only
- Use a damp duster for collecting dust
- Dust with clear duster
- Collect dust at one place to avoid flying from place to place
- Dusting should be done without disturbing or removing the patients from bed
- Dusting should be done from top to bottom i.e. from upward to downward direction

- While dusting, take care not to spoil the beds or walls or other fixtures in the room or hospital ward
- While dusting, wounds or dressing should not be opened by other staff
- There should be a different time for dusting daily

Care of hospital and health care unite equipments

- General Instructions for Care of Hospital Equipment
- Use articles only for the purpose for which they are intended
- Keep articles clean and in good condition. Use the proper cleaning method
- Protect mattresses with rubber sheets
- Use protective pillowcases on pillows.
- Do not boil articles, especially rubber articles and instruments longer than the correct time
- Do not sterilize rubber goods and glass articles together - wrap glass in gauze when sterilizing it by boiling
- Protect table tops when using hot utensils or any solution that may leave stain or destroy the table top
- Report promptly any damaged or missing equipment

Care of Equipment in General

- Rinse used equipment in cold water.
- Remove any sticky material.
- Hot water coagulates the protein of organic material and tends to make it adhere
- Wash well in hot soapy water. Use an abrasive, such as a stiff-bristled brush, to clean equipment
- Rinse well under running water
- Dry the article
- Clean the gloves, brush and sink

Care of Linen and Removal of Stains

- Clean linen should be folded properly and be kept neatly in the linen cupboard

- Dirty linen should be put in the dirty linen bag (hamper) and never be placed on the floor
- Torn linen should be mended or sent to the sewing room
- Linen with blood should be soaked in cold water to which a small amount of hydrogen peroxide is added if available
- Linen stained with urine and feces is first rinsed in cold water and then washed with soap
- Iodine stained linen- apply ammonia, rinse and then wash with cold water
- Ink stained linen first soak in cold water or milk for at least for 24 hrs then rub a paste of salt and lemon juice on the stain and allow the article to lie in the sun
- Tea or coffee stains – wash in cold water and then pour boiling water on the stain
- To remove vitamin B complex stains dissolve in water or sprit • Mucus stains – soak in salty water
- Rust _ soak in salt and lemon juice and then bleach in sun

Care of Pick up Forceps and Jars

- Pick up forceps: an instrument that allows one to pick up sterile equipment.
- Sterile equipment: material, which is free of all forms of microorganism.
- Pick up forceps should be kept inside the jar in which 2/3 of the jar should be filled with antiseptic solution
- Wash pick up forceps and jars and sterilize daily
- Fill jar with disinfectant solution daily
- Care should be taken not to contaminate tip of the forceps
- Always hold tip downward
- If tip of forceps is contaminated accidentally, it should be
- Sterilized before placing it back in the jar to avoid contamination.

Rubber Bags

- Example: hot water bottles, ice bags should be drained and dried
- They should be inflated with air and closed to prevent the sides from sticking together

Rubber Tubing

- Should be washed with warm, soapy water

- The inside should be flushed and rinsed well

Ventilation and lighting of the patient room

Ventilation moves outdoor air into a building or a room, and distributes the air within the building or room. The general purpose of ventilation in buildings is to provide healthy air for breathing by both diluting the pollutants originating in the building and removing the pollutants from.

Basic Elements Ventilation

Ventilation Rate: the amount of outdoor air that is provided into the space, and the quality of the outdoor air.

Airflow Direction: the overall airflow direction in a building, which should be from clean zones to dirty zones.

Air distribution or airflow pattern: the external air should be delivered to each part of the space in an efficient manner and the airborne pollutants generated in each part of the space should also be removed in an efficient manner.

Assessing ventilation performance

Ventilation performance in buildings can be evaluated from the following four aspects, corresponding to the three basic elements of ventilation discussed above.

1. Does the system provide sufficient ventilation rate as required?
2. Is the overall airflow direction in a building from clean to dirty zones (e.g. isolation rooms or areas of containment, such as a laboratory)?
3. How efficient is the system in delivering the outdoor air to each location in the room?
4. How efficient is the system in removing the airborne pollutants from each location in the room?

Collecting Patient Specimen

Specimen collection: refers to collecting various specimens (samples), such as, stool, urine, blood and other body fluids or tissues, from the patient for diagnostic or therapeutic purposes. These includes, stool, urine, blood and other body fluid or tissue specimens.

General Considerations for specimen collection

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1. When collecting specimen, wear gloves to protect self from contact with body fluids.
2. Get request for specimen collection and identify the types of specimen being collected and the patient from which the specimen collected.
3. Get the appropriate specimen container and it should be clearly labeled have tight cover to seal the content and placed in the plastic bag or racks, so that it protects the laboratory technician from contamination while handling it.
4. The patient's identification such as, name, age, card number, the ward and bed number (if in-patient). The types of specimen and method used (if needed). The time and date of the specimen collected.
5. Assemble and organize all the necessary materials for the specimen collection.
6. Give adequate explanation to the patient about the purpose, type of specimen being collected and the method used.
7. When collecting specimen wear gloves to protect self from contact with the specimen (body fluids in particular)
8. Put the collected specimen into its container without contaminating outer parts of the container and its cover.
9. All the specimens should be sent promptly to the laboratory, so that the temperature and time changes do not alter the content.

Collecting Urine Specimen

Types of urine specimen collection

Clean voided urine specimen: (Also called clean catch or midstream urine specimen)

Sterile urine specimen

3. Timed urine specimen: It is two types
 - ✓ Short period → 1-2 hours
 - ✓ Long period → 24 hours

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Operation sheet

Operation Title: Collecting Urine Specimen

Definition: is method of taking small portion of urine from client, which can represent the client's quality of whole urine.

Instruction: Perform midstream urine specimen by using all steps/tasks according to standard procedures /guideline

Purposes

- Diagnostic purposes
- Routine laboratory analysis and culture and sensitivity tests

Indications

- End stage renal failure(acute)
- Drug toxicity
- UTI
- Pregnancy test
- Screening
- Acute hemolytic problems
- Post -operative evaluation

Precautions

- Never contaminate with fecal matter
- Send immediately to laboratory department
- Follow instruction for type of urine specimen
- Specimen should be free of toilet tissue
- Label specimen containers or bottles before the client voids
- Note on the specimen label if the female client is menstruating at that time

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Equipments

- Laboratory request form
- Clean container with lid or cover (1): wide-mouthed container is recommended
- Bedpan or urinal (1): as required
- Disposable gloves (1): if available
- Toilet paper as required

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Explain the procedure				
2.	Assemble equipment and check the specimen form with client's name, date and content of urinalysis				
3.	Label the bottle or container with the date, client's name, department identification, and Dr's name				
4.	Perform hand hygiene and put on gloves				
5.	Keep privacy				
6.	Instruct the client to void in a clean receptacle.				
7.	Remove the specimen immediately after the client has voided				
8.	Pour about 10-20 mL of urine into the labeled specimen bottle or container and cover the bottle or container				
9.	Comfort patient				
10.	Dispose of used equipment or clean them. Remove gloves and perform hand hygiene.				
11.	Send the specimen bottle or container to the laboratory immediately with the specimen form.				
12.	Document the procedure in the designated place and mark it off on the Kardex.				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform urine specimen Collection

Operation sheet

Operation Title: Stool specimen Collection

Definition: Taking small pieces of stool from patient for chemical, bacteriological or parasitological analysis.

Instruction: Perform stool specimen specimen by using all steps/tasks according to standard procedures /guideline

Purpose:

- To identify specific pathogens
- To determine presence of ova and parasites
- To determine presence of blood and fat
- To examine for stool characteristics such as color, consistency and odor

Necessary Equipments

1. Clean disposable glove
2. Tongue depressor
3. Bed pan
4. Screen

5. Air fresher as needed
6. Tissue paper
7. Specimen bottle
8. Labeling tape
9. Lab request
10. Glove
11. Request chart

Procedures

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
	Explain the procedure				
	Wash hands				
	Assemble the necessary equipment				
	Keep patient privacy				
	Offer clean bed pan to the patient				
	Take bed pan to the utility room				
	Take a portion of feces from different area of stool				
	Throw tongue depressor into the waste can				
	Spray air fresher as necessary				
	Label bottle properly				
	Send to the laboratory				
	Return used equipment and wash hand				
	Proper documentation				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Stool specimen collection

Collecting Blood Specimen

Definition: It is method of taking small drop of blood from capillary by pricking the skin. The site for pricking may include tip of the finger (ring finger of the left hand), Lobe of the ear and Infants plantar surface of the heel and the plantar surface of the big toe.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

1. To detect hemo-parasite
2. To detect blood cell abnormalities

Required Equipments

3. Antiseptic swab
4. Glove
5. Tray
6. Safety box
7. West receiver
8. Lancet
9. pen and pencil
10. capillary tube
11. record chart
12. Glass of slide

Precaution

- Use safety box
- Blood should never be taken from IV line or above an existing line
- Use personal protective equipment

Procedures

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Dry cotton				
2.	Explain the procedure				
3.	Wash hands				
4.	Assemble the necessary equipment				
5.	Put on glove				
6.	Clean the site with antiseptic swab				
7.	Prick the site with lancet				
8.	Collect a drop of blood on the glass slide				
9.	Spread the drop of blood along slide(smearing)				
10.	Try to work quickly so not to allow clotting on the slide				
11.	Give alcohol for client to apply pressure to the site				
12.	Return used equipment and wash hand				
13.	Proper documentation				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Blood Specimen collection

Sputum specimen collection

Definition: It is method of collecting coughed sputum for diagnostic purpose.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose: Examination of sputum may aid in the diagnosis and treatment of several upper and lower respiratory tract conditions.

Equipment

- ✓ Sterile specimen container with cover

- ✓ Clean disposable gloves
- ✓ Facial tissue
- ✓ Emesis basin (optional)
- ✓ Toothbrush (optional)
- ✓ Completed identification label
- ✓ Completed laboratory request

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Explain the procedure				
2.	Wash hands				
3.	Assemble the necessary equipment				
4.	Keep patient privacy				
5.	Position client: semi-Fowler's position, setting on side of				
6.	Apply clean disposable gloves				
7.	Provide client with specimen container, and instruct client				
8.	Instruct client to take three to four slow deep breaths				
9.	Instruct client to emphasize slow, full exhalation				
10.	After series of deep breaths, ask client to cough after full				
11.	Instruct client to expectorate sputum directly into				
12.	Have client repeat coughing until an adequate amount of				
13.	Comfort patient				
14.	Send specimen to lab department with its request				
15.	Return used equipment and wash hand				
16.	Proper documentation				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Sputum Specimen collection

Feeding Helpless Patients

Definition: is providing nutritional intake for a patient that is unable to feed him/herself.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- To assist the patient to eat meal
- To meet the nutritional need
- To promote healthy
- To prevent dehydration
- To improve appetite

Indication

- General weakness or critically ill patient
- Paralysis or limitation of movement E.g. Presence of arm splints casts and traction.
- Small children.

Precautions

- Control odors noise and unpleasant sights at meal equipment.
- Remove solid equipment & linens
- Assess food allergy
- Assess presence of special diet (DM, HTN, CKD....)
- Check the diet ordered
- Make surrounding neat and clean.
- Prepare patient and over – bed table
- Hot food should be served hot and cold food cold.
- The tray should be complete, clean and neat.
- The food, no matter how simple, should be attractive and appetizing

Necessary Equipments

- Extra pillow, if not a patch bed Nap kin
- Food on a clean tray
- Towel
- Glass of water

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- Meal tray
- Drinking tube or feeding cup
- Over bed table
- Oral hygiene equipment
- Feeding spoon

Procedure

S.No	Procedural steps	Assessment			
		0	1	2	Remark
1.	Make patient comfortable.				
2.	Elevate head and shoulder if permissible.				
3.	Protect patient's gown and bed with a towel.				
4.	Arrange tray conventionally				
5.	Place tray where it can be reached easily				
6.	Feed patient as indicated.				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform feeding of helpless patient

Gastrostomy feeding

Definition: Gastrostomy is an operation performed to create an opening in to the stomach to administer food and medications.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- For long term use and total feeding supplementation.

- For patients who cannot tolerate nasogastric or naso-entric tube.
- It decreases the risk of

Equipment

- Gastrostomy tube
- 50 ml syringe
- Funnel
- Clamper
- Measuring jag
- Sterile gauze
- Adhesive tape
- Chart

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Explain the procedure to the patient				
2.	Wash hand				
3.	Assemble the necessary equipment				
4.	Position the patient in his/ her comfortable position				
5.	Pour the fluid (food) into the measuring jag as prescribed.				
6.	Connect the syringe with the tube.				
7.	Hold syringe at angle so that air doesn't enter stomach				
8.	Hold syringe perpendicular so feeding can enter by				
9.	After feeding rinse with water and remove the syringe.				
10.	Cover the tip of the tube with sterile gauze using a plastic				
11.	Apply light dressing over the stoma and tube.				
12.	Comfort patient; keep the head of the bed elevated for at				
13.	Clean return used equipment				
14.	Wash hands and document procedure in the client's				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

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LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Gastrostomy feeding

Unit Four: Minimize risk of injury

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Body mechanics
- Basic concept of safe manual handling
- Manual handling equipment
- Body posture and handling techniques
- Safe work practice
- Load and un load packs

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Define and list Basic Body mechanics
- Have basic understanding about Basic concept of safe manual handling
- Identify Manual handling equipment
- Understand Body posture and handling techniques
- Define Safe work practice
- Have basic understanding about Load and un load packs

Body mechanics is the use of the muscle and skeletal systems during activity and when positioning the body for work tasks, given that the task is within the limits of worker capability when assisting in the movement, positioning and transfer of clients. Proper body mechanics is the use of the safest and most efficient methods of moving and lifting. It is the means of applying mechanical principles of movement to human body. It is the coordinated and safe use of the body to produce motion and maintain balance during activity. Body mechanics is the coordinated use of the body parts to produce motion and to maintain balance.

Principles of body mechanics

1. Center of gravity
2. Base of support
3. Line of gravity

Center of Gravity

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A well aligned standing adult persons center of gravity is located in the pelvic area i.e. half of the body weight is distributed above this area and half below it. When lifting an object, bend at the knells and hips, and keep the back straight, by doing so, the center of gravity remains over the feet, giving extra stability.

Base of support

Is the foundation on which an object rests a person's feet provide the base of support the wider the base of support, the more stable the object with in limits. The feet spread side wise when lifting to give side to side stability on the other hand, one foot is placed slightly in front of the other for back to front stability and the weight is distributed evenly b/n both feet.

Line of gravity

It is the direction of gravitational pull from the top of the head to the feet or it is an imaginary vertical line drawn through an object's center of gravity. Generally, it is the point at which all of the mass of an object is centered.

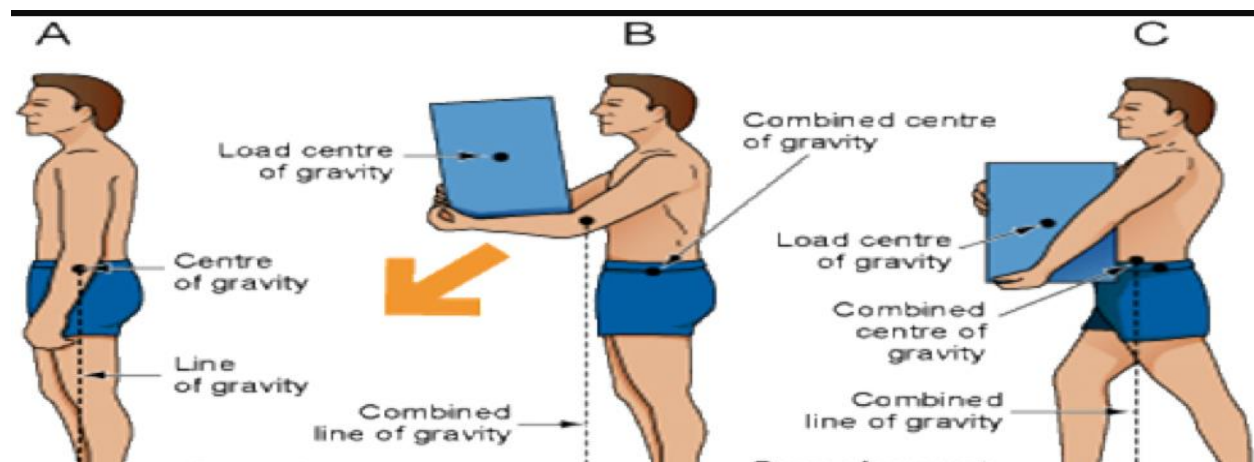


Figure 4.1: Line/Center of Gravity

Checking proper/normal alignment of spine

Definition: Proper/normal alignment of the spine refers to cervical concavity, a thoracic convexity, and a lumbar concavity in standing patients.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- To check the normal posture of spine

Necessary Equipments

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- Pen
- Documentation/charting format

Procedure

Greet the patient and explain the purpose

Instruct the patient to get stand

Observe the lateral view for cervical concavity, thoracic convexity and lumbar concavity

Observe the posterior view (scapula, iliac crest and gluteal fold)

Document the findings

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Greet the patient and explain the purpose				
2.	Instruct the patient to get stand				
3.	Observe the lateral view for cervical concavity, thoracic				
4.	Observe the posterior view (scapula, iliac crest and gluteal				
5.	Document the findings				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform checking proper/normal alignment of spine

Checking proper standing body alignment

Definition: Proper standing alignment characterized by head upright, face forward, shoulders square, back straight, abdominal muscles tucked in, arms straight at side, hands

palm forward, legs straight and feet forward with the center of gravity in the middle of the pelvis(about halfway between the umbilicus and the symphysis pubis).

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- To check the normal posture in standing posture

Necessary Equipments

- Pen
- Documentation/charting format

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Greet the patient and explain the purpose				
2.	Instruct the patient to get stand and face you				
3.	Let the patient put arms at the side and palm foreword				
4.	Feet flat on the ground and straight forward				
5.	Observe the shoulder, back, abdominal muscles, and arm,				
6.	Document the findings				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform check proper standing body alignment

Checking proper sitting posture

Definition: Proper/normal alignment on sitting posture has similar characteristics with standing posture except the hips and knees are flexed.

Instruction: Perform all steps/tasks according to standard procedures /guideline

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Purpose

- To check the normal posture on sitting posture

Necessary Equipments

- ❖ Pen
- ❖ Documentation/charting format
- ❖ Chair

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Greet the patient and explain the purpose				
2.	Instruct the patient to sit on chair facing you				
3.	Let the patient put arms on the respective thighs with palms				
4.	Feet flat on the ground, straight forward and thigh together				
5.	Observe the patients shoulder, back, abdominal muscles,				
6.	Document the findings				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform check proper sitting posture

Checking proper alignment of client in lying posture

Definition: Proper/normal alignment on lying posture has similar characteristics with standing posture except that the patient is in supine position.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

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- To check the normal posture on lying posture n

Equipment

- Pen
- Documentation/charting format
- Bed or examination couch

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Greet the patient and explain the purpose				
2.	Instruct the patient to lie flat on bed or examination couch				
3.	Let the patient put arms at the side with palms facing				
4.	Observe the shoulder, back, abdominal muscles, and arm.				
5.	Document the findings				
6.	Greet the patient and explain the purpose				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform check proper lying posture

Basic Concepts of Manual Handling

Manual Handling involves any transporting or supporting of any load by one or more employees, and includes lifting, putting down, pushing, pulling, carrying or moving a load, which by reason of its characteristics or unfavorable ergonomic conditions, involves risk, particularly of back injury, to employees. Manual handling operations” means any transporting or supporting of a load (including the lifting, putting down, pushing, pulling, carrying or moving thereof) by hand

or by bodily force. Manual handling refers to activity requiring the use of force by a person to lift, lower, push, pull, hold or restrains something.

To achieve good manual handling techniques, follow these 7 basic principles when dealing with basic lifting, pushing, pulling, lowering, filling, emptying, or carrying:

- Plan your lift:
- Position your feet:
- Ensure a good posture:
- Maintain a firm grip
- Lift smoothly
- Keeping close to the load
- Put it down then adjust it

Follow these tips to avoid compressing the spinal discs or straining your lower back when you are lifting:

Keep a wide base of support. Your feet should be shoulder-width apart, with one foot slightly ahead of the other (karate stance).

Squat down, bending at the hips and knees only. If needed, put one knee to the floor and your other knee in front of you, bent at a right angle (half kneeling)

Keep good posture. Look straight ahead, and keep your back straight, your chest out, and your shoulders back. This helps keep your upper back straight while having a slight arch in your lower back.

Slowly lift by straightening your hips and knees (not your back). Keep your back straight, and don't twist as you lift.

Hold the load as close to your body as possible, at the level of your belly button.

Use your feet to change direction, taking small steps.

Lead with your hips as you change direction. Keep your shoulders in line with your hips as you move.

Set down your load carefully, squatting with the knees and hips only.

Keep in mind:

- Do not attempt to lift by bending forward. Bend your hips and knees to squat down to your load, keep it close to your body, and straighten your legs to lift.
- Never lift a heavy object above shoulder level.
- Avoid turning or twisting your body while lifting or holding a heavy object.

Proper Lifting Technique



Figure 4.2: Wait Lifting Techniques

Safe Work Practices

Safe Work Practices: are written methods outlining how to perform a task with minimum risk to people, equipment, materials, environment, and processes.

Safe work practices should be developed as a result of completing a job safety analysis (JSA) or a hazard risk assessment (HRA) and should closely reflect the activities most common in the company's type or sector of construction. All safe work practices should be kept in a location central to the work being performed and readily available to the workforce. Some safe work practices will require specific job procedures, which clearly set out in a chronological order each step in a process.

Safe job procedures: are a series of specific steps that guide a worker through a task from start to finish in a chronological order. Safe job procedures are designed to reduce the risk by minimizing potential exposure.

Safe job procedures are usually developed by management and workers as a result of an accident or incident investigation, and/or as a supplement to a safe work practice. Safe work procedures should be included in the company's "Worker Orientation" program. All workers should be aware of the fact that safe job procedures have been established, are in effect, are written down, and must be followed.

Unit Five: Managing patient safety and comfort

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Vital signs Measurements
- Cotton Ring Application
- Foot-Board Application
- Applying pillows
- Applying air rings
- Applying bed-cradle
- Adjusting side rails of beds
- Applying sand bag
- Applying splint
- Applying fracture board
- Applying back rest

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Define and perform/take Vital signs
- Define and apply Cotton Ring Application
- Have basic understanding about Foot-Board Application
- Have basic knowledge and skill on how to apply pillows, air ring, bed cradle, sand bag, spint, fracture board and back rest

Patient Safety and Comfort

Patient Safety is a health care discipline that emerged with the evolving complexity in health care systems and the resulting rise of patient harm in health care facilities. It aims to prevent and reduce risks, errors and harm that occur to patients during provision of health care.

A definition for patient safety has emerged from the health care quality movement that is equally abstract, with various approaches to the more concrete essential components. Patient safety was

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defined by the IOM as “the prevention of harm to patients.”¹ Emphasis is placed on the system of care delivery that (1) prevents errors; (2) learns from the errors that do occur; and (3) is built on a culture of safety that involves health care professionals, organizations, and patients.^{1, 10} The glossary at the AHRQ Patient Safety Network Web site expands upon the definition of prevention of harm: “freedom from accidental or preventable injuries produced by medical care.”¹¹

Patient safety practices have been defined as “those that reduce the risk of adverse events related to exposure to medical care across a range of diagnoses or conditions.”¹² This definition is concrete but quite incomplete, because so many practices have not been well studied with respect to their effectiveness in preventing or ameliorating harm. Practices considered to have sufficient evidence to include in the category of patient safety practices are as follows:

- Appropriate use of prophylaxis to prevent venous thromboembolism in patients at risk
- Use of perioperative beta-blockers in appropriate patients to prevent perioperative morbidity and mortality
- Use of maximum sterile barriers while placing central intravenous catheters to prevent infections.
- Appropriate use of antibiotic prophylaxis in surgical patients to prevent postoperative infections
- Asking that patients recall and restate what they have been told during the informed-consent process to verify their understanding
- Continuous aspiration of subglottic secretions to prevent ventilator-associated pneumonia
- Use of pressure-relieving bedding materials to prevent pressure ulcers
- Use of real-time ultrasound guidance during central line insertion to prevent complications
- Patient self-management for warfarin (Coumadin®) to achieve appropriate outpatient anticoagulation and prevent complications

- Appropriate provision of nutrition, with a particular emphasis on early enteral nutrition in critically ill and surgical patients, to prevent complications
- Use of antibiotic-impregnated central venous catheters to prevent catheter-related infections

Measuring Patient Vital Signs

Physical assessment, an essential nursing function, is performed on every client. The measurement of vital signs and the execution of the physical examination as part of the assessment process are done to gather information regarding the physiological functioning of the body. The “taking of vital signs” refers to measurement of the client’s:

- Body temperature (T)
- Pulse (P)
- Respiratory (R) rates
- Blood pressure (BP)

These measurements can indicate if the circulatory, pulmonary, neurological and endocrine body systems are functioning normally. Because of their importance as indicators of the body’s physiological status and response to physical, environmental and psychological stressors, they are referred to as vital signs

Body temperature (T°)

The body temperature is the difference between the amount of heat produced by body process and the amount of heat lost to the external environment. This can be done via Axillary, oral, rectal and tympanic routes.

Measuring oral temperature: It is technique of measuring body temperature through oral route.

Measuring axillary temperature: It is technique of measuring body temperature on arm pit.

Measuring rectal temperature: Rectal temperature measurement: is method of measuring body temperature by inserting thermometer through the anus into the rectum

Measuring tympanic temperature: Tympanic temperature measurement: method of assessing body temperature by inserting thermometer through ear

Purpose

- To determine body temperature
- To assist in diagnosis
- To evaluate patient's recovery from illness
- To determine if immediate measures should be implemented to reduce dangerously elevated body temperature or converse body heat when body temperature is dangerous low
- To evaluate patient's response once heat conserving or heal reducing measures have been implement

Measuring Axillary Temperature

Definition; It is technique of measuring body temperature on arm pit.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- To determine body temperature
- To assist in diagnosis
- To evaluate patient's recovery from illness
- To determine if immediate measures should be implemented to reduce dangerously elevated body temperature or converse body heat when body temperature is dangerous low
- To evaluate patient's response once heat conserving or heal reducing measures have been implement

Necessary Equipments

- Thermometer: glass or electronic
- Two pairs of non-sterile gloves
- Dry Cotton
- Tray
- Face towel

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- Receiver/receptacle
- Soap and water
- Watch with secondhand
- Pen or pencil
- vital following sheet or record form

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Explain the procedure				
2.	Wash hands				
3.	Assemble the necessary equipment				
4.	Maintain privacy if necessary				
5.	Remove client's arm and shoulder from one sleeve of gown.				
6.	assist the client assume supine or semi sitting position				
7.	Make sure axillary skin is dry; if necessary, pat dry				
8.	Prepare thermometer (If thermometer is not below a normal				
9.	Place thermometer or probe into center of axilla				
10	Fold client's upper arm straight down and place arm across				
11	Leave glass thermometer in place as specified by agency				
12	Remove and read thermometer				
13	Inform client of temperature reading				
14	Cleanse glass thermometer (Remove thermometer and wipe				
15	Assist client with replacing go				
16	Comfort the patient				
17	Return used equipment and wash your hand				
18	Record reading and indicate site as "AT."(Axillary				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
Name: _____	Date: _____
Time started: _____	Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Measure Axillary Temperature

Measuring oral temperature (3-5 minutes)

Definition: It is technique of measuring body temperature through oral route.

Contraindication

- ☞ Child below 7 yrs.
- ☞ If the patient is delirious, mentally ill
- ☞ Unconscious
- ☞ Uncooperative or in severe pain
- ☞ Surgery of the mouth
- ☞ Nasal obstruction
- ☞ If patient has nasal or gastric tubes in place

Precaution:

- ✓ Never use oral thermometer for rectal and vice versa

Equipment

1. Thermometer: glass or electronic
2. Two pairs of non-sterile gloves
3. Watch
4. Dry cotton
5. Receiver/receptacle
6. Soapy water
7. Pen and pencil
8. Vital follow sheet or record form

Procedure

1. Record reading and indicate site as “OT.”(oral temperature)
2. *Explain the procedure*
3. Wash hands
4. Assemble the necessary equipment

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5. Remove thermometer from storage container and cleanse under cool water
6. Wipe thermometer dry with a tissue from bulb's end toward fingertips
7. Read thermometer by locating mercury level. It should read 35.5°C (96°F).
8. If thermometer is not below a normal body temperature reading, grasp thermometer with thumb and forefinger and shake vigorously by snapping the wrist in a downward motion to move mercury to a level below normal
9. Assist the client to assume semi fowlers position
10. Place thermometer in mouth under the tongue and along the gum line to the posterior sublingual pocket. Instruct client to hold lips closed
11. Leave in place as specified by agency policy, usually 3–5 minutes
12. Remove thermometer and wipe with a tissue away from fingers toward the bulb's end
13. Read at eye level and rotate slowly until mercury level is visualized
14. Shake thermometer down, and cleanse glass thermometer with soapy water, rinse
15. under cold water, and return to storage container
16. Remove and dispose of gloves in receptacle
17. Comfort the patient
18. Return used equipment and wash your hand
19. Record reading and indicate site as “OT.”(oral temperature)

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
20. Name: _____	Date: _____
21. Time started: _____ _____	Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Measure oral Temperature

Measuring rectal temperature (3-5minutes)

Definition: Rectal temperature measurement: is method of measuring body temperature by inserting thermometer through the anus into the rectum

Contraindication

- Patient with diarrhea
- Rectal surgery
- Disease of the rectum(anal fissure, hemorrhoid)

Precaution:

- ✓ Never use oral thermometer for rectal and vise verse
- ✓ Never use rectal temperature if the immunosuppressant, hematologic disorder, rectal surgery and diarrhea

Equipment

1. Thermometer: glass (client's bedside); electronic
2. Lubricant (rectal, glass thermometer) and disposable protective sheath
3. tray
4. Two pairs of disposable gloves
5. Pen or pencil
6. Receiver /receptacle
7. Vital following sheet or record form
8. Tissue paper
9. Screen

Procedure

1. Explain the procedure
2. Wash hands
3. Assemble the necessary equipment

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4. Keep privacy
5. Place client in the Sims' position with upper knee flexed. Adjust sheet to expose only anal area
6. Instruct client to take a deep breath
7. Clean the anal area as necessary
8. Lubricate the tip of rectal thermometer or probe
9. Insert thermometer or probe gently into anus: infant, 1.2 cm (0.5 in.) adult, and 3.5 cm (1.5 in.)
10. If resistance is felt, do not force insertion
11. Length of time (as specified by agency policy, usually 3–5 minutes).
12. Wipe secretions off glass thermometer with a tissue for reading without touching the bulb. Dispose of tissue in a receptacle
13. Read measurement and inform client of temperature read
14. While holding glass thermometer in one hand, wipe anal area with tissue to remove lubricant or feces with other hand and dispose of soiled tissue
15. Comfort of the patient
16. Cleanse thermometer (Remove thermometer and wipe with a tissue away from fingers toward the bulb's end
17. Hand washing and return in the place
18. Record reading and indicate site as “**RT.**”(Rectal temperature)

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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22. Name: _____

Date: _____

Time started: _____

Time finished: _____

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Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Measure rectal Temperature

D. Measuring tympanic temperature (2 minutes)

Tympanic temperature measurement: method of assessing body temperature by inserting thermometer through ear

Contraindication

- Perforated ear drum
- Ear infection(Otitis media)

Precaution:

- ✓ Take tympanic and oral temperature for children above 6 year
- ✓ Never use tympanic temperature is any ear surgery

Equipment

- Thermometer: glass (client's bedside); electronic
- Two pairs of disposable gloves
- Probe cover
- tray
- Pen or pencil
- Receiver /receptacle
- Vital following sheet or record form
- Dry cotton
- Cotton tipped applicator

Procedure

1. Explain the procedure
2. Wash hands
3. Assemble the necessary equipment

4. Assist clients for assuming comfortable position with hand toward one side away from nurse for Right handed nurse take from right ear and for Left handed nurse take from left ear
5. Note if any excess ear wax
6. Position client in Sims' position
7. Remove probe from container and attach probe cover to tympanic thermometer unit
8. Turn client's head to one side. For an adult, pull pinna upward and back; for a child, pull down and back
9. Gently insert probe with firm pressure into ear canal.
10. Remove probe after the reading is displayed on digital unit
11. Remove probe cover and replace in storage container
12. comfort the client
13. Return tympanic thermometer to storage unit and wash hand

Record reading and indicate site as "ET." (Ear temperature)

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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23. Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Measure Tympanic Temperature

Pulse (P)

Assessing patient pulse

Pulse assessment is the measurement of a pressure pulsation created when the heart contracts and ejects blood into the aorta.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose:

- To determine number of heart beats occurring per minute (rate)
- To gather information about heart rhythm and pattern of beats
- To evaluate strength of pulse
- To assess heart's ability to deliver blood to distant areas of the blood viz. fingers and lower extremities
- To assess response of heart to cardiac medications, activity, blood volume and gas exchange
- To assess vascular status of limbs

Necessary Equipments

- Watch with a second hand
- Stethoscope
- Swab
- tray
- west receiver
- Vital sign flow sheet
- pencil and pen

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Explain the procedure				
2.	Wash hands				
3.	Assemble the necessary equipment				
4.	Inform client of the site(s) at which you will measure pulse				
5.	If supine, place client's forearm straight alongside body or				
6.	Support client's wrist by grasping outer aspect with thumb				

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7.	Place your index and middle finger on inner aspect of client's wrist over the radial artery or thumb side and apply light but firm pressure until pulse is palpated				
8.	Identify pulse rhythm and then Determine pulse volume				
9.	Count pulse rate by using second hand on a watch for a regular rhythm, count number of beats for 30 seconds and times two; for an irregular rhythm, count number of beats for a full minute, noting number of irregular beats				
10.	Comfort the client				
11.	Return equipment and wash hand				
12.	Record reading and indicate site as "PR."(pulse rate)				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Measure pulse Rate

Respiratory Rate

Definition; is method of assessing patient breathing for depth, rate and rhythm.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- For diagnostic purpose
- To evaluate the progress of patient condition

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- To evaluate the effect of administered drugs
- To evaluate breathing for rate, depth and rhythm

Necessary Equipments

- Watch with a second hand
- Pen
- Pencil
- Vital sign flow sheet or record form

Procedures

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Wash hands				
2.	Assemble the necessary equipment				
3.	Be sure the patient is comfortable position; preferably, he				
4.	Before replacing client's gown from auscultating heart				
5.	Place your hand over client's wrist and observe one				
6.	Start to count with first inspiration while looking at second				
7.	Infants and children: count a full minute				
8.	Adults: count for 30 seconds and multiply by 2				
9.	If an irregular rate or rhythm is present, count for a full minute				
10.	Observe depth of respirations by degree of chest wall				
11.	Observe depth of respirations by degree of chest wall				
12.	Comfort the client				
13.	Return equipment and wash hand				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Measure respiratory Rate

Measuring Blood pressure

Blood pressure is force exerted on arterial wall when the blood ejected under pressure from the heart.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose:

- ✓ To evaluate effect of some drugs affecting cardiovascular system
- ✓ To have baseline vital sign of patient on admission
- ✓ To diagnose hypertensive and hypertensive disorders

Precautions: Contraindications for brachial artery blood pressure measurement

When the client has any of the following, *do not* measure blood pressure on the involved side

- ✓ Venous access devices, such as an intravenous infusion or arterio-venous fistula for renal dialysis
- ✓ Surgery involving the breast, axilla, shoulder, arm, or hand
- ✓ Injury or disease to the shoulder, arm, or hand, such as trauma, burns, or application of a cast or bandage

Necessary Equipments

- Alcohol swabs
- Sphygmomanometer with proper size cuff
- Stethoscope
- Tray
- Vital sign sheet
- Pen and pencil

Procedures

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S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Explain the procedure				
2.	Wash hands				
3.	Assemble the necessary equipment				
4.	Determine which extremity is most appropriate for reading				
5.	Have the client rest at least 5 minute before measurement				
6.	Use appropriate size cuff				
7.	Move clothing away from upper aspect of arm				
8.	Position arm at heart level, extend elbow with palm turned				
9.	Make sure bladder cuff is fully deflated and pump valve moves freely				
10.	Locate brachial artery in the antecubital space				
11.	Apply cuff comfortably and smoothly over upper arm, 2.5				
12.	Connect bladder tubing to manometer tubing. If using a				
13.	Palpate brachial artery ,turn valve clockwise to close and				
14.	Insert earpiece of stethoscope in ears with a forward tilt,				
15.	Relocate brachial pulse with your non dominant hand and				
16.	With dominant hand, turn valve clockwise to close.				
17.	Slowly turn valve counterclockwise so that mercury falls at				
18.	Deflate cuff rapidly and completely				
19.	Remove cuff or wait 2 minutes before taking a second				
20.	Inform client of reading				
21.	Lower bed, raise side rails, place call light in easy reach				
22.	Put all equipment in proper place				
23.	Comfort the client				
24.	Return equipment and wash hand				
25.	Record reading and interpret				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Measure Blood pressure

Application of Safety and Comfort Devices

Applying Cotton Rings

Definition: Cotton rings are small circle of cotton rolled with bandage or gauze with a hole in the middle.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- Used to lift the hip from bed to prevent bed sores.
- To relieve pressure from small bony prominent areas such as heel, Elbow, occipital.
- Improves the circulation.

Indication

- Bed ridden patients
- Unconscious patients.

Size: Size differs from small to medium size based on the body areas we are going to apply.

Necessary Equipments

- Cotton
- Bandage
- Chart showing human body prominent areas

Procedures

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
	Explain the procedure to the patient				
	Wash hands				

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	Assemble the necessary equipment				
	Prepare cotton ring based on the size of body to be applied				
	Place cotton ring under the bony prominence such as elbow				
	Wash hands				
	Document procedure				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Apply Cotton Rings

Applying foot – board

Definition: A footboard is a flat plane often made of wood or plastic placed at the foot of the bed.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- To provide support for the client's feet and maintain a natural foot position.
- To keep the top bed covers off the client's feet relieving pressure.
- To make the foot comfortable/prevent foot drop.
- To prevent sagging of patient in to bed.

Indication

- Unconscious patients
- Patient with fracture
- Bedridden patients

Necessary equipments

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- A firm pillow
- Box of board
- Cotton/sheet of cotton
- Bandage

Procedures

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Explain the procedure to the patient				
2.	Wash hands				
3.	Prepare the equipment				
4.	Move the patient up in the bed to allow room for the				
5.	Loosen the top linens at the foot of the bed, and then fold				
6.	Lift the mattress at the foot of the bed, and place the lip of				
7.	Adjust the footboard so that the patient's feet rest				
8.	Unless the footboard has side supports, place a sandbag, a				
9.	Fold the top linens over the footboard, tuck them under the				
10.	Wash hands				
11.	Document				

- **Quality criteria:**
- **Performed:** performed the step or task according to the standard procedure or guidelines=2
- **Partially Performed:** unable to perform the step or task according to the standard procedure or guidelines=1
- **Not Performed:** step or task not performed by participant =0

LAP Test	Practical Demonstration
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- **Name:** _____ **Date:** _____
- **Time started:** _____ **Time finished:** _____
- **Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks.
- **Task:** Apply Applying foot – board

Applying Air Rings

Definition: Air rings are used to relieve pressure from the buttock and other bony prominent areas. For application they should be filled with air and covered with pillow case

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- Used to lift the hip from bed to prevent bed sores
- To relieve pressure from small bony prominent areas such as heel, Elbow, occipital.
- Improves the circulation.

Indication

- Bed ridden patients
- Unconscious patients

Necessary Equipments

1. Plastic air rings
2. Covering towel or pillow case
3. Chart showing body's prominent areas

Procedures

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Explain the procedure to the patient				
2.	Wash hands				
3.	Assemble the necessary equipment				
4.	Support the appropriate site				
5.	Applying air ring to body prominent area				
6.	Observe patient comfort status				
7.	Wash hands				

8.	Document				
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Quality criteria:

- **Performed:** performed the step or task according to the standard procedure or guidelines=2
- **Partially Performed:** unable to perform the step or task according to the standard procedure or guidelines=1
- **Not Performed:** step or task not performed by participant =0

LAP Test	Practical Demonstration
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- **Name:** _____ **Date:** _____
- **Time started:** _____ **Time finished:** _____
- **Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks.
- **Task:** Apply Air Rings

Applying bed cradle

Definition: Bed cradle is/Anderson frame. It is a device designed to keep the top bed clothes off the feet, leg, abdomen and chest of a client

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- To keep bed top linen off the injured part of the body.
- To prevent the weight of the bedding from resting on some part of the body.
- To apply heat in case of drying plaster casts.
- In case of electronic bed cradles are used to supply the desired warm in the case of shock.

Indication

- Client with fracture or soft tissue injury.
- Client with burn.
- Client with some skin lesions.

Equipment:

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- Bed cradle
- Roll gauze/bandage
- Small size blanket

Procedures

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Explain the procedure to the patient				
2.	Wash hands				
3.	Assemble the necessary equipment				
4.	Loosen and remove top linen				
5.	However the cradle on to patients bed				
6.	Secure it in place				
7.	Wrap gauze roll around both sides of the cradle				
8.	Cover the cradle with top linen				
9.	Wash hands				
10.	Document				

Quality criteria:

- **Performed:** performed the step or task according to the standard procedure or guidelines=2
- **Partially Performed:** unable to perform the step or task according to the standard procedure or guidelines=1
- **Not Performed:** step or task not performed by participant =0

LAP Test	Practical Demonstration
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- **Name:** _____ **Date:** _____
- **Time started:** _____ **Time finished:** _____
- **Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks.
- **Task:** Apply Bed Cradle

Adjusting side rails of the bed

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Definition: Adjustable full or half side rails are used on hospital beds and stretchers to prevent accidents. Side rails can be of various shapes and sizes usually made of metal

Instruction: Perform all steps/tasks according to standard procedures /guideline

Position: side rails have two or three positions.

- These are high, intermediate and low.
- The down or low positions are employed when a side rail is not needed.
- The up or high side rail position is used when a client is in bed and requires protection.

Purpose

- Help weak patient turn independently
- Protects patient from falling out of bed

Indication:

- For unconscious patient.
- For weak and unable to control his/her body movement.
- For small children.
- For elderly patients
- Patient with seizure disorder
- Post operatively until the patient awake from anesthesia.
- When changing position.
- When making certain procedure.

Necessary Equipments

- Bed with side rails

Procedures

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark

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1.	Explain the procedure to the patient				
2.	Wash hands				
3.	Assemble the necessary equipment				
4.	Position the side rail to the needed height				
5.	Secure lock and it should be far from reaching by the				
6.	Document				

Quality criteria:

- **Performed:** performed the step or task according to the standard procedure or guidelines=2
- **Partially Performed:** unable to perform the step or task according to the standard procedure or guidelines=1
- **Not Performed:** step or task not performed by participant =0

LAP Test	Practical Demonstration
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- **Name:** _____ **Date:** _____
- **Time started:** _____ **Time finished:** _____
- **Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks.
- **Task:** Apply side rails

Applying Sand Bag

Definition: Sand bags are canvas, rubber or plastic bags filled with sand and sewed.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- To relieve discomfort
- To support or immobilize limbs
- To prevent foot drop or wrist drop
- To prevent contracture

Indication

- Fractured limb or cervical spine
- Amputated limb

Necessary Equipments

- Bag
- Rope
- Sand
- Covering towel
- Weight scale
- Adhesive plaster for labeling

Procedures

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Explain the procedure to the patient				
2.	Wash hands				
3.	Assemble the necessary equipment				
4.	Positioning the patient				
5.	Apply the sand bags on the side of the area				
6.	Wash hands				
7.	Document and report				

Quality criteria:

- **Performed:** performed the step or task according to the standard procedure or guidelines=2
- **Partially Performed:** unable to perform the step or task according to the standard procedure or guidelines=1
- **Not Performed:** step or task not performed by participant =0

LAP Test	Practical Demonstration
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- **Name:** _____ **Date:** _____
- **Time started:** _____ **Time finished:** _____
- **Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks.
- **Task:** Apply Sand Bag

Applying Splints

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Definition: splints are devices applied to the arms, legs, or trunk to immobilize the injured part of the body.

Types:

1. **Wooden:** straight pieces of woods of varying length and width.
2. **Metal:** Splints made of a tin end of aluminum which is molded to fit with natural curvature of the body part.
3. **Wire:** It can be quickly cut to required length and easily bent to support a limb in desired position.
4. **Plaster (P.O.P):**-Often used by surgeon

Nursing consideration: There are a number of important points to remember.

- ✓ **Choice:-**The splint chosen should be sufficiently strong and of suitable length and width.
- ✓ **Padding:-**The splint should be covered with cotton wool to prevent discomfort or damage.
- ✓ **Molding:-**Choose one which is most suitable mold to fit the natural curvature of the limb
- ✓ **Fixation:-**Splints must be fixed to the insured fracture limbs by bandage placed above and below the injured part. Do not apply bandage directly on the injured part.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- To immobilize the injured body part
- To relieve pain and discomfort and encourage healing.

Necessary Equipments

- Splints (wooden, metallic)
- Dressing material (if there is open wound)
- Glove
- Padding for splint (rolled bandage to cover the splint)
- Elastic bandage or roll bandage (to hold the splint in place)

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Procedures

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Wash hands				
2.	Explain the procedure to the patient				
3.	Assemble the necessary equipment				
4.	Positioning the patient				
5.	First tie the bandage above the injured part				
6.	Joints must be immobilized above and below the				
7.	Wash hands				
8.	Document and report				

Quality criteria:

- **Performed:** performed the step or task according to the standard procedure or guidelines=2
- **Partially Performed:** unable to perform the step or task according to the standard procedure or guidelines=1
- **Not Performed:** step or task not performed by participant =0

LAP Test	Practical Demonstration
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- **Name:** _____ **Date:** _____
- **Time started:** _____ **Time finished:** _____
- **Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks.
- **Task:** Apply splints

Applying Fracture Board

Fracture Board: It is a board made up of – wood or some other firm composition which is placed under the mattress of patients with fracture.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- To maintain good body alignment.
- To prevent bed from sagging.

- To support the injured part when the patient has fractured spine, hips, lower limbs.

Necessary Equipments

- Fracture board
- Thin foam mattress

Procedures

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Wash hands				
2.	Assemble the necessary equipment				
3.	Explain the procedure to the patient				
4.	Positioning the patient				
5.	First tie the bandage above the injured part				
6.	Joints must be immobilized above and below the				
7.	Wash hands				
8.	Document and report				

Quality criteria:

- **Performed:** performed the step or task according to the standard procedure or guidelines=2
- **Partially Performed:** unable to perform the step or task according to the standard procedure or guidelines=1
- **Not Performed:** step or task not performed by participant =0

LAP Test	Practical Demonstration
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- **Name:** _____ **Date:** _____
- **Time started:** _____ **Time finished:** _____
- **Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks.
- **Task:** Apply Fracture Board

Applying pillows

Definition:-Pillows are used to give comfort, support and to position patient properly.

Pillows are placed:

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- Under the head
- Under the back
- Between the knees
- At the foot of the bed
- Under the arm

Purpose:

- To elevate body part
- To support patient on side
- To prevent pressure on the skin
- To increase comfort

Necessary equipment

- Pillows
- Pillows case

Applying back rest

Definition: Back rest is used for elevating and supporting the head and back of the patient. However, patient may be liable to slip down to the foot of the bed; therefore a foot board might be used

Unit Six: Providing Hygienic Care for Patients

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Giving bed bath
- Giving tub bath
- Giving back care
- Giving sits bath
- Giving mouth care
- Giving bed pan and urinals
- Giving perineal care
- Giving pediculosis treatment
- Giving Hair shampoo

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Define and give Giving bed bath
- Have basic understanding about Giving tub bath
- Have basic knowledge and skill on how to giving back care
- Have basic knowledge and skill on how to giving sits bath
- Proved Mouth care
- Understand how to give bed pan and urinals
- Define & apply perineal care
- Have basic understanding about pediculosis treatment

Basic Concepts of Hygienic Care for Patients

Providing patient's hygiene is probably the most basic all nursing care activities, but it is undoubtedly one of the most important. Not only is it a provision for the patients physical needs; it also contributes immeasurably to the patients feeling of emotional well-being.

Personal hygiene is a concept that is commonly used in health practices. It is also widely practiced at the individual level and at home. It involves maintaining the cleanliness of our body and clothes. Personal hygiene is personal, as its name implies. In this regard, personal hygiene is

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defined as a condition promoting sanitary practices to the self. Everybody has their own habits and standards that they have been taught or that they have learned from others. Generally, the practice of personal hygiene is employed to prevent or minimize the incidence and spread of communicable diseases.

Difference between cleanliness and hygiene

The term cleanliness should not be used in place of hygiene. Cleaning in many cases is removing dirt, wastes or unwanted things from the surface of objects using detergents and necessary equipment. Hygiene practice focuses on the prevention of diseases through the use of cleaning as one of several inputs. For example, a janitor cleans the floor of a health centre using detergent, mop and broom. They might also use chlorine solution to disinfect the floor. The cleaning process in this example is the removal of visible dirt, while the use of chlorine solution removes the invisible microorganisms. Hygienic practice encompasses both cleaning for the removal of physically observable matters and the use of chlorine for the removal of microorganisms. The hygiene practice in this example aims at preventing the spread of disease-causing organisms. Cleaning is a means to achieve this task.

Giving Bed Bath

Bed Bath

Definition: Bed bath is a bath given to a patient who is unable to give care for him/herself.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purposes

- To promote comfort relaxation and cleanliness
- To stimulate circulation
- To prevent bad body odors
- To prevent pressure sores
- To relax and refresh the patient
- Maintain muscle tone & joint mobility
- To improve self-image
- To give an opportunity for the nurse to assess patients

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- To prevent multiplication of pathogenic microorganisms on the skin surface.

Indication:

- Patients who are weak
- seriously ill and for pt. that has certain heart conditions
- Unconscious, paralyzed or confused pt.

Precautions

- Avoid scratching the skin with jeweler or long sharp fingernails.
- Avoid harsh scrubbing, use of rough towel or wash clothes.
- Assess the status & level of mobility.
- Maintain adequate privacy and warmth throughout the procedure and drape appropriately.
- Identify if there are limitation of movements or position for pt.
- Bath water must be warm enough and change throughout the procedure when it becomes cool, too soapy, dirty or after washing the genital area
- Always wash from clean to dirty.
- Determine allergies to soap and other cream lotion.
- Clean the eyes with water from the inner to the outer cantus.

Necessary Equipments

- Washcloth (2)
- Washbasin (2)
- Bath towels (2)
- Basin and jug with warm water
- Pajama
- Oil, cream, lotion/powder
- Soap with soap dish
- Nail cutter
- Bath blanket
- Trays for nail care or mouth care if necessary

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- Bed making materials
- air freshener
- Face towel
- Lotion thermometer
- Bed pan or urinal
- Comp and brush
- Gloves disposable
- Screen
- Deodorant
- Humber for soiled cloths
- Trolley

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Assess the patient condition and Explain procedure to pt.				
2.	Wash your hands				
3.	Assemble the necessary equipment for bed bath.				
4.	Before starting bath, offer bedpan or urinal, remove bedpan				
5.	If the patient is in the ward, screen patient and remove				
6.	Remove top bedding, fold and place over back of chair. If				
7.	Use pillow for turning patient if necessary; otherwise,				
8.	Wash eyes with clean water only and face of patient before				
9.	Do not expose patient unnecessary.				
10.	Work quickly and smoothly. Watch for signs of fatigue				
11.	Remember to protect the bed from dampness by placing				
12.	Place one hand under each part to support it while washing				
13.	Using long, firm, even strokes, wash from wrist to shoulder.				
14.	Bath chest, dry and cover with towel, then bath abdomen.				
15.	Flex knee on far side, uncover leg and thigh and drape to				
16.	Get clean, warm water and turn patient on side. Spread				
17.	Rub back with alcohol and talcum powder or soapy water				
18.	Place towel under hips. Put basin and soap within easy reach				
19.	Put on clean gown protect the pillow or bed with face towel				
20.	Make the bed and leave patient comfortable.				
21.	Wash bedside table and take dirty linen, bath basins, soap				
22.	Before you leave patient, ask patient if there is anything else				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Bed Bath

Giving Tub Bath

Definition: Type of bath that allow direct washing and rinsing by using shower. The pt. is assisted to the bathroom, sits or stands and spray of water is usually directed on to the body.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- To promote comfort relaxation and cleanliness
- To stimulate circulation
- To prevent bad body odors
- To relax and refresh the patient
- Maintain muscle tone & joint mobility
- To prevent multiplication of pathogenic microorganisms on the skin surface.

Precautions

- Adjust temperature and flow of the water
- Avoid chilling
- Always keep bath room un locked
- Check pt. frequently for sign of exhaustion.

Necessary Equipments

- soap and soap dish
- Washcloth
- Bath towel
- Gown
- Sleeper
- Chair
- Comb & Brush
- Wheel chair (optional)
- Bed pan/Urinal
- Nail cutter
- Oil/cream/lotion
- Pajama

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Assess the patient condition and Explain procedure to pt.				
2.	Assist patient to undress				
3.	Assist patient into the tub and avoid falling.				
4.	Allow patient to bath himself or assist as necessary.				
5.	Assist patient out of tub and dry his body and put on gown.				
6.	Return patient to room and put to bed.				
7.	Clean bathtub and leave room in order.				
8.	Discard soiled linen				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Tub Bath

Giving Back Care

Definition: Is purpose full manipulation (massage) of the muscle and tissues. It is also known as back message, back rub.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- Provide psychological & physical comfort (reduce tension, anxiety stress, stimulate and relax muscles)
- Increase general and local circulation
- Improves muscle and skin functioning
- Prevent bed sore.
- To relieve insomnia (inability to sleep)
- It provides opportunity for the nurse to assess the patient condition.

Necessary Equipment

- Soap and soap dish
- Draw sheet
- Wash cloth
- Lotion
- Bath towel
- Powder
- Alcohol
- Screen
- Basin with water
- Rubber sheet with its cover

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- Other medication as ordered
- Air ring, cotton ring as necessary

Precautions

- Massage pressure areas gently massage the back by using appropriate technique.-
duration of massage should not exceed 20 minutes
- Repeated back massage may possibly cause subcutaneous tissue degeneration
- Frequent positioning is preferable to back massage
- Inspect skin areas of pressure points for whitened or reddened areas that do not disappear after rubbing
- Covering areas not being massaged & prevent unnecessary exposure
- Lubricating palms to decreases friction on skin during massage
- Identify location of bony prominences to avoid direct pressure

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Assess and explain procedure to pt.				
2.	Wash your hands				
3.	Assemble the equipment				
4.	Place patient on his side				
5.	Place towel under patient's side				
6.	Wash with soap and water				
7.	Apply powder or lotion and rub back. pay special attention				
8.	Use firm long strokes up ward and down wards in a circular				
9.	Circular movement should be used on bony prominences.				
10.	Repeat upward and down ward stroke several times.				
11.	Use lotion to avoid friction and to give lubrication &				
12.	Dry back and apply powder.				
13.	Turn patient on back and put pillow as necessary.				
14.	Report reddened area on the back.				
15.	If there is pressure sore (breakage of the skin) sterile				
16.	Clean and return the used equipment in to their proper place.				
17.	Wash your hands and charting.				
18.	Assess and explain procedure to pt.				
19.	Wash your hands				
20.	Assemble the equipment				
21.	Place patient on his side				
22.	Place towel under patient's side				
23.	Wash with soap and water				

24.	Apply powder or lotion and rub back. pay special attention				
25.	Use firm long strokes up ward and down wards in a circular				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Giving Back Care

Mouth Care

Mouth care: -Care of the mouth which includes brushing the teeth, mouth and tongue with mouth wash solution and rinse it with water.

- **Routine mouth care:**-is providing oral care at least three times a day for hygienic purpose.
- **Special mouth care:** - Is a care given to entire mouth, teeth, tongue and gum in an increased frequency using mouthwash solution for helpless patient.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- Keep the mouth clean and fresh, which provide the pt. sense of well- being.
- Stimulate appetite
- Prevent dental decays & halitosis (bad breath)
- Remove food particles, dead epithelial cells, microorganisms from around and b/n the teeth tongue & lips.
- Prevent inflammation of tongue gums & oral mucous.
- Prevent spread of infection to other parts of the body

Indications for special mouth care

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- Is unconscious
- Is not taking oral food or fluid
- Has mouth infection or inflammation.

Necessary Equipment

- Sodium bicarbonate solution ½ Tsp. in 250 ml, of water
- Hydrogen peroxide solution
- Glass of Clean water
- Normal saline solution
- Lemon juice
- Other mouth washes solution if a specially ordered.
- Mouth gag
- Emesis basin
- Glycerin/petrolatum
- Cotton tipped application
- Receiver
- Towel
- Tissue paper or piece of gauze
- Denture care cup
- Toothbrush and paste
- Forceps
- Sputum mug
- Tongue depressor wrapped with gauze bandage
- Lubricate (liquid paraffin or mineral oil, cold cream, glycerin , Vaseline)
- Drinking tube (straw)

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Explain procedure to the patient and wash your hands				
2.	Have all equipment read on the bed side table				
3.	Set on the semi sitting position and up the head of the bed				

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4.	Place towel under patient's chin across his/her chest				
5.	Turn patient's head to the side and arrange basin at corner of				
6.	Dip applicator in mouth washes solution and cleans the				
7.	Discard the swab.				
8.	If the teeth are difficult to clean, a larger swab can be used.				
9.	If the tongue or lips are dry and cracked, moisten an				
10.	If he/she is unconscious, hold the mouth open with a tongue				
11.	This care should be done in the morning, at night and after				
12.	Wait at least ten minutes after patient has eaten to prevent				
13.	Chart – procedure, time and observation.				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Mouth Care

Giving bedpan and urinals

Definition: Giving bedpan and urinals is the process of giving bedpan or urinal for patients in bed.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- To provide receptacle for elimination of waste material for clients confined to bed.
- To obtain specimen of urine or stool for laboratory examination.

- To obtain an accurate measurement or assessment of the client's urine or stool.

Indication

- Bed ridden patients
- Patient with problem of the spine
- Patient with cast or fracture
- For critically ill patients
- Post-operative patients

Necessary Equipments

- Bed pan
- Cover of bed pan
- Urinal
- Screen
- Toilet tissue
- Disposable glove
- Protecting material (rubber sheet and draw sheet)
- Soap
- Basin of water

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Bring the bed pan or urinal and equipment to bedside.				
2.	Don disposable gloves				
3.	Warm and dry the outer of the bedpan and carry to bed side				
4.	Place an adjustable bed in the high position.				
5.	Screen bed				
6.	Fold the cover of the bedpan and hang it over side frame of				
7.	Turn back covers at the side. Place free hand under patient's				
8.	Place paper within reach and be sure patient can reach bell.				
9.	Be ready to remove bedpan when patient calls. If he is not				
10.	Arrange bedding neatly. Draw back screens, and carry				
11.	To hand urinal, elevate bed cloths slightly at side of bed.				
12.	Note output sheet to see if urine is to be measure. Proceed as				
13.	Record & Report				

14.	Care of equipment after use				
15.	Empty bedpan or urinal and rinse well. If possible soak in				
16.	Wash your hands after completing procedure.				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
----------	-------------------------

Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Give bedpan and urinals

Perianal care

Perianal care: -is a cleaning procedure prescribed for cleansing the perineum and genitalia of male or female patient. It can be clean or sterile procedure.

- **Routine perianal care:** - Is done for hygienic purposes routinely twice a day and more frequently during menstruation and excess vaginal discharge.
- **Special perianal care:** - Is a care given after various procedures for therapeutic and preventive purpose using strict aseptic technique.

Purpose

- To remove normal perinea secretions and odors
- To prevent infection
- To promote client comfort
- To facilitate healing
- To prevent irritation and ulceration of the genitalia.

Indication

- Infection on the genital and perineum
- Surgery of the genitalia and perineum

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- Post delivery
- Incontinent patients
- Pts. with indwelling catheter
- Abnormal or unpleasant discharge from the genitalia.

Equipment

- Pitcher or container with warm water
- Prescribed solution
- Sterile forceps or glove
- Protecting materials ,draw sheet
- Gauze swabs
- Sterile perianal pad
- Bowl or kidney basin
- Bed pan/urinals
- Screen

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Prepare tray or trolley with the above equipment, cover &				
2.	Explain procedure to patient.				
3.	Assist patient to use bedpan.				
4.	Remove soiled pad and place in bowel or kidney basin.				
5.	Move tray or trolley near bed.				
6.	Fold the blanket to foot of the bed				
7.	Flex patient's knees and cover with top sheet.				
8.	Take the sterile cotton swabs with forceps, pour solution on				
9.	Repeat cleansing the perineum pouring the solution over the				
10.	Avoid hurting the perineum with the forceps. Be careful				
11.	Dry perineum and genitalia thoroughly using cotton swabs-				
12.	Remove bedpan				
13.	Turn patient on one side and dry anal area.				
14.	Place perianal pad across perineum.				
15.	Avoid contaminating the inner side of pad				
16.	Apply T – Binder (as needed)				
17.	Straighten bed and leave patient comfortable				
18.	Remove soiled article, clean and return to their proper				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
----------	-------------------------

Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Perianal care

Unit Seven : Performing Patient Transportation

Instruction sheet

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Identify transportation requirement
- Equipment to assist client movement
- Patient Dangling
- Patient positioning
- Ambulating a patient
- Lifting a patient in bed
- Moving a patient from bed to stretcher
- Moving a patient from stretcher to bed
- Moving a patient from bed to chair
- Moving a patient from chair to bed

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify transportation requirement
- Select equipment to assist client movement
- Perform patient Dangling
- Perform patient positioning
- Ambulate a patient
- Lift a patient in bed
- Move a patient from bed to stretcher
- Move a patient from stretcher to bed
- Moving a patient from bed to chair
- Moving a patient from chair to bed

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Read the information written in the information Sheets
3. Follow the instructions described below.
4. Accomplish the Self-checks

Introduction

Lifting and carrying are dynamic processes. To ensure that no individual suddenly bears the risk of injury to Emergency Medical Technicians-Basics (EMT-B) or the patient, you must know where rescuers should be positioned and how to give and receive lifting commands so that all parties act simultaneously. Whenever the patient is moved, special care must be taken not to cause any further injury to the patient as well as injury to rescuer/career. Many EMT-Basics are injured every year because they attempt to lift patients improperly. Study shows that back injury from improper lifting is the number one injury suffered by pre-hospital care providers. Effective and safe applications of patient handling procedures to avoid self-inflicted and career-ending injuries are very important parts of EMT training. EMTs should have the basic knowledge and skill about proper lifting and moving of the patients.

Definition of terms

Body Mechanics: is the effort; coordinated, & safe use of the body to produce motion and maintain balance during activity.

Body Alignment (Posture) - when the body is well-aligned, balance is achieved without undue strain on the joints, muscles, tendons or ligaments.

Balance (Stability) - good body alignment is essential to body balance. A person maintains balance as long as the line of gravity passes through the center of gravity and the base of support.

Coordinated Body Movement - body mechanics involves the integrated functioning of the musculoskeletal and nervous system as well as joint mobility.

Bariatric- care for obese patients, needs special attention while lifting and carrying the patients.

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7.1. Identify transportation requirement

When you use the drag to move a patient, the same basic body mechanics and principles apply as when lifting and carrying.

1. The back should always be locked and straight, not curved or bent laterally.
2. Avoid any twisting so that the vertebrae remain in normal alignment.
3. When you are reaching overhead, avoid hyperextending the back.
4. When you are pulling a patient on the ground, kneel to minimize the distance that you will have to lean over.
5. When a patient is at a different height from you, bend your knees until your hips are just below the height of the plane across which you will be pulling the patient.
6. When pulling, extend your arms no more than about 15" to 20" in front.
7. Keeping your reach within the recommended distance, reach forward and grasp the patient so that your elbows are just beyond the anterior torso.
8. Reposition your feet so the force of pull will be balanced equally between both arms, and the line of pull will be centered between them.
9. Pull the patient by slowly flexing your arms.
10. When you can pull no further, stop and move back another 15" to 20". When properly positioned, repeat the steps.
11. If you must drag a patient across a bed, use the sheet or blanket under the patient.
12. Unless the patient is on a backboard, transfer a patient from the ambulance cot to the bed with a body drag.
13. Drag the patient in increments until he or she is properly centered on the bed.

7.2. General consideration for moving

Moving a patient should be done in orderly, planned and slow fashion. This is important to protect you as well as the patient from further injury and reduces the risk of worsening the patient's condition during movement. You should carefully plan ahead and select the method that will involve the list lifting and carrying. Remember always to use the method that will cause less strain to you and your partners.

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7.3. Emergency moves

Emergency move is performed before initial assessment and care are provided when there is potential danger to you and the patient. Its purpose is to move the patient to a safe place to avoid possible harm or death.

When is emergency move of the patient necessary? Move the patient immediately in the following conditions:

- Danger of fire, explosion, and structural collapse exists.
- Hazard materials are present.
- The accident scene can't be protected.
- It is otherwise impossible to gain access to other patients who need lifesaving care.
- The patient has developed cardiac arrest and must be moved to start CPR.

7.4. Employee responsibilities

Each employee is responsible for:

- Taking reasonable care of the health and safety of others in the workplace
- Cooperating with employers in their efforts to comply with OH&S requirements such as following procedures and participating in hazard identification and reporting
- Using equipment properly in order to provide for the health and safety of other people in the workplace
- Not obstructing attempts to reduce risks or provide aid to injured workers, and not disrupting a workplace by creating health or safety fears
- Not refusing a reasonable request for assistance to prevent a risk to safety or health

Client responsibilities

Your client also has OH&S responsibilities because their home is your workplace.

Clients are responsible for:

Maintaining their home in a reasonable condition so it does not pose a health or safety risk to personal careers or other service providers

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Cooperating with service providers and personal careers in their efforts to comply with OH&S requirements. Not directing personal careers to undertake unsafe practices during personal care routines. Supplying or arranging the supply of any equipment, including personal protective equipment that is their responsibility under the terms of their service agreement. Not obstructing the efforts of the service provider or personal cares to reduce risks or provide care to not obstructing the efforts of the service provider or personal cares to reduce risks or provide care to injured workers. Not refusing a reasonable request for assistance to prevent a risk to the health or safety of personal cares, other health professionals in their home, or themselves.

7.5. Manual handling three steps process

A. Promote patient independence

Where possible, patient independence should be promoted as this will assist to facilitate patient independence, nurses should have knowledge of normal movement and body mechanics. For example, normal healthy people when rolling over in bed move their body turn their head and push off with their leg. This translates to rolling as follows:

- Lifts the arm and place it over the body in the direction of the roll
- Bend the leg up on the same side as the arm, or bend both legs up
- Push on the knee (the handle) and shoulder in the direction of the roll

B. Assess

Patient assessment is a critical part of manual handling risk assessment and an important nursing skill. The patient assessment in the patient care plan and update it is needed. It should be used in conjunction with the risk assessment checklist when conducting risk assessments on patient-handling activities.

C. Plan

Manual handling plans should be specific to the unit, detailing available equipment options. In a unit where there is low turnover of patients and patient dependency levels are fairly constant

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(such as in nursing homes and residential care centers), a manual handling plan (instructions) should be developed for each patient. For patients undergoing rehabilitation and in acute care, the plan should be constantly reviewed as the patient improves. A checklist for setting out patient manual handling plans lists information that should be included in the patient care plan. The checklist can also be used for detailing risk control strategies in conjunction with the risk assessment.

7.6. General Safety Rules

- 1) **All** accidents, injuries or near misses, regardless of their nature, shall be promptly reported to the safety officer.
- 2) Clothing shall be appropriate to the duties being performed. Long pants, a clean neat shirt and steel toed shoes are the minimum requirements.
- 3) Hard hats and safety vests are provided for all warehouse staff and **must** be worn at all times in the warehouse, loading or unloading of vehicles in the yard.
- 4) Running is **not** permitted except in extreme emergencies.
- 5) Smoking is not permitted in any part of the warehouse or office. You may only smoke in designated areas.
- 6) Visitors and customers are to be escorted by staff while on company property.
- 7) Hand tools are to be used for their intended purpose only.
- 8) Only licensed personnel may operate forklifts or other warehouse equipment and must wear a seatbelt while doing so.
- 9) Riding on equipment is prohibited except where designated for operator.
- 10) Horseplay, fighting or tomfoolery is strictly prohibited on Your Company Name premises
- 11) All spacers are to be of equal proportion and undamaged. Damaged spacers are dangerous.
- 12) Open lifts are to be stored on the floor or in assigned bunks. Do not stack an open lift; this act will result in disciplinary action up to and including dismissal. All lumber lifts must be banded.
- 13) Only solid spacers are to be used on lumber products, no particle board spacers.
- 14) All bunked products will be placed securely in the bunks.
- 15) All spills will be immediately cleaned up and reported.

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- 16) Drawers and filing cabinets will be kept closed when not in use.
- 17) Filing cabinet drawers are to be filled from the bottom up or the cabinet is to be securely fastened /anchored.
- 18) Lifts and clutter will be cleaned up before the end of your workday.
- 19) Aisles are to be kept clear at **all** times.
- 20) Do not unload a truck alone under any circumstances, if someone can not help you then wait or call someone else for help. (Applies on and off Your Company Name property)

Safety Tips

- 1) If you are not sure.....ask.
- 2) Follow instructions and don't take chances.
- 3) Wear your personal safety equipment.
- 4) Never operate equipment you have not been trained for.
- 5) Keep your work area clean.
- 6) stay clear of forklifts while they are being operated.
- 7) Avoid injury by lifting correctly. If it's heavy ask for help. Max weight to be lifted is 75lbs.
- 8) make sure the job can be done safely.
- 9) **DO NOT** unload a truck alone.

7.7. Unsafe/High Risk moves

The Draglift

This includes any way of handling the patient in which the handler places a hand or an arm under the patient's armpit (axilla), whether the patient is being moved up the bed, sat up in the bed, being assisted from sitting to standing, or being assisted to change from one seated position to another - and regardless of whether the handler is facing or behind the patient, or whether there is more than one handler.

Two-Sling Lift

With slings placed under the patient's lower back and thighs, the handlers stand either side of the patient with one knee on the bed; this is a total body lift.

When to not lift people

You must not lift people because:

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- They weigh too much and are unpredictable
- It is difficult or impossible for staff to get into a safe position to lift
- Staff are at risk of injury in all manual handling techniques
- Most lifts include a risk of injuring the patient
- Manual lifts are not therapeutic; they do not improve the patient's mobility.

Procedures for seated patients

Sitting Back in a Chair

Ensure the patient is sitting in the correct size of chair. The patient should be able to have their bottom at the back of the seat and still be able to have their feet flat on the floor, with their knees at hip height. If this is not possible; i.e. for very short patients, the patient should be given a footrest to rest their feet on.

Consider ways to prevent slipping: one way slide sheet

Where appropriate, use a molded or angled chair

Think before lifting/handling. Plan the lift. Can handling aids be used? Where is the load going to be placed? Will help be needed with the load? Remove obstructions such as discarded wrapping materials. For a long lift, consider resting the load midway on a table or bench to change grip.

Adopt a stable position. The feet should be apart with one leg slightly forward to maintain balance (alongside the load, if it is on the ground). Be prepared to move your feet during the lift to maintain your stability. Avoid tight clothing or unsuitable footwear, which may make this difficult.

Get a good hold. Where possible, the load should be hugged as close as possible to the body. This may be better than gripping it tightly with hands only.

Start in a good posture. At the start of the lift, slight bending of the back, hips and knees is preferable to fully flexing the back (stooping) or fully flexing the hips and knees (squatting).

7.2. Selecting transportation equipment

7.2.1. 6.2.1. Wheeled ambulance stretcher/cot/

The wheeled ambulance stretcher is the most commonly used device to move and transport patients. Most patients are placed directly on the ambulance cot. However, Patients with a possible spinal injury or multiple-system trauma should be placed and secured on a backboard first. Patients who can tolerate being in a sitting position can be carried down a flight of stairs in

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a stair chair, then transferred to the cot.



Figure7. 1: Wheeled ambulance stretcher

7.2.2. Portable/folding stretchers

- ✓ A stretcher with a strong rectangular tubular metal frame and rigid fabric stretched across it. It does not have a second multi positioning frame or adjustable undercarriage. Portable stretchers may be folded in half across the center of each side so that the stretcher is only half its unusual length during storage. Portable stretcher permits easy transfer of a patient down stairs and over rough terrain. It should be carried end to end and can be loaded in ambulance from end to end.



Figure 7. 2: portable/folding stretcher

7.2.3. Backboards

Long Spine boards/Trauma boards

Backboards are long flat boards, 6' to 7' long, made up of rigid, rectangular material. They are used to carry patients and immobilize supine patients who have suspected spinal injury or other multiple traumas. They have holes on the side and ends for grasping, lifting and carrying the board and for passing the straps to secure the patient on the board.

Indication for use

- Patient with potential spinal injury
- Patient with potential spinal injury who needs extrication from the vehicle
- As full-body splint in multi trauma patient

NB: Patient experiences pain in pressure areas during long transport unless the board is padded well.



Figure 7.3: Long spin board

7.2.4. Short boards

A short board, or half-board, should be used to immobilize the torso, head, and neck of a seated patient who has a suspected spinal injury until the patient can be immobilized on a back board. Short boards are 3' to 4' long. Short wooden backboards have generally been replaced with a vest-type device that is specifically designed to immobilize the patient until he or she is moved from a sitting position to supine on a backboard.



Figure 7. 4: Short spin board

7.2.5. Scoop Stretcher (Orthopedic Stretcher)

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A **scoop stretcher** is a device that can split into two long halves or four pieces, patient can be picked up with minimum body requirement. Parts are reconnected and the patient is lifted and placed on a long backboard or stretcher. A scoop stretcher is efficient; however, both sides of the patient must be accessible. EMT must pay special attention to the closure area beneath the patient so that clothing, skin, or other objects are not trapped. The patient must be fully stabilized and secure before he or she can be moved. Scoop stretchers are not adequate when used alone for standard immobilization of a spinal injury.

Indication

- Patient with hip and pelvic injuries.
- Patient with spinal injuries who needs to be lifted and transferred to another stretcher e.g backboard.

Advantages

- Fits narrow space where other stretcher cannot be used
- Provide good body support by design

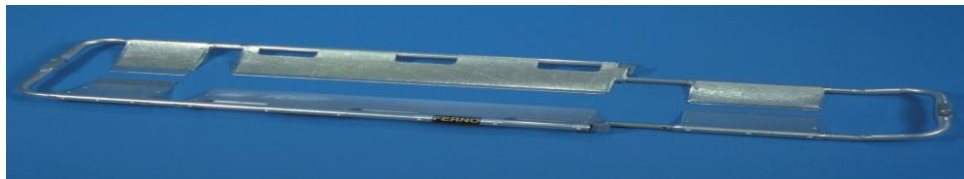


Figure 7. 5: Scoop stretcher

7.3. Basket Stretchers (stokes)

A **basket stretcher** is often called a **Stokes litter** is used to carry a patient across uneven terrain in a remote location that is inaccessible by ambulance or other vehicle. If the patient has a suspected spinal injury, he or she should be immobilized on a backboard before being placed in the basket stretcher .Basket stretchers are constructed of hard plastic or wire mesh with a metal frame. The wire basket is very uncomfortable for the patient unless the wire is padded. Basket stretchers surround and support the patient, but their design allows water to drain through holes in the bottom. Some styles can also be used for technical rope rescues and some water rescues. Not all basket stretchers are rated or are appropriate for these specialized rescue uses.



Figure 7.6: Basket stretcher

7.3.1. *Stair chairs*

- ✓ **Stair chairs** are folding aluminum frame chairs with fabric stretched across them to form a seat and seat back. They have fold-out handles that enable the EMT to carry the head and foot ends up or down a flight of stairs. Most stair chairs have rubber wheels at their back with casters in front so that they can be rolled along the floor and then carried down. They serve as an adjunct for moving a patient up or down stairs and are Ideal device for narrow stairways.

Stair chairs should never be used for suspected spinal injury and unconscious patients. Patient should be transferred to wheeled cot stretcher ambulance.

Using the stair chairs

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1. Move the patient into the chair using the extremity lift.
2. Secure the patient on stair chair with straps
3. EMTs take their places: one at head, one at foot.
4. EMT at the head gives directions.
5. Third EMT precedes.
6. Tilt the chair back to move to ground level.



Figure 7. 7: Stair chair

7.3.2. Flexible stretcher

A **flexible stretcher** is consists of rigid slats and useful for carrying a patient through narrow corridors and from confined space. Flexible stretcher is the most uncomfortable of all the devices; however, it provides an excellent support and immobilization. When the stretcher is wrapped around the patient and the straps are secured, the patient is completely immobilized. The stretcher can then be lowered by rope or slide down a flight of stairs by resting it on the front edge of each step.



Figure7. 8: Flexible stretcher

7.4. Equipment to assist client movement

Assistive technology is a term for equipment or products that can make it easier for you to manage at home. Generally, you can get this equipment through your local Health and Social Care Trust, following an assessment by a suitable professional - for example occupational therapist, district nurse or physiotherapist. Assistive technology can help with a range of daily living tasks such as managing your personal care, assisting with your mobility and transfers.

Your doctor can prescribe certain items from an approved list. You can get some items through the district nurse - this will usually need an assessment and recommendation by a nurse or therapist. Items include:

- Wheelchairs and walking aids
- Hearing and vision aids
- Artificial limbs and surgical appliances
- Communication aids

Assisting client movement

Lift – carrying all or a portion of body weight using a mechanical lift e.g. patient is incapable of assisting with mobility

Transfer- moving a patient from one surface to another in a dynamic and cooperative way e.g. bed to a chair

Repositioning – change in patient's position in a chair/bed to improve posture, increase safety, aid circulation, prevent skin breakdown

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Facilitation - invite patient to move with use of verbal, handling guidance, positioning, environment, equipment

Lifting and carrying are dynamic processes. To ensure that no individual suddenly bears the risk of injury to EMT-B or the patient, you must know where rescuers should be positioned and how to give and receive lifting commands so that all parties act simultaneously.

Whenever the patient is moved, special care must be taken not to cause any further injury to the patient as well as injury to rescuer/career. Many EMT-Basics are injured every year because they attempt to lift patients improperly.

Study shows that back injury from improper lifting is the number one injury suffered by pre-hospital care providers. Effective and safe applications of patient handling procedures to avoid self-inflicted and career-ending injuries are very important parts of EMT training. EMTs should have the basic knowledge and skill about proper lifting and moving of the patients. To safely lift and carry a patient, you and your team must understand each other and each move must be performed in a coordinated manner. Before lifting the patient, team leader should coordinate the move and indicate the sequence of steps each member should go after. Orders that will initiate the actual lifting or moving should be given in two parts: Preparatory command and a command of execution/implementation.

Additional Lifting and carrying guidelines

1. Find out how much the patient weighs before attempting to lift. With proper lifting technique, you and one other EMT can safely lift a weight between 100 to 210 lb. (45-95 kg) However, for safe lifting, it is better to use four rescuers lifting technique.
2. Know how much you can comfortably and safely lift.
3. If lifting the patient places strain on you, stop lifting and lower the patient and obtain additional help before attempting to lift again.
4. Communicate clearly and frequently with your partner and other rescuers whenever you are lifting a patient.
5. Do not attempt to lift a patient who weighs more than 250 lb. with fewer than four rescuers.

6. Find out the weight limitations of the equipment you are using and how to handle patient who exceed the weight limitation.
7. Special techniques, equipment, and resources are required to move any patient who weighs more than 300 lb. (136 kg) to the ambulance.
8. The strongest of the available EMTs should be located at the head end of the device as more than half of the patients weight is distributed to the head end of the backboard or cot.
9. Whenever possible, use a chair or canvas pole stretcher instead of a wheeled stretcher to carry a patient down stairs. Follow the following steps:
 - a. Secure the patient to the stair chair with straps.
 - b. Rescuers take their places around the patient seated on the chair: one at The head and one at the foot
The rescuer at the head gives directions to coordinate.
 - c. A third rescuer precedes the two carrying the chair to open doors and spot them on stairs. For lengthy carries, the third person can rotate and provide breaks for the other two.
 - d. When reaching landings or other flat intervals, lower the chair to the ground and roll it rather than carrying it.
 - e. When reaching the level where the cot awaits, position next to the cot in preparation for transferring the patient.
10. Always remember to keep your back in the locked position.
11. Flex at your hips, not at your waist.
12. Bend your knees and keep the patient's weight and your arms as close to your body as possible.
13. Avoid any unnecessary lifting and carrying of the patient.

General consideration for moving

Moving a patient should be done in orderly, planned and slow fashion. This is important to protect you as well as the patient from further injury and reduces the risk of worsening the patient's condition during movement. You should carefully plan ahead and select the method that will involve the list lifting and carrying. Remember always to use the method that will cause less strain to you and your partners.

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Emergency moves

Emergency move is performed before initial assessment and care are provided when there is potential danger to you and the patient. Its purpose is to move the patient to a safe place to avoid possible harm or death.

Emergency drags

A patient on the floor or ground should be dragged away from the scene instead of lifting or carrying. Every effort should be made to pull the patient in the direction of long axis of the body to provide protection to the spine.

Cloth drag

Is the simplest method to move the patient in emergency situation? If the patient is too heavy for you to lift or carry, grasp the cloth around the neck and shoulder, rest the patient head on your arm and drag the patient from danger.

Blanket drag

If the patient is not dressed or dressed in cloth that could tear easily during the cloth drag, use a large sheet or blanket to drag the patient. First, place the blanket on the floor and roll the patient on to it. Then move the patient to a safe place by dragging the blanket. This method is advantageous to move a patient who weighs more than you.

7.5. Dangling Patients

Dangling is a funny term for sitting on the edge of bed, but many occupational, physical, and other therapists use it quite often. Learn why it is done, when it is done, and other tips. Dangling in bed means to sit on the edge of the bed with or without the help of the OT. The term probably came from the patient's lower extremities dangling on the edge of the bed. According to the NIH, dangling is an intermediary stage of assisting people into the sitting position with their legs hanging over the side of the bed, before moving them into the standing position, is therefore used to ensure that patients are moved safely. This can help to prevent notable reductions in blood pressure – i.e., orthostatic hypotension.

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Figure 7.9: Patient dangling

7.5.1. .Application of principles Body mechanics

Objective: At the end of the lesson, learner will be able to:

1. List the necessary steps in lifting and moving an object
2. Apply principle of moving or lifting activity

Definition: - Body mechanics is the coordinated use of the body parts to produce motion and to maintain balance

Propose: - Promotes the efficient use of muscles and conserves energy

Principles/steps in moving or lifting objects

Face the direction of movement

Use large muscle groups of the legs, arms, and shoulders to lessen the strain on the back and abdominal muscles.

Bring the object to be lifted or carried as close to the body as possible before lifting. (This keeps both centers of gravity close together.)

Bend the knees and keep the back straight when leaning over at work level.

Kneel on one knee, or squat, and keep the back straight when working at the floor level.

Push, pull, slide, or roll a heavy object on a surface to avoid unnecessary lifting.

Obtain help before attempting to move an obviously unmanageable weight.

Use of supportive devices (wheel chair)

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Work in unison with an assistant. Give instructions and agree on the signal to start the activity

7.6. Lifting the patient

Dangling

Objective: At the end of the lesson, learner will be able to:

1. Define dangling
2. Identify purpose of dangling
3. Mention indication and contraindication
4. Demonstrate proper dangling

Definition: Dangling is sitting on the side of the bed with the feet hanging down

Purpose

- To prepare patient before walking ,moving to chair or wheelchair or performing others
- To relive pressure in case of pulmonary edema

Indication: - Moving patient out of bed

Contraindication

- Uncurious patient
- Spinal injury

Precaution

Do not leave the patient alone when dangling.

If the patient becomes dizzy lie him down.

Have the patient cough, deep breathe, and exercise their leg muscles when dangling

Check the person's pulse and respirations

Equipment

- Turn sheet or draw sheet
- Screen

Procedure

1. Greet the patient and explain the procedure
2. Perform hand hygiene
3. Collect the necessary material

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4. Provide privacy
5. Assess the patient condition
6. Position yourself and client appropriately before performing the move
 - a. Assist the client to a lateral position facing you
 - b. Raise the head of the bed slowly to its highest position
 - c. Position the clients feet and lower legs at the edge of the bed
 - d. Stand beside the client's hips and face the far corner of the bottom of the bed
7. Move client to sitting position
 - a. Place one arm around the client shoulder and the other arm beneath both of the client thighs near the knee
 - b. Tighten your gluteal , abdominal, leg and arm muscle
 - c. Lift the client thighs slowly
 - d. Private on your feet in the desired direction facing the foot of the bed while pulling the client feet and legs off the bed
 - e. Keep supporting the client until client is well balanced and comforted
 - f. Assess vital signs as indicated
8. Document all relevant information

7.6.1. Log rolling

Definition: Logrolling is a technique used to turn a patient whose body must at all times be kept in a straight alignment.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose: - To turn a patient to the side of bed

Indication:- Spinal injury

Note: logrolling is accomplished by two or three nurses working in a coordinated fashion (Figure8 and 9)

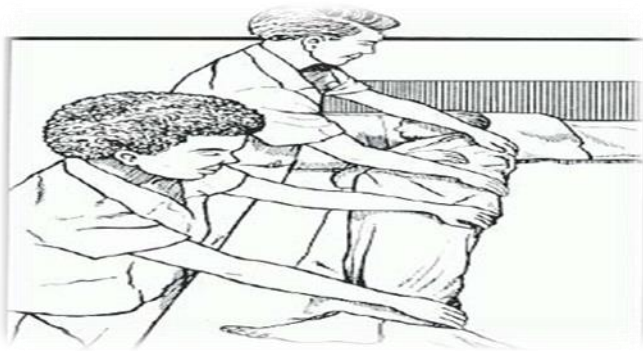


Figure 7.10: Logrolling with two person

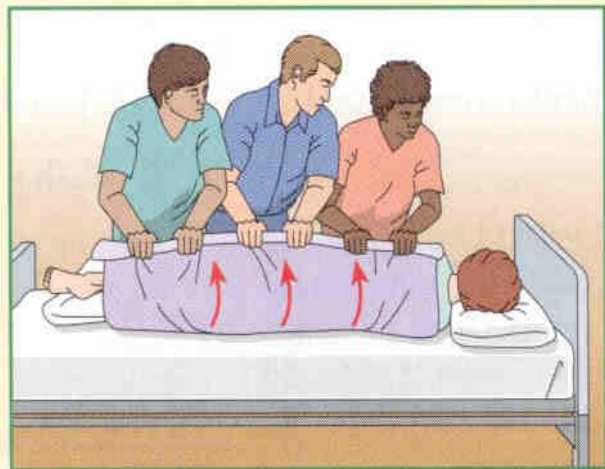
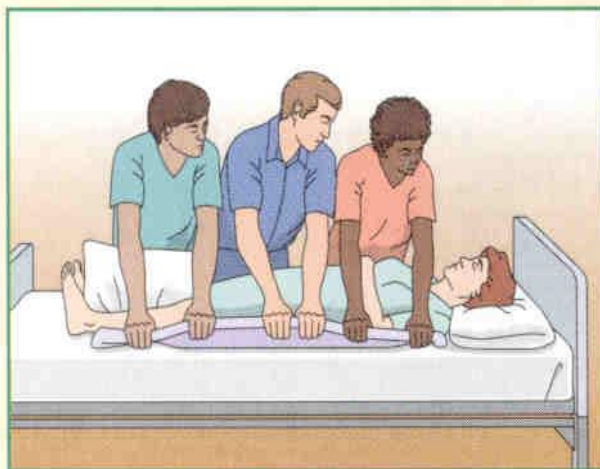


Figure 7.11: Log rolling with three persons

Equipment

1. Hospital bed with side rails
2. Turn sheet or draw sheet
3. Pillows

Procedure

	Procedural steps	Assessment criteria			
					Re
1.	Wash your hands				
2.	Greet and explain the procedure				
3.	Provide privacy				
4.	Position the bed in the flat position at a				
5.	Lower the side rail on the side of the				
6.	Position yourself with your feet apart				
7.	Fold the patient's arms across his chest				
8.	Place your arms or turn sheet under the				
9.	The arm of the other nurse should				
10.	On the count of three, move the patient				
11.	Move to the other side of the bed.				
12.	Place a pillow under the patient's head				
13.	Position the patient's near arm toward				
14.	Grasp the far side of the patient's body				
15.	On the count of three, roll the patient to				
16.	Place pillows in front of and behind the				
17.	Report and record as appropriate				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Tasks: Perform Log rolling

7.6.2. Moving patient up in bed with two nurses using draw sheet

Definition: Moving patients up in bed refers to returning the patient to previous correct position in bed if he/she slides to the foot side of the bed.

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose

- To make patients in comfortable position in bed
- To maintain good body alignment

Indication: Patient slides to the foot of the bed

Equipment: Documentation format, Draw sheet, Pillow

Procedure

	Procedural steps	Assessment criteria			
					Re
1.	Explain the procedure				
2.	Perform hand washing				
3.	Collect necessary equipment				
4.	Lower head of the bed to flat position				
5.	Remove all pillows from under the				
6.	One nurse stands on each side of the				
7.	Each nurse rolls up and grasps edges of				
8.	Flex knees and hips tighten abdominal				
9.	Raise the patient up in bed				
10.	Observe the condition of the patient				
11.	Record the procedure				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Tasks: Perform moving patient

7.6.3. Positioning the patient

Definition:- Positioning is turning or putting the patients in a proper body alignment for the purpose of preventive, promotive, curative and rehabilitative aspects of health

Instruction: Perform all steps/tasks according to standard procedures /guideline

Purpose of positioning

- To relief pressure on various parts or lessen possible stress on pressure points
- To prevent formation of deformity
- To Improve circulation
- Preserve muscle function as different muscle group's contract and relax.
- To provide comfort, support, and good body alignment
- To make the patient ready for different procedures

Type of positioning

Common positioning methods of patient in a bed include but not limited to

1. Front lying (prone):
2. semi-prone position(or Sims' position)
3. Dorsal Supine (back lying):
4. Dorsal recumbent position
5. Lateral recumbent (on either side)
6. Fowler's position
7. Fowler's position (semi-upright with back and knee rests elevated)

8. Trendelenburg position

9. Lithotomy position

7.6.4. Front lying (prone)

Definition

Prone position is putting the patient in a flat on the abdomen, legs extended, feet over the edge of the mattress, and toes pointing to the floor(figure.---).

Purpose

- To Promotes drainage from mouth
- To prevent contractures of hips and knee
- To examine the spine and the back

Indication

- Patient with excessive secretion from mouth
- Patient with potential risk of knee and hip contracture

Contraindication

- Cervical –spine fracture
- Respiratory impairment/breathing difficulties
- Foot drop
- Pregnant women
- Clients with abdominal incisions

Equipment

1. Small pillow (3)
2. Bed with side rails
3. Draw sheet or turn sheet
4. Documentation format
5. Receiver for drainage(if any)

Procedure

1. Great the patient (if conscious) and explain the procedure
2. Perform hand washing
3. Collect all necessary equipment's
4. Provide privacy

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5. Elevate bed to highest position.
6. Place turn or draw sheet under client's back and head
7. Assist the client to lie on abdomen.
8. Place a small pillow under client's head; turn head to side.
9. Extend the client's arms near side or flexed toward head.
10. Place a small pillow under chest for female clients and for clients with barrel chest.
11. Place a small pillow under ankles or allow toes to rest in space between foot of bed and the mattress.
12. Assess client for comfort.
13. Lower the bed and elevate the side rails
14. Wash your hand
15. Note the patient reaction
16. Document the procedure

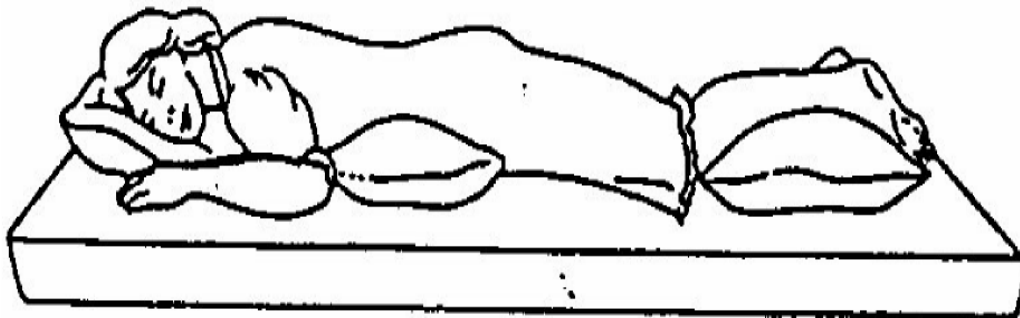


Figure 7.12: Proper prone position

7.6.5. Semi-prone position (or Sims' position)

Definition:- Semi-prone position putting or assisting patients with upper arm flexed at shoulder and elbow; lower arm positioned behind client and both legs flexed in front of client with more flexion in upper leg either of body side (**Figure.--**) .

Purpose

- To promotes drainage from mouth
- To prevents aspiration
- Comfortable for sleeping.
- sacrum and greater trochanter of hip
- Promotes comfort especially in pregnant clients

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Indication

- For rectal examination
- Pressure sore on the buttocks/sacrum and hips

Contraindication

- lumbar lordosis
- Foot drop
- client with leg injuries or arthritis

Equipment

- | | |
|-----------------------------|-----------------------------------|
| 1. Small pillow (3) | 4. Sand bag |
| 2. Bed with side rails | 5. Documentation format |
| 3. Draw sheet or turn sheet | 6. Receiver for drainage(if any) |

Procedure

1. Greet the patient (if conscious) and explain the procedure
2. Perform hand washing
3. Collect all necessary equipment's
4. Provide privacy
5. Elevate bed to highest position.
6. Place turn or draw sheet under client's back and head
7. Flexed at shoulder and elbow
8. Position lower arm behind and away from the back
9. Put pillow between chest and upper arm;
10. Flex both legs in front with more flexion in upper leg.
11. Put pillow between legs
12. Support ankle with sand bag (if necessary)
13. Lower the bed and elevate the side rails
14. Wash your hand
15. Note the patient reaction

16. Document the procedure

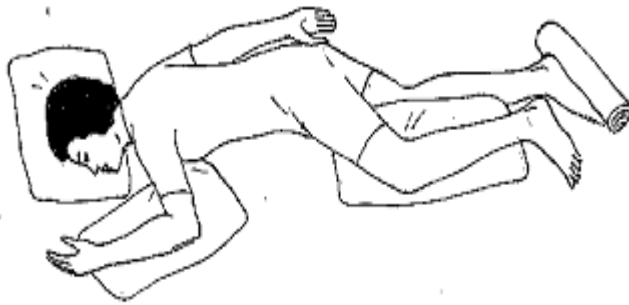


Figure 7.13: Proper Semi prone position

7.6.6. Supine (back lying)

Definition: Supine position is putting patient in back lying often with a small pillow to support the head and shoulder

Purpose

- Promote comfort
- To help healing after certain abdominal operations

Indication

- After abdominal, chest and neck surgery
- For physical examination of anterior part of the body
- Usual position for the patient

Contraindication

- ❖ Spinal injury
- ❖ Cardiac patient (CHF)
- ❖ Breathing impairments
- ❖ Pressure sore (buttock, scrum, heal and shoulder)

Equipment's

1. Pillow of different size (3)
2. Bed with side rails
3. Draw sheet or turn sheet
4. Wrist splint
5. Air rings
6. Cotton rings

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7. Footboard or high-top tennis shoes

8. Documentation format

Procedure

1. Greet the patient (if conscious) and explain the procedure
2. Perform hand washing
3. Collect all necessary equipment's
4. Provide privacy
5. Elevate bed to highest position.
6. Place turn or draw sheet under client's back and head
7. Place bed in a flat position.
8. Place the patient's head in a straight line with his or her back, shoulders, hips and knees
9. Place small pillows under head, back and ankles.
10. Place air ring under the hips/buttock
11. Flex the arm and rest on the stomach or straighten and support with wrist splint
12. Support the feet with padded footboard or high-top tennis shoes
13. Place the cotton ring under the heel
14. Lower the bed and elevate the side rails
15. Wash your hand
16. Note the patient reaction
17. Document the procedure

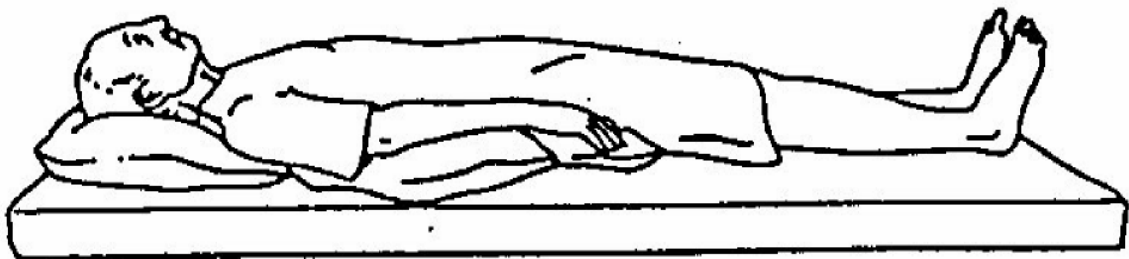


Figure 12: Proper supine position

7.6.7. Dorsal recumbent position

Definition: Dorsal recumbent position is putting patient in back lying position with knees are flexed and the soles of the feet flat on the bed.

Instruction: Perform all steps/tasks according to standard procedures /guideline

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Purpose

- Promote comfort
- For visualize the perineum
- To insert urinary catheter
- To relief pressure from ileum, knee and ankle

Indication

- Rectal , vulvar and vaginal examination
- Pelvic surgical procedures
- Vaginal douche
- Perineal care
- Catheterization
- Supra-pubic puncture

Contraindication

- Spinal injury
- Cardiac patient (CHF)
- Breathing impairments
- Pressure sore (buttock, scrum, heal and shoulder)

Equipment's

1. Pillow of different size (3)
2. Bed with side rails
3. Draw sheet or turn sheet
4. Bath Blanket or sheet
5. Air rings
6. Cotton ring
7. Bed block (if necessary)
8. Documentation format

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Great the patient (if conscious) and explain the				
2.	Perform hand washing				
3.	Collect all necessary equipment's				
4.	Provide privacy				
5.	Elevate bed to highest position.				
6.	Place turn or draw sheet under client's back and head				
7.	Place bed in a flat position.				
8.	Cover the client with a sheet or a bath blanket folded once				
9.	Place the patient's head in a straight line with his or her				
10.	Place small pillows under head and shoulder or elevate the				
11.	Place air ring under the hips/buttock				

12.	Flex the leg and wide apart				
13.	Place cotton ring under the heels				
14.	Lower the bed and elevate the side rails				
15.	Wash your hand				
16.	Note the patient reaction				
17.	Document the procedure				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform dorsal recumbent position



Figure 7.13: Proper dorsal recumbent position

7.2.1. Lateral recumbent (on either side)

Definition:-Lateral recumbent position is putting patient on either of the side with the legs flexed at knee (The upper leg is more flexed than the lower leg) (Figure.....).

Purpose

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- To perform back care
- To relieve pressure on sacrum and heels
- To perform enema
- To take rectal body temperature
- To insert suppositories

Indication

- Enema and colonic irrigation
- Pressure sore on heel and sacrum
- Rectal examination
- To measure rectal temperature

Contraindication

- Arm and rib fracture
- Spinal injury
- Flank injury

Equipment's

- Pillow of different size (4)
- Draw sheet or turn sheet
- Bed with side rails
- Documentation format

Procedure

1. Greet the patient (if conscious) and explain the procedure
2. Perform hand washing
3. Collect all necessary equipment's
4. Provide privacy
5. Place turn or draw sheet under client's back and head
6. Elevate bed to highest position

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7. Logroll client to side
 - a. For left lateral position, place the patient on left side with buttocks to the edge of the bed both thighs flexed and left arm underneath
 - b. For right lateral position, Place the patient on right side with buttocks to the edge of the bed both thighs flexed and right arm underneath
8. Place a small pillow under client's head.
9. Place pillow or foam wedges behind client's back.
10. Put a pillow tucked by the client's abdomen.
11. Place a pillow between client's legs.
12. Run your hand under the client's dependent shoulder and move the shoulder slightly forward
13. Lower the bed and elevate the side rails
14. Wash your hand
15. Note the patient reaction
16. Document the procedure

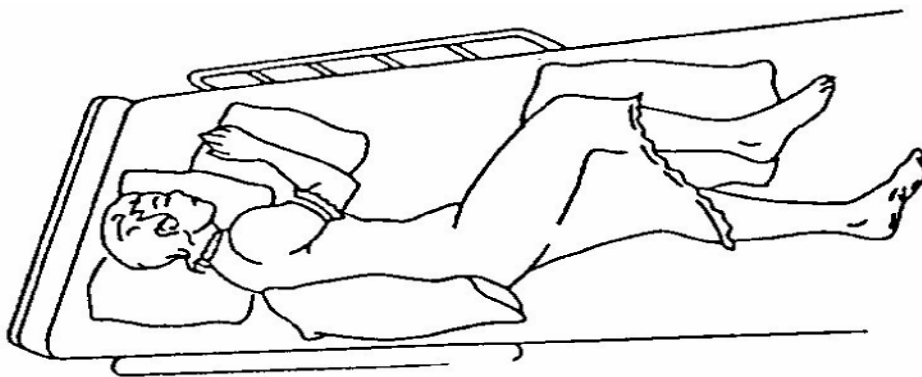


Figure 7.14: Proper Lateral Recumbent position

7.2.2. Knee chest

Definition: Knee chest position is putting a patient on the Knee and the chest with the head turned one side, arms above the head and one cheek on a pillow (Figure...)

Purpose

1. Used for vaginal and rectal examination
2. Used in first aid treatment in cord Prolapse or retroverted uterus

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3. Assumed for postpartum and gynecologic exercises

Indication

1. Sigmoidoscopic examination
2. Vaginal and rectal examination
3. Cord Prolapse
4. Retroverted uterus

Contraindication

- Cardio-pulmonary problem
- Upper arm, spine and ribs fracture
- Increased intra-cranial pressure (IICP)

Equipment

1. Pillow (1)
2. Drape/ Bath Blanket or sheet
3. Screen
4. Documentation format

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Great the patient (if conscious) and explain the				
2.	Perform hand washing				
3.	Collect all necessary equipment				
4.	Provide privacy				
5.	Elevate bed to highest position.				
6.	Make the patient on the knees and chest				
7.	Turn the head to one side with the cheek on pillow				
8.	Extend the arms on the beds and flex it at the elbows to				
9.	The weight should rest on the chest and knees which are				
10.	Cover the client with a sheet or a bath blanket.				
11.	Lower the bed and elevate the side rails				
12.	Wash your hand				
13.	Note the patient reaction				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Knee chest position

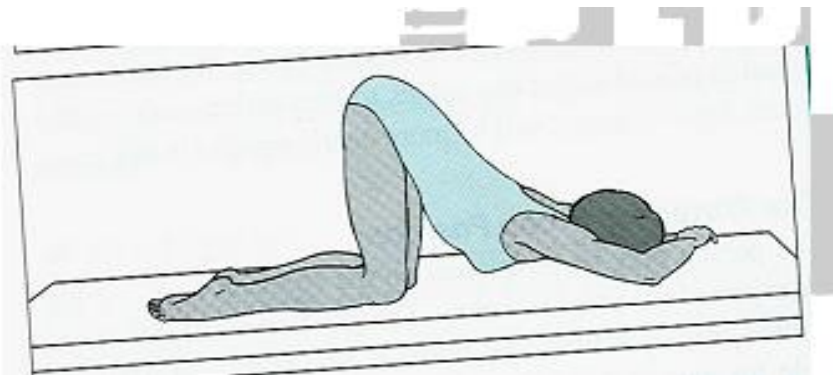


Figure 7.15: Proper knee chest position

7.2.3. Fowler's position (semi-upright with back and knee rests elevated)

Definition: Fowler's position is sitting position in which the head is elevated at different angle (15-90)° angle and may have knees either bent or straight (Figure....).

Type

1. High Fowler's position is when the patient's head is raised 80-90 degrees,
2. Semi-Fowler's position is when the patient's head is elevated 30-45 degrees.
3. Low Fowler's position is when the head of bed is elevated 15-30 degrees
4. Fowler's which is 45-60 degrees

Purpose

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1. To relieve dyspnea
2. To improve circulation
3. To prevent thrombosis
4. To prevent aspiration during the introduction of feeding tubes
5. To facilitate drainage from abdomen and pelvic cavity post operatively
6. To relax the muscle of the abdomen, back and thighs
7. To relieve tension on abdominal suture
8. To promote comfort
9. Increase comfort during eating
10. To relieve edema of the chest and abdomen

Indication

- Cardio-pulmonary problem (Respiratory distress, CHF, pulmonary edema..)
- Increased intra-abdominal pressure
- Thrombosis
- Abdominal, back and thigh muscle strain
- Nasal or oral passageway procedures (e.g. NGT...)

Contraindication

1. Comatose/unconscious patients
2. Spinal injury
3. Foot drop
4. Head injury
5. Shoulder dislocation

Equipment

- | | |
|-------------------------|------------------------|
| 1. Small pillow (3) | 4. Hand wrist support |
| 2. Foot rest/foot board | 5. Screen if necessary |
| 3. Back support | |

Procedure

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1. Greet the patient (if conscious) and explain the procedure
2. Perform hand washing
3. Collect all necessary equipment's
4. Provide privacy
5. Place the patient in sitting position with arms at sides knees raised with pillow
6. Place bed in a 15° to 30° angle for low-Fowler's position, 45° to 60° angle for Fowler's position, or 70° to 90° angle for high-Fowler's position.
7. Turn patients head to one side and align the patient in good position
8. Place a small pillow under client's head.
9. Support the backs and arms with pillows.
10. Place a pillow between client's legs.
11. Lower the bed and elevate the side rails
12. Wash your hand
13. Note the patient reaction
14. Document the procedure

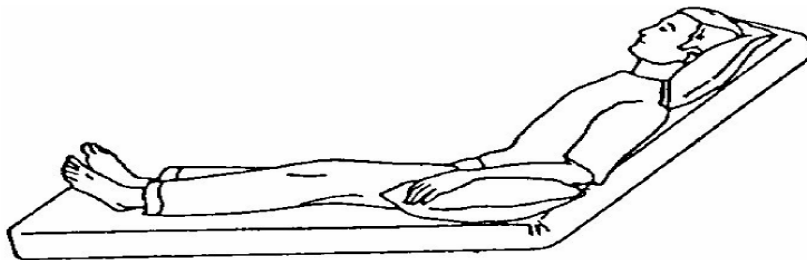


Figure 7.16: Proper fowler's position

7.2.4. Trendelenburg position

Definition: Trendelenburg is putting the patient in a flat on the back with the feet higher than the head by 15-30 degree.

Purpose

- To increase cerebral perfusion pressure
- To allow better access to pelvic organ during pelvic surgery
- To help in surgical reduction of hernia
- To enhance access to central venous line

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Indication

- Hypotension/shock
- Abdominal and gynecologic surgery
- Placing central venous line
- Surgical reduction of hernia

Contraindication

- Cervical –spine fracture
- Respiratory impairment/breathing difficulties
- Brain injury with increased intracranial pressure

Contraindication

- Spinal injury
- Cardiac patient (CHF)
- Breathing impairments
- Pressure sore (buttock, scrum, heal and shoulder)

Equipment's

1. Bed block(if necessary)
2. Drape
3. Screen
4. Documentation format

Procedure

1. Great the patient (if conscious) and explain the procedure
2. Perform hand washing
3. Collect all necessary equipment's
4. Provide privacy
5. Place the patient's head lower than the feet with arms at the side
6. Place bed blocks at the foot end of the bed.
7. Lower the bed and elevate the side rails
8. Wash your hand
9. Note the patient reaction

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10. Document the procedure

7.2.5. Lithotomy position

Definition: Lithotomy position is positioning the client feet above or the same level as hips with perineum positioned at the edge of examination table (Figure....).

Purpose

- To provide good visual and physical access to perineum
- To perform simple pelvic procedures to major surgeries
- To conduct delivery

Indication

- Pelvic medical examination and surgeries
- Delivery

Contraindication

- Spinal injury
- Breathing impairments

Equipment

1. Pillow (1)
2. Bed with side rails/examination table/delivery couch
3. Draw sheet /drape
4. Screen
5. Documentation format

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Great the patient and explain the procedure				
2.	Perform hand washing				
3.	Collect all necessary equipments				
4.	Provide privacy				
5.	Elevate bed to highest position.				
6.	Place bed in a flat position.				
7.	Cover the client with a sheet or a bath blanket				
8.	Lie the patient flat with pillow under the head				
9.	Flex the feet above or the same level as hips and support with				
10.	Wash your hand				
11.	Note the patient reaction				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
----------	-------------------------

Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Lithotomy position

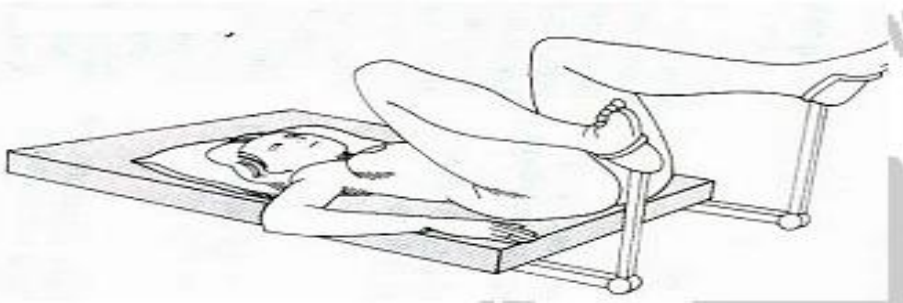


Figure 7. 17: Dorsal Lithotomy position

6.5. Patient ambulation

Definition: Client ambulation is assisted or unassisted walking which encouraged soon after the onset of illness or surgery to prevent the complications of immobility

Purpose

- To Keep client more active
- To prevent the complications of immobility
- To improve muscle tone and strength in his legs
- To slow down loss of bone mass and density related to osteoporosis
- To improve appetite, peristalsis and circulation
- To give a sense of accomplishment and maintain greater independence for clients (psychological wellbeing)

Indication

- Immobile patients unless contraindicated
- Postoperative patient

Contraindication

- Unstable vital sign
- Spinal fracture
- Patient with traction

Equipment: - Assistive devices (Gait belt, Cane, Walker and Crutch)

7.2.6. Preparing the Client to Walk/ambulate

Precaution for ambulation

- Determine the client's activity level and tolerance for physical exertion (strength, endurance, general status and mobility status)
- Assess for factors that may negatively affect ambulation (e.g., mental status, fatigue, pain, medications).
- Evaluate the environment for safety (e.g., presence of obstacles in walkway, adequate lighting, nonslip floor, handrails).
- Check assistive devices for safety hazards

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- Check client's clothing (e.g., nonslip shoes, adequate covering for privacy and warmth).

Procedure

1. Inform client about the purposes and distance of the walking exercise
2. Elevate the head of the bed and wait several minutes to prevent orthostatic hypotension
3. Lower the bed height
4. With one arm under the client's back and one arm under the client's upper legs, move the client into the dangling position
5. Encourage client to dangle at side of bed for several minutes
6. Stand in front of client with your knees touching client's knees
7. Place arms under client's axilla
8. Assist client to a standing position, allowing client time to balance
9. Help client ambulate desired distance or distance of tolerance by placing your hand under the client's forearm and ambulating close to the client

7.2.7. Assisting patient with assistive devices

Definition: Assistive device is a material used to support client/patient who is unable to walk independently

Common types

- | | |
|--------------|-----------|
| 1. Gait belt | 3. Walker |
| 2. Cane | 4. Crutch |

7.2.8. Gait belt

Definition: Gait belt is an assistive device used during simple assisted ambulation (Figure.....)

Purpose: - To aid patient/client in ambulation

Indication: - One body part weakness

Equipment: - Gait belt

Procedure

1. Wash your hands.
2. Explain what you are going to do.
3. Assist the client to sit on the edge of the bed.
4. Pause and allow the client to sit on the edge of the bed for a few moments to regain balance.

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5. Assist the client in putting on socks and nonskid shoes.
6. Put a gait belt around the client's waist.
7. Stand in position of good body mechanics.
8. Assist the client to a standing position by straightening your legs as you lift with the gait belt and the client pushes down with his hands on the mattress.
9. Pause to allow the client to regain balance.
10. Walk with the client by placing one hand on the gait belt in front of his waist and your other hand in back under the gait belt.
11. Walk in the same pattern as the client (both step with left foot at the same time).
12. Assist the client to step forward with strong foot first.
13. Walk the client the distance instructed by supervisor or as indicated by the service plan
14. Return the client to the bed/chair.
15. Make sure the client is comfortable.
16. Remove the gait belt.
17. Wash your hands.
18. Record observations.



Figure 7.18: Gait belt

7.2.9. Cane

Definition: A cane is assistive devices that can be used by clients who can bear weight on both legs but have some weakness in one leg or hip

Type

1. Standard Cane
2. T-handle Cane
3. Tripod Cane

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4. Quad (Quadruped) Cane

Indication: - Some weakness in one leg or hip

Purpose: To support the patient during walking

Equipment

- Appropriate type of cane
- Gait belt
- Documentation format

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Wash your hands.				
2.	Explain what you are going to do.				
3.	Lower the bed to lowest level; assist client to sit on edge				
4.	Pause and allow the client to sit on the edge of the bed a				
5.	Assist the client in putting on socks and nonskid shoes.				
6.	Apply a gait belt.				
7.	Stand in a position of good body mechanics.				
8.	Assist the client to a standing position by straightening				
9.	Instruct the client to move the cane forward and a little to				
10.	Instruct the client to take short steps and keep his head up				
11.	Instruct the client to move his weak foot forward to line up				
12.	Instruct the client to put weight on the cane and weak foot				
13.	Walk in the same pattern as the client (both step with left				
14.	Walk the client the distance instructed by supervisor/nurse				
15.	Return the client to bed/chair.				
16.	Make sure the client is comfortable.				
17.	Wash your hands.				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Show how to use cane

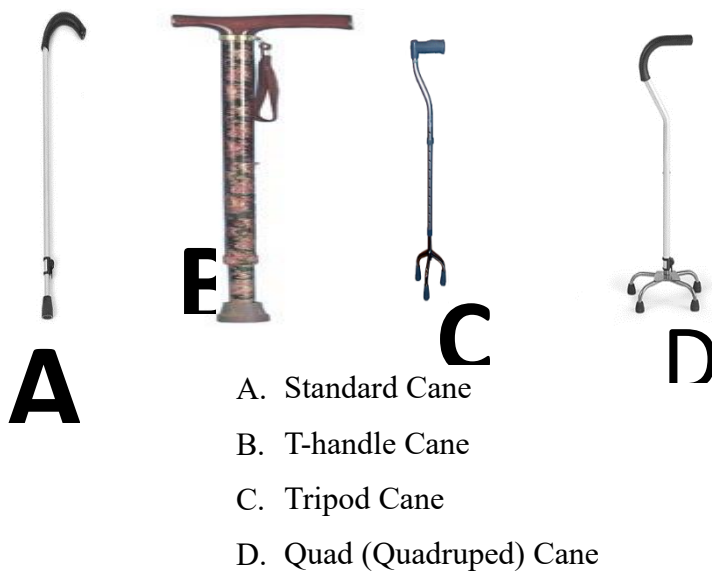


Figure 7. 19: Canes

7.2.10. Walker

Definition: A walker is a waist-high metal tubular device with a handgrip and four legs characterized by the presence of rubber tips on all four legs or have wheels on the two front legs

Purpose: _ To provide extra support, sense of security, and independence

Indication

- Weakness in lower Limbs
- Disability
- Postoperative (as needed)

Equipment

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1. Walker
2. Gait belt
3. Documentation format

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Wash your hands.				
2.	Explain what you are going to do.				
3.	If using a hospital bed, lower the bed to lowest level.				
4.	Assist the client to sit on the edge of the bed.				
5.	Pause and allow the client to sit on the edge of the bed a few				
6.	Assist the client in putting on socks and nonskid shoes.				
7.	Apply a gait belt.				
8.	Stand in a position of good body mechanics.				
9.	Assist the client to a standing position by straightening your				
10.	Instruct the client to position his body within the frame of the				
11.	Instruct the client to move the walker forward by lifting it up,				
12.	Instruct the client to take a step forward with the weak leg.				
13.	Instruct the client to move strong leg forward.				
14.	Instruct the client to take short steps and keep his head up and				
15.	Walk the client the distance instructed by supervisor/nurse as				
16.	Return the client to bed or a chair. To ambulate backward, the				
17.	Assist the client into the chair or bed; make sure the client is				
18.	Wash your hands				
19.	Record observations.				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
----------	-------------------------

Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Show how to use walker

Procedures



Figure 7. 20: Walker
7.2.11. Crutch

Definition

Crutch is walking aids made of wood or metal in the form of a shaft which reaches from the ground to the client's axilla.

Crutch walking; is one of the patient ambulation techniques which helps the client to stand and walk with the help of Crutch

Purpose

- Reduces anxiety and promotes client's autonomy
- To improve muscle strength

Types of Crutch

Axillary: Fits under the axilla with the weight being placed on the handgrips

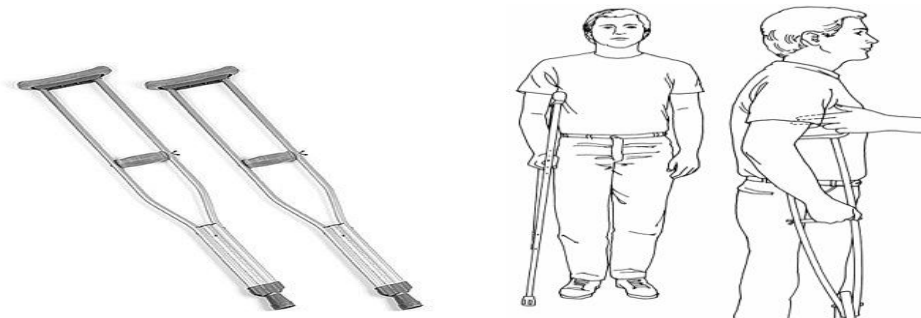


Figure 7. 21: Axillary crutch

Forearm:

- It has a handgrip and a metal cuff that fits around the arm
- More convenient but provides less stability than the axillary crutch



Figure 7.22: Forearm crutch

Types of Crutch walking gaits

1. Two-point gait
2. Three point gait
3. Four point gait
4. Swing to gait
5. Swing through gait
6. Up and down stair gait

A. Two-point gait

Definition: Two-point gait is an assisted gait used for partial weight bearing on each leg which provides a strong base of support

Purpose

- ✓ To reduces anxiety and promotes client's autonomy
- ✓ To improve muscle strength
- ✓ To Helps clients able to cope with disabilities
- ✓ To Support patient during walking

Indication

- Weakness of the leg with partial ability to bear weight

Contraindication

- Patients unable to bear weight fully on each leg

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Equipment

- Properly fitted crutches
- Regular, hard soled street shoes
- Gait /Safety belt, if needed

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Great and explain the procedure.				
2.	Assess client for strength, mobility, range of motion,				
3.	Adjust crutches to fit the client.				
4.	Lower the height of the bed.				
5.	Dangle the client at the side of bed for several minutes.				
6.	Apply the gait belt around the client's waist if balance and				
7.	Assist the client to a standing position with crutches.				
8.	Instruct client on method to hold and walk with the				
9.	Move the left crutch and right leg forward 4 to 6 in then				
10.	Help the client practice the gait by repeating step 9 until				
11.	Assess the client's progress, and correct any mistakes as				
12.	Observe the patient condition				
13.	Record the procedure				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
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Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Two point Gait

B. Three point gait

Definition: Assisted gait with weak/non weight bearing one leg supported with two Crutches

Purpose

- Reduces anxiety and promotes client's autonomy
- To assist weak or non-weight bearing one leg
- Helps clients able to cope with disabilities

Indication:- Those patients having weakness in one leg or amputated one leg

Contraindication: - Patients having weakness in both legs

Equipment

1. Properly fitted crutches
2. Regular, hard soled street shoes
3. Safety belt, if needed
4. Documentation chart/format

Procedure

1. Greet and explain the procedure.
 2. Assess client for strength, mobility, range of motion, visual acuity, perceptual difficulties, and balance
 3. Adjust crutches to fit the client.
 4. Lower the height of the bed.
 5. Dangle the client at the side of bed for several minutes.
 6. Apply the gait belt around the client's waist if balance and stability are impaired.
 7. Assist the client to a standing position with crutches. Support as needed.
 8. Instruct client on method to hold the crutches to hold and walk with the crutches
- Advance both crutches and the weaker leg forward together 4 to 6 in then move the stronger leg forward, even with the crutches.
9. Help the client practice the gait by repeating step 8 until the client independently practice it
 10. Assess the client's progress, and correct any mistakes as they occur.
 11. Observe the patient condition
 12. Record the procedure

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C. Four point gait

Definition: Very stable but slow gait for weight bearing with both legs follows the pattern of right crutch forward, left foot forward, left crutch forward, then right foot forward

Purpose

- ✓ Reduces anxiety and promotes client's autonomy
- ✓ To improve muscle strength
- ✓ Helps clients able to cope with disabilities

Indication

- Weight bearing difficulties on both legs

Contraindication

- Patients unable to bear weight on both leg
- Bearing weight on axilla

Equipment needed

1. Properly fitted crutches
2. Regular, hard soled street shoes
3. Safety belt, if needed

Procedure

1. Great and explain the procedure.
2. Assess client for strength, mobility, range of motion, visual acuity, perceptual difficulties, and balance
3. Adjust crutches to fit the client.
4. Lower the height of the bed.
5. Dangle the client at the side of bed for several minutes.
6. Apply the gait belt around the client's waist if balance and stability are impaired.
7. Assist the client to a standing position with crutches. Support as needed.
8. Instruct client on method to hold the crutches to hold and walk with the crutches

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- Position the crutches 4.5 to 6 in. to the side and in front of each foot then move the right crutch forward 4 to 6 in. and move the left foot forward, even with the left crutch.
 - Move the left crutch forward 4 to 6 in. and move the right foot forward, even with the right crutch.
9. Help the client practice the gait by repeating step 8 until the client independently practice it
 10. Assess the client's progress, and correct any mistakes as they occur.
 11. Observe the patient condition
 12. Record the procedure

D. Swing to gait

Definition: Crutch walking gait in which both crutches move together then Lift body weight by the arms and swing to the crutches (at the level)

Purpose

- To relax and strengthen muscle
- To promote the client/autonomy
- To support the disability

Indication: - Weakness of both legs

Contraindication: - Improper body balance

Equipment

1. Properly fitted crutch
2. Regular, hard soled street shoes
3. Safety belt, if needed

Procedure

1. Great and explain the procedure.
2. Assess client for strength, mobility, range of motion, visual acuity, perceptual difficulties, and balance
3. Adjust crutches to fit the client.
4. Lower the height of the bed.
5. Dangle the client at the side of bed for several minutes.
6. Apply the gait belt around the client's waist if balance and stability are impaired.

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7. Assist the client to a standing position with crutches. Support as needed.
8. Instruct client on method to hold the crutches to hold and walk with the crutches
 - ❖ Move BOTH crutches together then Lift body weight by the arms and swing to the crutches (at the level)
9. Help the client practice the gait by repeating step 8 until the client independently practice it
10. Assess the client's progress, and correct any mistakes as they occur.
11. Observe the patient condition
12. Record the procedure

E. Swing through gait

Definition: Crutch walking gait in which the pattern of crutches forward, then legs swing forward together through the crutch

Purpose

- To relax and strengthen muscle
- To promote the client/autonomy
- To support the disability
- To Speed up the walking

Indication: - Weakness of both legs

Contraindication: - Improper body balance

Equipment

1. Properly fitted crutch
2. Regular, hard soled street shoes
3. Safety belt, if needed

Procedure

1. Great and explain the procedure.
2. Assess client for strength, mobility, range of motion, visual acuity, perceptual difficulties, and balance
3. Adjust crutches to fit the client.
4. Lower the height of the bed.

5. Dangle the client at the side of bed for several minutes.
6. Apply the gait belt around the client's waist if balance and stability are impaired.
7. Assist the client to a standing position with crutches. Support as needed.
8. Instruct client on method to hold the crutches to hold and walk with the crutches
 - Move BOTH crutches together then Lift body weight by the arms and swing to the crutches **(beyond the level)**
9. Help the client practice the gait by repeating step 8 until the client independently practice it
10. Assess the client's progress, and correct any mistakes as they occur.
11. Observe the patient condition
12. Record the procedure

F. Up and down stair gait

Definition: Crutch walking gait helps to climb up and move down stair.

Purpose

- To promote clients level of activity in moving up and down stair
- Relax and strengthen muscle
- To promote the client/autonomy
- To support the disability

Indication: Musculo-skeletal injury

Contraindication: - Improper body balance

Equipment

1. Properly fitted crutch
2. Regular, hard soled street shoes
3. Safety belt, if needed

Procedure

1. Great and explain the procedure.
2. Assess client for strength, mobility, range of motion, visual acuity, perceptual difficulties, and balance
3. Adjust crutches to fit the client.

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4. Lower the height of the bed.
5. Dangle the client at the side of bed for several minutes.
6. Apply the gait belt around the client's waist if balance and stability are impaired.
7. Assist the client to a standing position with crutches. Support as needed.
8. Instruct client on method to hold the crutches to hold and walk with the crutches

Up stair

- a) Place unaffected leg on the stair
- b) Client transfer body weight to unaffected leg
- c) Client moves crutches and affected leg to stair

Down stair

- a) Start with weight on uninjured leg and crutches on the same level.
- b) Put crutches on the first step
- c) Put weight on the crutch handles and transfers unaffected extremity to the step where crutches are placed
9. Help the client practice the gait by repeating step 8 until the client independently practice it
10. Assess the client's progress, and correct any mistakes as they occur.
11. Observe the patient condition
12. Record the procedure

7.3. Patient transfers

7.3.1. Transferring a Client from Bed to Chair

Definition: This is a procedure done to help clients in transferring from bed to chair

Purpose

- Helps client stands safety and gives time to assess status
- Moves client in to proper position to be seated
- Reduces risk of falling by maintaining clients stability during transfer
- Maintains clients stability and reduces pressure on axilla and strain on back

Indication: - Clients unable to help themselves in transferring from bed to chair

Contraindication: - Unconscious patients

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Equipment

1. Bed pan (if necessary)
2. Chair /wheel chair
3. Slipper

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Greet the patient and explain the procedure.				
2.	Offer bed pan (Empty bladder will increase patient				
3.	Assess client's ability to assist with the transfer and for				
4.	Take pulse and respiration				
5.	Lower the bed comfortable position.				
6.	Bring wheelchair close to the side of the bed, toward the				
7.	.Lock wheelchairs brakes and elevate the foot pedals.				
8.	Give the client slipper.				
9.	Assist client to side of bed until feet touch the floor.				
10.	Assess client for dizziness. Remain in front of client until				
11.	Assist the client to a standing position and provide				
12.	Stand facing the patient; place your hands under patient's				
13.	Raise the patient, bend at the knees, and gently put in				
14.	Assist client to maintain proper posture.				
15.	Take pulse and respiration.				
16.	Watch for signs of tiredness				
17.	Record the procedure.				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
----------	-------------------------

Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Perform Patient Transfer

7.3.2. Transferring a Client from Bed to Stretcher

7.3.3. Three carrier lift

Definition: A three carrier lift is alternative method of transferring helpless patients from bed to stretcher with three nurses or a nurse and two informed assistants.

Purposes

- To reduces client's anxiety and increases cooperation
- Decrease risk of client's falling

Indication: - For patients unable to move from bed to areas where procedures performed

Equipment

1. Stretcher
2. Pillow
3. Clean glove

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Greet the patient and explain the procedure to the patient				
2.	Wash your hand.				
3.	Make sure that assistants are available				
4.	Adjust the head of bed to the flat position.				
5.	Put stretcher parallel to patients head.				
6.	Each person must support one section of the patients'				
7.	Slide your arms under the patient as far as possible and on				
8.	Walking together, move patient from bed to stretcher				
9.	Observe the patient condition				
10.	Document the procedure.				
11.	Greet the patient and explain the procedure to the patient				
12.	Wash your hand.				
13.	Make sure that assistants are available				
14.	Adjust the head of bed to the flat position.				
15.	Put stretcher parallel to patients head.				
16.	Each person must support one section of the patients'				
17.	Slide your arms under the patient as far as possible and on				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
----------	-------------------------

Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Transferring a Client from Bed to Stretcher

7.3.4. Draw sheet method of transferring patient from bed to stretcher

Definition: This is method of transferring patient from bed to stretcher using the sheet already under the patient as draw sheet.

Purpose, indication and contraindications

- Similar with three carrier lift method

Equipment

1. Stretcher
2. Pillow
3. Lift sheet
4. Glove
5. Documentation format

Procedure

1. Greet the patient and explain the procedure
2. Wash your hand and dry it
3. Done glove if necessary
4. Loosen bottom sheet beneath patient
5. Position stretcher next to and parallel to bed
6. Prepare stretcher and adjust to bed height
7. Adjust the draw sheet
8. Across stretcher and grasp sheet firmly at the patient's head, chest, hips and knees
9. Give direction
10. Slide the patient gently on to stretcher
11. Comfort the patient
12. Observe the patient condition
13. Document the procedure.

7.4. Range of motion exercise/ROM

Definition: Range of motion exercise refers to activities aimed at improving movement of specific or group of joints

Purpose

- To maintain the current joint function
- To restore joint function that has been lost through disease or injury, or lack of use
- To maintain muscle tone and strength
- To prevent contractures
- To improve circulation

Types

Active- movements of the joints independently by the client/patient on a nonfunctioning joints

Active-passive:-movement of nonfunctioning joint from partial assistant from others carried

Passive:-movement applied by a nurse or other person or passive motion machine on a pt's immobilized joint.

Indication

- Unable to move joints
- Part of daily living activities

Contraindication

- ✓ Dislocation in specific joints
- ✓ heart & respiratory disease and Swollen or inflamed joints or musculoskeletal injury

Procedure

S.No	Procedural steps	Assessment criteria			
		0	1	2	Remark
1.	Wash hands				
2.	Explain the procedure to the client				
3.	Adjust the bed to a comfortable height.				
4.	Select one side of the bed to begin PROM exercises.				
5.	Uncover only the limb to be exercised.				
6.	Support all joints during exercise activity.				
7.	Use slow, gentle movements when performing exercises.				
8.	Repeat each exercise three times.				
9.	Stop if the client complains of pain or discomfort.				
10.	Begin exercise with the client's neck and work down ward.				
11.	Flex, extend and rotate the client's neck				
12.	Support his or her head with your hands				
13.	Support the client's elbow with one hand and grasp the client's				
14.	Raise the client's arm from the side to above the head				
15.	Perform internal rotation by moving the client's arm across his				
16.	Externally rotate the client's shoulder by moving the arm away				
17.	Flex and extend the client's elbow.				
18.	Perform all exercises on the client's wrist and fingers				
19.	Exercise the client's hip and leg				
20.	Flex and extend the hip and knee while supporting the leg				
21.	Abduct and adduct the hip by moving the client's straightened				
22.	Perform internal and external rotation of the hip joint by				
23.	Perform exercises on ankle and foot				
24.	Move to the other side of the bed and repeat exercise.				
25.	Position and cover the client. Return the bed to low position.				
26.	Wash your hands.				
27.	Document completion of PROM exercise				

Quality criteria:

Performed: performed the step or task according to the standard procedure or guidelines=2

Partially Performed: unable to perform the step or task according to the standard procedure or guidelines=1

Not Performed: step or task not performed by participant =0

LAP Test	Practical Demonstration
----------	-------------------------

Name: _____

Date: _____

Time started: _____

Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks.

Task: Range of Motion Exercise

Self-Check 2	Written Test
---------------------	---------------------

Instructions: Answer all the questions listed below. Write your answers in the sheet provided in the next page.

1. Explain the difference between workplace design and job design? (7 points)
2. List out the two Features of good workplace design (4 points)
3. Describe the key factors need to be taken into consideration when designing roles?(6 points)
4. List out the Common approaches to job design (7 points)

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. How to give and receive lifting commands? (5)
- 2..... is a statement of preferred practice but also provides practical guidance on the control of manual handling tasks. (5)
- 3..... is a two-way street – both employers and employees have certain rights and responsibilities under the law. (5)
- 4..... any activity requiring a person to lift, lower, push, pull, carry, throw, move, restrain, hold or otherwise handle any animate, or inanimate, objects.(5)
- 5..... Is a critical part of manual handling risk assessment and an important nursing skill? (5)

Direction –choose the best answer from the following questions.

1. Which statement was true about cleaning?
 - A Making free from substance that are unwanted
 - B Removing dirty
 - C Removing of bacterial contamination
 - D All
2. Cleaning means free from substance that are harmful or unwanted.
 - A True
 - B. false
3. Cleaning device immediately after use has the potential to eliminate this problem of biofilm contamination.

A True

B. false

4. Which statement was true about damage to medical device?

- A Medical device may become damaged by cleaning solution.
- B Cleaning solution that are not compatible with the device.
- C Improper reusable medical device cleaning
- D All

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