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ADULT HEALTH NURSING-I

MEDICAL SURGICAL NURSING



Semester III

As per the Revised INC Syllabus for BSc Nursing

MJ Kumari

2nd Edition

JAYPEE

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Unit 3

Nursing Care of Patients with Common Signs and Symptoms and Management

UNIT OUTLINE

- Fluid and Electrolyte Imbalance
- Dehydration
- Vomiting
- Dyspnea
- Cough
- Respiratory Obstruction
- Hemoptysis
- Fever
- Shock
- Unconsciousness
- Syncope
- Pain
- Incontinence
- Edema

FLUID AND ELECTROLYTE IMBALANCE

In human body most of the organs and tissues comprise >70% **water**, in blood and kidneys contain of 83% **water**, and muscles 76% **water**. In adipose tissue comprises only 10% of **water**. The human body water in intracellular is two third of total body water. The plasma and interstitial fluids present in extracellular fluid. There are two main fluid compartments in human body which are the intracellular and extracellular sections. The intracellular compartment is the space within the organism's cells. It is separated from the extracellular compartment by cell membranes. Sodium is the major cation and the major anion is chloride within the extracellular fluid. Potassium is the major cation in the intracellular fluid. These electrolytes play an vital role in maintaining homeostasis.

Electrolyte is an element. It has dissolved in water or another solvent, disconnect into ions and carry electrical current. There are positive charged ions such as sodium, potassium, calcium and negative charge ions such as chloride, phosphates, bicarbonates and sulfate. Fluid move from lower concentration to higher concentration through cell membrane is known as **osmosis.** Molecules move from higher concentration to lower concentration is known as diffusion.

Electrolytes are distributed into positively and negatively charged groups of cations (+) and anions (–). The intracellular and extracellular fluid consists of electrolytes. There is any abnormal changes in electrolytes cause life-threatening condition for normal cellular metabolism and function. Plasma osmolality, circulation and transmission of action possibilities, maintaining acid-base balance, and maintaining electroneutrality maintain by sodium. Electrical membrane excitability, maintaining acid-base balance, and regulating intracellular osmolality done by potassium. Calcium is an essential element in the contractile processes such as cardiac, skeletal, and smooth muscle. It is responsible for strength and density of teeth and bones, stabilizes excitable membranes, and is a cofactor in the clotting mechanism. The bony skeleton, cofactor for many metabolic enzymes, regulator of ion channels and transporters in excitable tissues all function done by magnesium. The bone mineral, phospholipids in cell membranes, and nucleic acids functions done by phosphorus. In the clinical setting, not possible direct measurement of intracellular electrolytes. It can be measure by dietary excesses, dietary deficits, prescribed medications, excess intake of water, lack of water ingestion, vomiting, and diarrhea, these all the factors may cause electrolyte abnormalities.

Fluid Compartments in Human Body (Figs. 3.1A and B)

The human body consists total amount of fluid is around 70% of body weight. The body fluid divided into two

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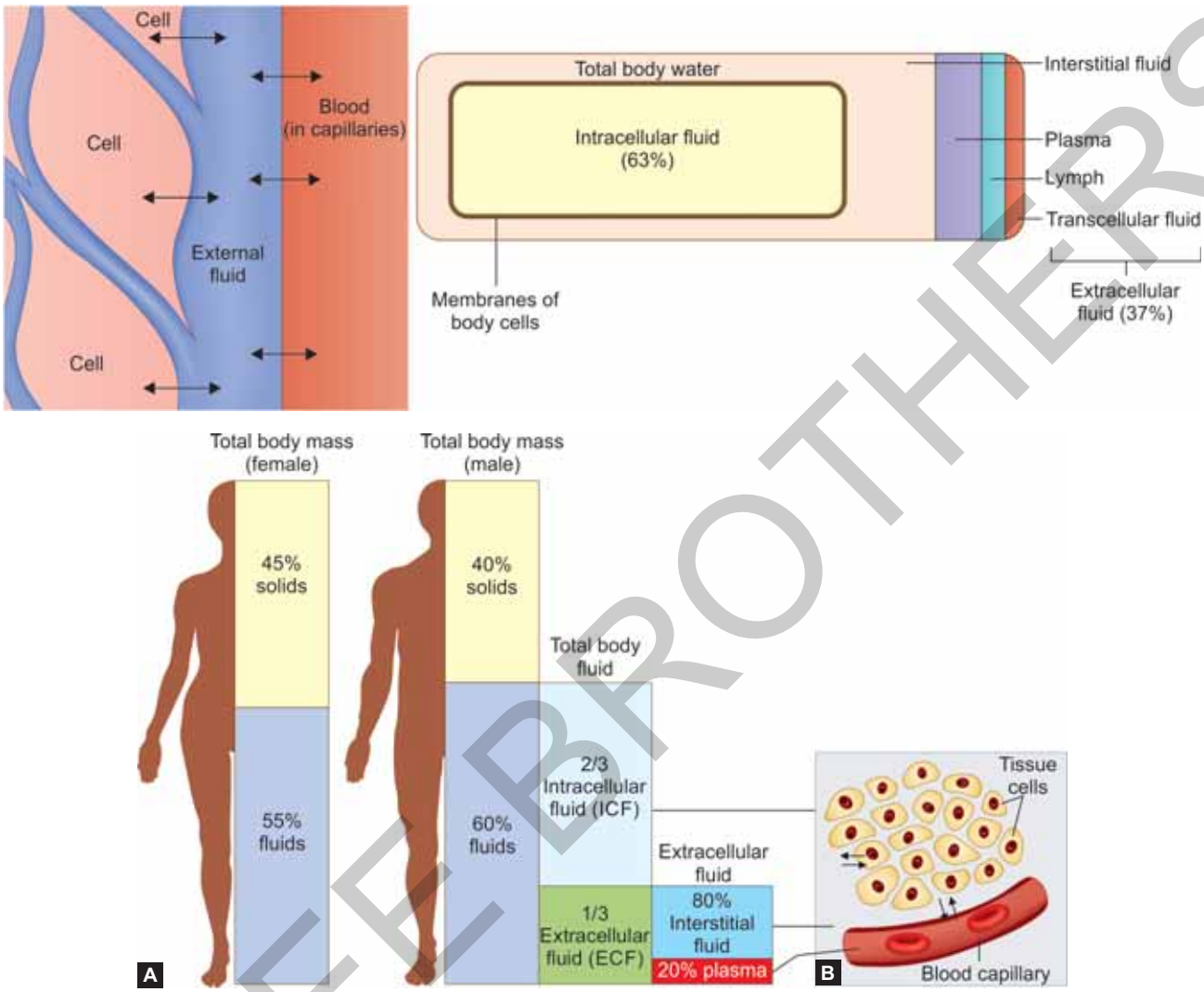

Figs. 3.1A and B: Distribution of body fluids. (A) Distribution of body solids and fluids in an average lean, adult female and male; (B) Exchange of water among body fluid compartments.

compartments—**intracellular fluid (ICF)** totally 55% of body water inside the cells; **extracellular fluid** (ECF) totally 45% of body water outside the cells.

Composition of Electrolytes (Table 3.1)

Table 3.1: Composition of electrolyte.

Electrolyte	*ECF (mEq/L)*	*ICF (mEq/L)*
Sodium	135–150	10–18
Potassium	3.5–5.0	120–145
Calcium	8.5–10.5 mg/dL	
Magnesium	1.5–2.4	30–50
Chloride	95–108	2–6
Phosphate	2.5–4.5	25–60

Composition of Body Fluids (Table 3.2)

Table 3.2: Composition of body fluid.

Organic substances	*Inorganic substances*
• Glucose • Amino acids • Fatty acids • Hormones • Enzymes	• Sodium • Potassium • Calcium • Magnesium • Chloride • Phosphate • Sulfate

Extracellular Fluid

- **Interstitial fluid:**
  - Existing between the cells
  - Nearly 80% of ECF

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- **Plasma:**
  - Existing in blood
  - Around 20% of ECF
- **Also includes:**
  - Lymph
  - Synovial fluid
  - Cerebrospinal fluid
  - Pleural, pericardial and peritoneal fluids

Extracellular Fluids

Interstitial fluid

Interstitial fluid another name is intercellular fluid. Tissue fluid is fluid present between the cells of multi-cellular organisms. This fluid supplies vital things to the cells, elimination of metabolic waste products from body and provide intercellular communication. It denotes the major portion of the ECF compartment.

Interstitial fluid **comprises** of a water solvent. It consists of amino acids, fatty acids, sugars, coenzymes, neurotransmitters, hormones, salts, and waste products from the cells. This fluid look similar as **gel-like extracellular matrix**. The plasma and the interstitial fluid incorporate through **pores** in the blood capillaries. It allow water and most dissolved elements excluding protein to diffuse. The molecules, blood, nutrients, and oxygen need to pass-through into the interstitial fluid before reaching the body cells. The cells waste products and hormone secretions essential to pass-through into the interstitial fluid before reaching the blood plasma **(Fig. 3.2)**.

The interchange of material pass-through the capillaries happens at high rate by transmission in both ways. In the cells, exchanges occurs between the biological tissue and the blood, it is depends up on the composition of tissue fluid. Tissue fluid in present in a different composition in different tissues and in different areas of the body. It is acting as a media for intercellular communication.

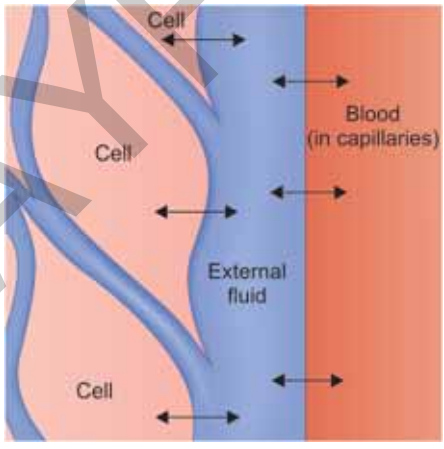


Fig. 3.2: Fluid movement.

Barrier for ICF, interstitial fluid and plasma:

- **Plasma membrane:** Separates ICF from surrounding interstitial fluid
- **Blood vessel wall:** Separate interstitial fluid from plasma

Blood plasma

The blood plasma is the fluid portion in the blood. The blood carryings oxygen from the lungs and supply to the body cells and carbon dioxide received from the body cells and send to the lungs. Blood carryings nutrients derivate from food in the intestine and supply to the body cells, other nutrients between organs.

Lymph

It is clear and colorless fluid. It consists of 96% water and 4% solids. Solids contains protein is 2–6%, albumin, globulin, prothrombin, fibrinogen, clotting factors, enzymes, and antibodies. Lipids contains 5 to 15% of chylomicrons and lipoproteins. Carbohydrates primarily present glucose. Non protein nitrogen (NPN) consists of urea and creatinine. Electrolytes comprises sodium, calcium, potassium, chloride, and bicarbonates.

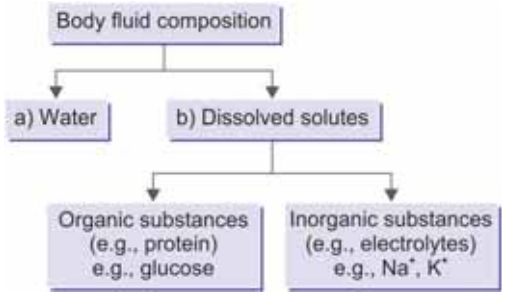
Functions of lymph

- Protein return from tissue into blood
- Elimination of toxins, bacteria, and other foreign bodies from tissues
- Preserve essential structure and purposeful functional reliability of tissue
- Way for intestinal fat absorption
- Transport lymphocytes

Intracellular Fluid

The intracellular fluid also called as cytosol. It is the liquid and it is present inside the cells. The cytosol has multiple cell processes comprising metabolic progresses such as glycolysis, gluconeogenesis, and poly-para-phenylenes (PPP). It is also involved in signal transduction from the cell membrane to sites within the cell.

The composition of body fluid in the tissue varies depend up on tissues type, gender, and age. The thin **type tissues** have higher fluid content than fat tissues. **Males** have more thin tissue and so more body fluid. **Age,** thin tissue is lost with age and body fluid is lost with it.



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Ever since water passes freely across through the body cell membranes. The fluid compartments are determined by unique solutes that are restricted to each space. Sodium present in the extracellular fluid compartment and potassium present in the intracellular compartment.

Electrolytes of the Body Fluids

In the body electrical impulses conduct by electrolytes of salts and minerals. The common human electrolytes consist of sodium, potassium, chloride, calcium, and bicarbonate. The body fluids are charged by electrolytes. In the electrolyte, cation is positively charged, e.g, Na^+, k^+, Ca^{+2} and anion is negatively charged, e.g., Cl^-, HCO_3^- PO_4^{-3}. The chief extracellular cation is Na^+. The chief intracellular cation are k^+. The Cl^- is the main anion in outside cells whereas phosphates establish the bulk of intracellular anions. The body fluid balance maintain by electrolytes. It is important in muscle contraction, energy generation and all major biochemical reaction in the body.

Movement of body fluids: Membrane transport processes **(Fig. 3.3)**:

- **Passive transport:** The substances move from higher to lower concentration across through a membrane, it does not require metabolic energy. Passive transport consists of two diffusion, which are—simple diffusion and facilitated diffusion.
  1. *Simple diffusion:* The substances move from a region of high concentration to a region of low concentration. Commonly, simple diffusion of water, gases, and other minor uncharged molecules across through plasma membranes can happen in the absenteeism of transport proteins.
  2. *Facilitated diffusion:* The substances transport from an area of higher concentration to an area of lower concentration pass through a biological membrane by a carrier protein.
- **Active transport:** It is the movement of the substances move from low concentration to high concentration pass through a membrane against gradient. Active transport needs energy and includes specific carrier proteins.

Movement of fluids due to—hydrostatic pressure and osmotic pressure.

- **Hydrostatic pressure:** It is normalize the fluids intake, output and movement of water and other substances melted in it between the body compartments. It is a physiological process.
- **Osmotic pressure:** It is pressure forces the water pass through a semi-permeable membrane from lower dissolved solutes to higher dissolved solutes separate the solutions with different concentration of solute **(Fig. 3.4)**.
  - *Osmosis:* It is distribution of a solvent which is generally water molecules pass through a semi-permeable membrane from an area of lower solute concentration to an area of higher solute concentration area**.**
  - *Osmoles* is the unit used to direct the concentration in term of numbers of particles.

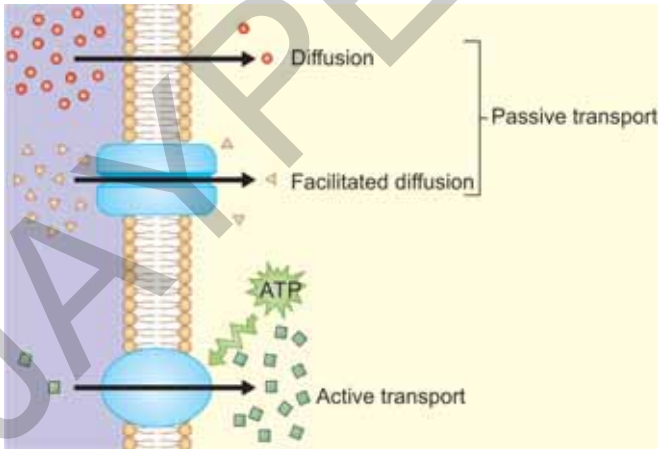

Fig. 3.3: Fluid transport.

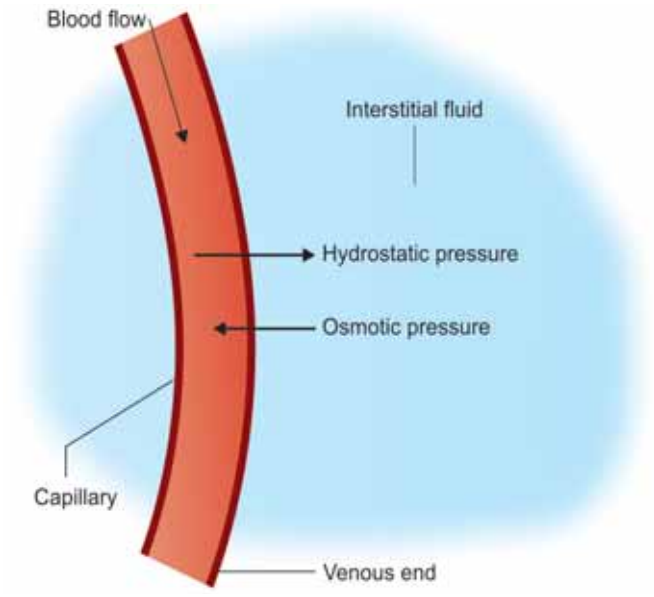

Fig. 3.4: Capillary microcirculation.

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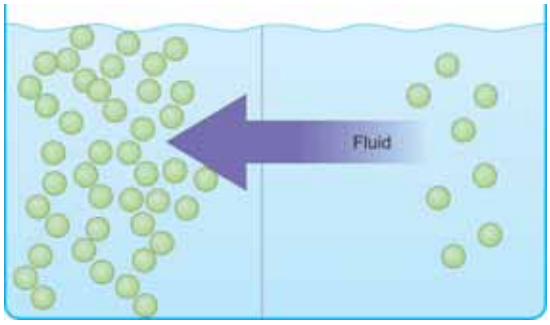
High solute concentration low fluid concentration and high osmotic pressure	Low solute concentration high fluid concentration and low osmotic pressure



Semipermeable membrane

The body fluids and electrolytes regulation maintains by balance between fluid intake and output**.**

Intake and Output of Water per Day

Intake of water (mL/day)	*Output of water (mL/day)*
• Water drunk—2100 • From metabolism—200 • Total intake—2300	• Unaware water loss by skin —350 • Unaware water loss by lungs—350 • Water loss by sweat—100 • Water loss by feces—100 • Water loss by urine—100 • Total—2300

Water balance: Water balance happens while water intake equals water output.

Water intake: Every individual intake of water volume per day will be vary from one another. Generally, every individual drink approximately 60% of water, 30% water getting from moist foods, and 10% from the metabolism of water.

Regulation of water intake: The water intake is mainly regulated by the thirst mechanism. The thirst center is hypothalamus. The thirst mechanism originates from the osmotic pressure of extracellular fluids. After intake of water, cause fullness of the stomach will stop the thirst mechanism.

Water output: Generally water loss happens through urine output, excretion of feces, sweat, insensible perspiration from skin, and from the lungs during breathing. The way of water loss determined by on temperature, relative humidity, and physical exercise.

Regulation of Water Output

The water output regulate by the distal **convoluted tubules** and **collecting ducts of the nephrons. The volume of water lost in the urine reduced by antidiuretic** hormone secreted from the posterior pituitary. While drinking adequate water, the ADH mechanism is suppressed, and more water is expelled in urine.

Disorders of Water Balance

- **Dehydration:** It occurs due to too much of water loss from the body than the intake, its result disturbed the metabolic process.
- **Hyponatremia:** It occurs due to abnormaly decreased sodium level in the blood.
- **Hypovolemia:** It occurs due to decrease the volume of blood in the body.

Electrolytes

Electrolytes are significant for keeping fluid balance, regulating to acid–base, helping enzyme reaction, and conducting neuromuscular reactions.

Electrolyte Balance

An electrolyte balance occurs when the volume of electrolytes increased and loss of electrolyte in equal amount. Electrolytes, **charged ions** capable of leading electricity, are existing in all body fluids and fluid compartments. The normal body function is maintaining by the fluid balance, accordingly it is maintaining electrolyte balance. Even though the concentration of specific electrolytes **differs** among the fluid compartments, a balance of cations (positively charged ions) and anions (negatively charged ions) **always** exists.

Regulation of electrolyte intake: Generally, an individual acquires adequate electrolytes from ingestion of food. A salt craving may indicate an electrolyte deficit.

Electrolyte output: An individual losses of electrolytes happen through sweating, in the feces, and in urine.

Hormonal Role (Fig. 3.5)

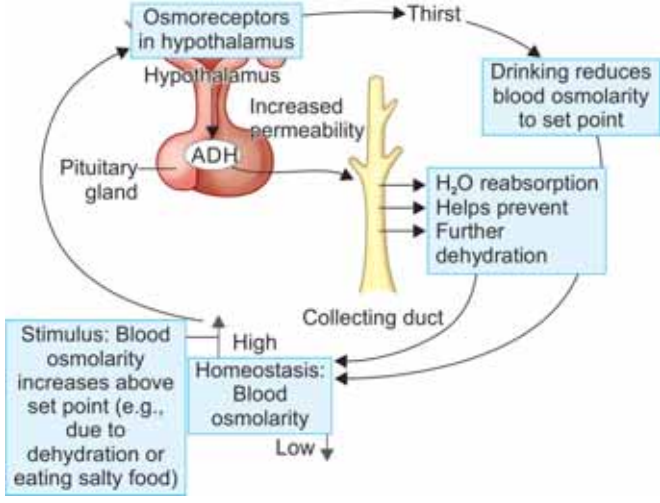


Fig. 3.5: Role of hormones in body fluid regulation.

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DEHYDRATION

Dehydration is otherwise known as water depletion or hypernatremia. **Fluid volume deficit** is a total body water deficit. It is related to loss of sodium together with water. **Iso-osmolar fluid volume deficit** happens when sodium and water are lost in equal quantities. **Hyperosmolar fluid volume deficit** happens while more fluid is lost than sodium, a state resulting in higher serum osmolality than normal. **Hypoosmolar fluid deficits** occur from sodium insufficiencies or free water surplus, resulting in a lower than normal serum osmolality. **Fluid deficit** leads to conditions known as dehydration and hypovolemia. **Dehydration** is a disorder of water loss with or without loss of sodium. It is often detected in critically ill patients. **Dehydration** defined as when human body loss more fluid than intake of fluid which results the plasma Na+ concentration more than 145 mmol/L and body incapable to look after normal body functions.

Types of Dehydration (Table 3.3)

Table 3.3: Types of dehydration.

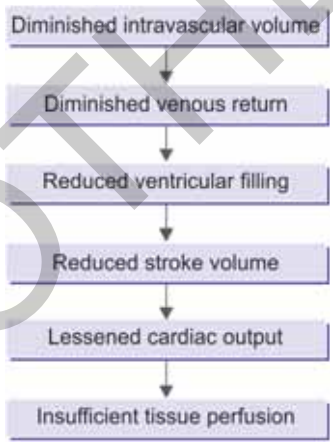
1. Isotonic dehydration or isotonic fluid depletion	• It is loss of balance between of sodium and water due to extracellular fluid loss • It is causes by vomiting, diarrhea, and osmotic diuresis from high glucose levels • It is affects total circulating fluid volume as an end result of overall fluid volume reduction
2. Hypotonic dehydration or extracellular fluid volume depletion	• It is a decline of sodium and water, along with greater losses of sodium than water, it leads in extracellular fluid loss • It causes due to frequent use of diuretics, chronic salt wasting, renal disease, and reduced intake of both salt and water • It affects the circulation because fluid moves intracellular and reductions plasma volume
3. Hypertonic dehydration or intracellular or hypernatremic dehydration	• It is decrease in total body water contented due to pathologic fluid losses, reduced water intake, or a mixture of both • It results in hypernatremia (>145 mEq/L) in the extracellular fluid compartment, thereby drawing water from the intracellular fluids • The water loss is shared by all body fluid compartments, and fairly little decrease in extracellular fluids occurs

Causes of Dehydration

- Extra-renal causes: Skin (fever, excessive sweating) and respiratory tract due to evaporation, burns.
- GI loss (diarrhea, vomiting)—diarrhea viral gastroenteritis, cholera, carcinoid syndromes.
- Renal cause.
- Loop diuretics, hyperglycemia.

Pathophysiology of Dehydration (Flowchart 3.1)

Flowchart 3.1: Pathophysiology of dehydration.



Stages of Dehydration

See **Table 3.4.**

Comparison of Clinical Manifestation between Adult and Children

See **Table 3.5.**

Assessment of Dehydration

History of Present Illness/Chief Complaint

- Complaint nausea, vomiting, and diarrhea
- Intake of oral fluid decreased
- Bleeding from any source
- Weight loss
- Excessive urination (polyuria), excessive thirst (polydipsia)
- Lethargy, fatigability, muscle cramps
- Postural faintness and syncope
- Seizures, coma, confusion
- Unusual salt desire
- Trauma: blunt or penetrating forces
- Abdominal or chest pain, i.e., attributable to pancreatitis and reduced organ perfusion
- Alcohol ingestion
- Hyperthermia

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Table 3.4: Stage of dehydration and clinical manifestations.

Symptoms	*Stages of dehydration*		
	Minimal or none (<3% loss of body weight)	***Mild to moderate (3% to 9% loss of body weight)***	***Severe (>9% loss of body weight)***
Mental status	Good; attentive	Regular, fatigued or restless, irritable	Lethargic, sluggish, unconscious
Thirst	Drinks routinely; might refuse liquids	Thirsty; excited to drink	Drinks poorly; incapable to drink
Heart rate	Regular	Normal to increased	Tachycardia; bradycardia in severe cases
Quality of pulses	Regular	Normal to reduced	Weak, thready, or unclear pulse
Breathing	Regular	Normal; fast	Deep
Eyes	Regular	Somewhat slightly sunken	Deeply sunken
Tears	Present	Reduced	Absent
Mouth and tongue	Moist	Dry	Parched
Skinfold	Instant recoil	Recoil in <2 seconds	Recoil in >2 seconds
Capillary refill	Regular	Continued	Lengthy; slight
Extremities	Warm	Cool	Cold; mottled; cyanotic
Urine output	Regular to decreased	Reduced	Slight

Table 3.5: Comparison of clinical manifestation between adult and children.

Level of dehydration	*Adult*	*Child*
Minimal (fluid loss <3% body weight)	No signs and symptoms	No signs and symptoms
Mild to moderate (loss of fluid <10% body weight)	• Oral cavity seems dry membrane and tongue • Sluggishness • Faintness in muscles • Headache • Dizziness • Fatigued • Rise heart rate • Breath rate increased • Urine output reduced • Thirst increased	• Oral cavity seems dry membrane and tongue • Irritable child • Crying without tears • Sunken cheeks, and eyes • No urine • No wet diaper for three or more hours
Severe (loss of fluid ≥10% body weight)	• Lack of sweating • Sunken eyes • Wrinkled and dry skin • Blood pressure decrease • Heart rate increased • Hyperthermia • Lethargic • Increased heart rate • Sunken eyes • Rapid shallow breath • Loss of skin tone • Unconsciousness • Hypotension	• Sunken fontanelle • Lethargic • Too weak to cry • Weak pulse • Cool, mottled skin • Urine output absent • Child looks very weak to suckle and drink fluid • Loss of skin tone • Floppy appearance • Hypotension • Unconscious

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Past Medical History (Current or Pre-existing Diseases/Illness)

- Diabetes
- Earlier similar episodes
- Substance abuse
- Medications
- Allergies

Physical Examination

General appearance

- Assess the level of consciousness, behavior, affect: find any confusion, lethargy, and coma
- Tachycardia, hypotension, orthostatic hypotension
- Potential raised temperature
- Moderate to severe distress/discomfort

Inspection

- Observe any lacerations, abrasions, ecchymosis, rashes, asymmetry and edema
- Petechial
- Bony abnormalities or angulation
- Flattened external jugular veins
- Sunken eyes
- Pupils, including size, shape, equality, reactivity to light
- Dry oral mucous membranes
- Any drainage and external bleeding
- Observe the respiratory rate, depth, work of breathing, use of accessory muscles, abdominal muscles, paradoxical chest wall movement
- Abdominal distention
- Venous access devices, feeding tubes or buttons
- Weight loss

Palpation/percussion

- Skin temperature, moisture and turgor, poor skin turgor: Sternum or inner thigh in the elderly
- Reduced peripheral pulses
- Sunken fontanel
- Skeletal muscle weakness

Diagnostic Procedures

- **Serum osmolality:** Raised or reduced
- **CBC with differential:** Hematocrit raised or reduced
- **Serum chemistries:** Glucose, BUN, creatinine, sodium raised or reduced
- **ABG analysis:** Metabolic alkalosis or metabolic acidosis
- **Blood, urine cultures:** To find causative organism and manage appropriate way
- **Urinalysis:** Pregnancy test in female patients of child-bearing age
- **Radiograph studies:** To rule out infection or trauma
- ECG to study the heart involvement in dehydration

Management of Dehydration

- Maintain airway, breathing, circulation
- Deliver supplemental oxygen as order
- Start IV/IO admission for administration of crystalloid fluids/medications
  - Administrate normal saline solution one to two liters rapidly for adults unless contraindication
  - Administer normal saline solution fluid challenge in older adults and monitor carefully for fluid to avoid overload
  - Infuse normal saline solution bolus 20 mL/kg in children as order; may repeat once
- **Prepare for/assist with medical interventions**
  - Monitor cardiac and pulse oximetry.
  - Arrange for oral fluid challenges with continuous monitoring carefully.
  - Monitor catheter location and monitoring of central venous pressure (CVP).
  - Put gastric tube and attach to suction as indicated.
  - Insertion of indwelling urinary catheter as indicated.
  - Assist with possible hospital admission.
  - Replace fluids and electrolytes depend up the level and age.
  - Normal adult required two and three liters of fluid per day.
  - Mild to moderate dehydration due to diarrhea, vomiting or fever may improve their condition by drinking more water or other liquids.
  - Diarrhea may be worsened by full-strength fruit juice and soft drinks.
  - Oral rehydration solution.
  - Encourage the mother to continue breastfeeding to child.
  - Administered intravenous fluid.
  - Clear fluid diet for 24 hours and progressively alter to normal diet after control diarrhea.
  - Loperamide (imodium) to control diarrhea as order. If the affected individual has a fever, or if there is blood in the diarrhea, medical advice should be attained before administering medications to control diarrhea.
  - Acetaminophen (Tylenol and others) to control fever.
  - Ibuprofen may irritate the stomach use with caution because it cause nausea and vomiting used caution.
  - If the person becomes confused or lethargic or coma, uncontrolled fever, vomiting, or diarrhea; inform medical emergency care immediately should be accessed.
- **Administer pharmacologic therapy as ordered**
  - Oral or intravenous sodium replacement
  - Intravenous sodium bicarbonate if pH less than 7.1

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- **Educate patient/significant others**
  - Administer small, frequent amounts of oral fluids for 12–24 hours after vomiting stops, then advance diet as tolerated
  - Advice to continue feeding normally even when diarrhea is present
  - Signs and symptoms that indicate need to emergency care setting
- Continuous vomiting
- Continuous diarrhea
- High temperature
- Dry mucous membranes and skin
- Reduced urine output
- Sunken fontanel and sunken eyes
- Crying without tears (i.e., after 2–3 months old)
- Sluggishness
- Postural dizziness

Nursing Management of Dehydration

- Collect the history of patient to determine the cause of the fluid imbalance.
- Assess and record patients' body weight every day at the same time.
- Maintain intake and output chart.
- Monitor vital sign and sign of fever, hypotension and tachycardia.
- Monitor the color and amount of urine.
- Monitor serum electrolytes and urine osmolality.
- Monitor active losses of fluid from drainage, suctioning, vomiting or bleeding.
- Assess and record the mental status and level of consciousness.
- Insert the urinary catheter if necessary for accurate monitoring of fluid output.
- Encourage the patient to increase the oral intake of fluid.
- Avoid acidic juice if the patient has impaired oral membrane integrity.
- Provide IV fluid replacement if patient unable to take oral fluid intake.
- Provide oral care regularly.
- Maintain regular turn schedule if immobile patient.
- Administrate the antidiarrheal agent or per order.
- Review medications like diuretic if patient is taking, obtain order to discontinue or adjust dose.
- Explain the cause for dehydration and preventive measure.
- Educate the patient about prevention of diarrhea and vomiting
- Advice to follow the environmental and personal hygiene.
- Educate the home remedy for diarrhea and vomiting.
- Teach to the patient and family members about the importance of oral fluid intake and how to monitor the intake and output in home setup.

VOMITING

Vomiting is removal of any harmless and harmful substances from the body after eating. It is also one of the protective mechanism in the human body to remove ingested toxic substance, e.g., alcohol and poisoning. **Vomiting** is forceful discharge of the contents from the stomach through the mouth. **Nausea** is a sensation of discomfort and uneasiness in the upper stomach with an automatic urge to vomit.

Causes of Vomiting

Major Causes (Table 3.6)

Table 3.6: Causes of vomiting.

Causes	*Examples*
Drug side effect and treatment induced	Cancer chemotherapy, opiates, nicotine, antibiotics, radiotherapy, Apomorphine, emetine, L-DOPA, estrogens
Labyrinth disorders	Motion, Meniere's disease
Endocrine causes	Pregnancy
Infectious causes	Gastroenteritis, viral labyrinthitis
Increased intracranial pressure	Hemorrhage, meningitis
Postoperative	Anesthetic, analgesics procedural
Central nervous system causes	Anticipatory, migraine, bulimia nervosa

Other Causes

- Motion sickness
- Pregnancy
- Medication-induced vomiting
- Deep pain
- Expressive stress
- Gallbladder disease
- Food poisoning
- Overeating
- Response to certain smells or odors
- Heart attack
- Brain injury
- Brain tumor
- Eating disorders (Bulimia)
- Paralysis of the stomach (Gastroparesis)
- Emptying stomach slow
- Viral infection
- Appendicitis
- Brain tumors
- Meniere's disease
- Chemotherapy
- Gastroparesis
- General anesthesia
- Intestinal obstruction
- Migraine
- Rotavirus

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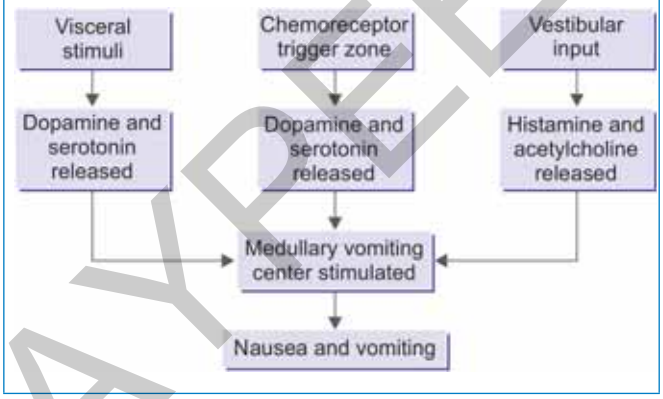
- Vestibular neuritis
- Viral gastroenteritis
- Acute liver failure
- Alcoholism
- Anaphylaxis
- Anorexia nervosa
- Appendicitis
- Benign paroxysmal positional vertigo
- Cholecystitis
- Pyloric stenosis
- Radiation therapy
- Severe pain
- Hypoparathyroidism
- Intestinal ischemia
- Intracranial hematoma
- Irritable bowel syndrome
- Medications—aspirin, digitalis, narcotics and antibiotics
- Cohn's disease
- Cyclic vomiting syndrome
- Depression
- Diabetic ketoacidosis
- Dizziness
- Ear infection
- Splenomegaly
- Fever
- Gallstones
- Gastroesophageal reflux disease (GERD)
- Generalized anxiety disorder
- Heart failure
- Hepatitis
- Hiatal hernia
- Hydrocephalus
- Hyperparathyroidism
- Hyperthyroidism
- Meningitis
- Pancreatic cancer
- Pancreatitis
- Peptic ulcer
- False brain tumor (Pseudotumor cerebri)

Mechanism of Vomiting

Trigger factors stimulates → Movement of the gastrointestinal tract start even before actual vomiting → antiperistalsis movement begins due to extreme irritation of the stomach or intestine → antiperistalsis movement push the intestinal contents into duodenum and stomach → result forceful emit outside through mouth.



It consists of three phases: 1. Nausea, 2. Retching, and 3. Vomiting.

1. **Nausea:** It is an unpleasant feeling that instantly leads vomiting. Common symptoms are cold, sweat, pallor, salivation, obvious unconcern in the environments, loss of gastric tone, and reflux of intestinal contents into the stomach.
2. **Retching:** It is continuous phases from nausea includes problematic irregular respiratory movement against a secure glottis through contractions of the muscles in the abdominal, chest wall and diaphragm without any ejection of gastric contents. It can occur without vomiting. It is usually creates the pressure gradient which leads to vomiting.
3. **Vomiting:** It is produced by the forceful continued contraction of the abdominal muscle and the chest musculature. It is associated by the origin of the diaphragm and the opening of the gastric cardia. It outcomes is the speedy and powerful removal of stomach contents out of the mouth.

   Action of vomiting → ↑ salivary secretion → initiated deep breathing to prevent aspiration → gastrointestinal retroperistalsis (opposite involuntary smooth muscle contractions of peristalsis) in small intestine and pyloric sphincter → ↓ intrathoracic pressure it is stimulation against a closed glottis → retching → vomiting → ↑ heart rate and sweating due to activation of sympathetic nervous system.

Neuronal Pathways, Transmitters and Receptors involved in Nausea and Vomiting

Mechano and chemoreceptors situated in stomach, jejunum and ileum. In the gastrointestinal tract, emetic stimuli is sensed by mechano and chemoreceptors. It is a tension receptors. It is initiate emesis response by contraction and relaxation of abdominal muscles. It is react to various types of toxins substance in the intestine. Afferent neural pathways from the abdomen are the same irrespective of the stimulus.

Common Pathway for Efferent Responses that Produce Emesis

- Controls the act of vomiting not a separate anatomical site, but at the same time, it is inter-related neuronal network **(Fig. 3.6)**.
- Vagal sensory pathway from the gastrointestinal tract and neuronal pathways from the labyrinths, higher centers of the cortex, intracranial pressure receptors and the chemoreceptor trigger zone.
- Vomiting sensation induced by stimulation of the salivary secretion, respiratory centers, pharyngeal, gastrointestinal and abdominal muscles.
- Main neurotransmitters are acetylcholine, histamine, dopamine, enkephalins, and substance P involved to control vomiting.

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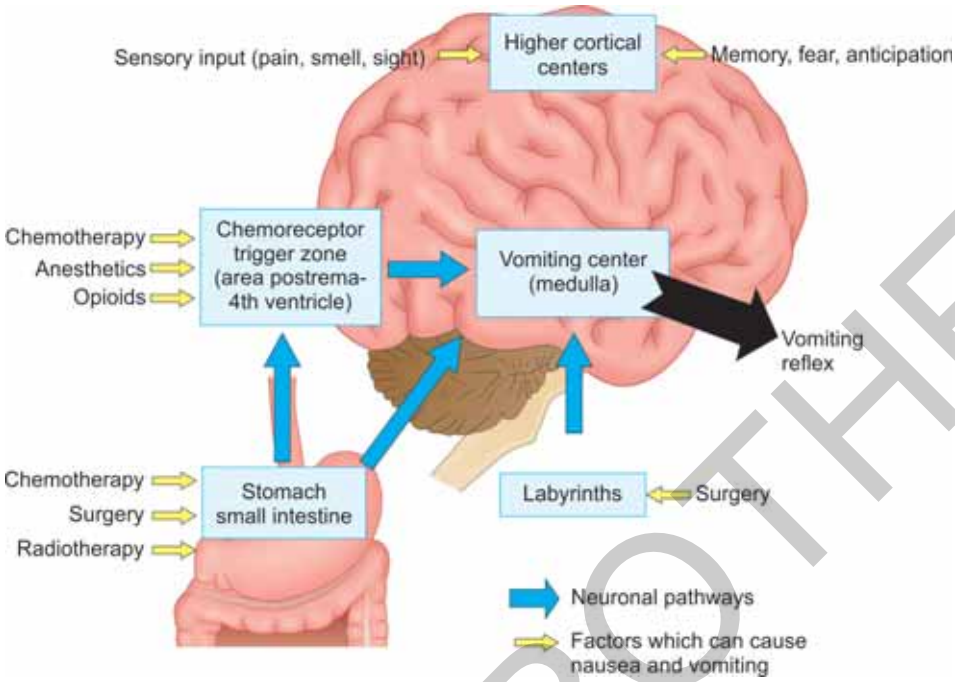

Fig. 3.6: Vomiting center.

Classifications of Vomiting

According to Nature

- Projectile vomiting caused by increase intracranial pressure, and pyloric stenosis.
- Non-projectile vomiting caused by gastroesophageal reflex disease (GERD).

According to Quality

- Dark green color bilious vomiting caused by infectious pathological changes and obstruction of GTI.
- Red color bloody vomiting caused by upper GI, massive lower GI bleed.
- Non-bloody, non-bilious vomiting—clear or yellowish with previous ingested food.

According to Occurrence

- **Primary vomiting:** It is generally happens due to GI disease like obstruction and gastroenteritis.
- **Secondary vomiting:** It is usually happens due to severe pain, disease such as myocardial infarction, sepsis, shock, and pregnancy women morning sickness due to hormonal changes, and increased intracranial pressure.

According to Duration

- **Acute vomiting:** It occurs more or equal to one week, related with obstruction in GIT, ischemic in GIT, poisoning, metabolic disorders, infectious disease, neurological disorder and postoperative complication, e.g., drug effect.
- **Chronic vomiting:** It is vomiting present more than one month due to incomplete obstruction, motility disorder, and neurological disorder.

Types of Vomiting

See **Table 3.7**.

Factors Associated with Vomiting Considered as Serious Conditions

- Severe chest pain
- Severe abdominal pain
- Severe abdominal cramp
- Unclear vision
- Confusion
- Hyperthermia and neck stiff
- Vomit with fecal content and fecal odor
- Bleeding in the rectum
- Severe headache
- Extreme thirst, dry mouth, rare urination, dark-colored urine and faintness, giddiness or lightheadedness in standing
- Vomit contains blood, look like coffee grounds or green
- Unexplained weight loss

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Table 3.7: Types of vomiting.

1. Non-productive emesis	Vomiting without ejection of vomitus. It is an effect of sustained vomiting for prolonged, anxiety, response to an odor, etc.
2. Blood dotted vomiting	Hematemesis is vomiting of blood. It is bright red color vomitus occurs due to bleeding from the esophagus, and dark red color vomit occurs due to bleeding from the stomach
3. Coffee ground vomiting	Vomit appear in coffee ground color caused by bleeding from upper GI bleeding due to peptic ulcer, gastroesophageal reflex disease, liver disease, stomach cancer, pancreatic cancer and also exposure of iron in the blood to the stomach acid
4. Bile-stained vomiting	Vomit appear in yellow color. Bile stain present in the vomit due to bowel obstruction, surgical removal of the gallbladder (cholecystectomy), gastrectomy, gastric bypass surgery, and reflux of bile into the stomach and lead to bile stained vomit. Bile mixes with food in the duodenum. It occurs continuous and severe vomiting after meals
5. Fecal vomiting	Fecal content present in the vomit content. It is known as stercoraceous vomiting or fecal vomiting. It occurs due to intestinal obstruction, abnormal connection between stomach and colon (gastrocolic fistula), etc. it occurs as result of ejection of incompletely or completely digested eaten food from the intestines through the mouth
6. Projectile vomiting	The stomach contents are ejected with great force, usually follow the feeding. It is generally seen in infantile pyloric obstruction

Complications for Vomiting

- **Dehydration:** Prolonged period severe vomiting cause dehydration and electrolyte imbalance. Metabolic acidosis caused by bile stained vomiting.
- **Hyperemesis gravidarum:** During pregnant duration a women experienced severe, insistent nausea and vomiting cause dehydration, weight loss, and reduced potassium levels. This condition is known as hyperemesis gravidarum.
- **Aspiration of vomitus:** During the vomiting process, the vomit content inhaled through the trachea into the lungs. It is happen particularly in patient with lack of protective lung reflexes, infants, older patient, altered conscious, extremely drunk, under general anesthesia, etc. These all the factors cause high risk for aspiration.
- **Enamel erosion:** Vomiting content high acidity, and repeated vomiting can able to destruct the teeth enamel. It is usually saw in patient suffering with bulimia nervosa.
- **Esophageal tear and rupture:** It is called Mallory-Weiss tear. Recurrent and copious vomiting cause erosion on the lining of esophagus lead tear the esophagus because the stomach acid. Rarely, the esophagus also may rupture in rare situation. It is named as Boerhaave's syndrome.

History Collection of Vomiting

- Duration of vomiting
- Type of vomiting
- Acute onset of vomiting due to gastroenteritis, pancreatitis, cholecystitis, appendicitis, anaphylaxis, medication effect and toxicity
- Moring vomiting due to increased intracranial pressure, migraine headaches, pregnancy, uremia, and alcoholism
- Vomiting occurs after one hour of ingestion of food caused by gastric outlet obstruction
- Vomiting happens after 12 hours of ingestion of food due to gastric, and intestinal obstruction
- Content of vomit: bilious due to gastric outlet obstruction, cause by the area between the stomach and duodenum is intact. Vomiting present with undigested food indicates achalasia or stricture, vomiting with digested food due to toxins or anaphylaxis, vomiting with blood dotted (hematemesis) due to upper GI bleeding. Vomiting appear with fecal matter or foul smelling due to distal bowel obstruction, fistula, and bacteria overgrowth due to long standing outlet obstruction
- Related symptoms like excessive salivation, elimination, tachycardia, bradycardia, atrial fibrillation, and cessation of ventricular tachyarrhythmias
- Past medical and surgical history like any GI disease or surgery
- Social history like alcohol consumption, substance abuse, frequent traveling, outside food ingestion
- Medication and dietary habits like drug intake, diet pattern

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- Treat malnutrition
- Treat protein loss (angiotensin-converting enzyme inhibitor)
- Bed rest and elevation of legs
- Loop diuretic, digoxin, angiotensin-converting enzyme inhibitor, beta blocker if tolerated
- Compression, leg-elevating exercises
- Anticoagulants
- Fluid mobilization like diuretic, elevation of legs, leg exercise, elastic stocking, massage
- Control infection
- Prophylaxis against streptococcal infection (amoxicillin)
- Flavonoids, water soluble vitamin
- Liposuction
- High-Fowler's position
- Oxygen administration for dyspnea
- Osmotic diuretics—mannitol for cerebral edema

Nursing Management

- Assess the skin may be smooth, shiny, taut, loss of normal small skin wrinkles. Observe for puffiness of eyelids and face and also the scrotal edema.
- Check the body weight daily and document.
- Maintain the intake and output chart regularly for progress of treatment and know the balance between intake and out amount of fluid.
- Keep the legs at least 12 inch above the level of the heart with supportive additional pillows for 10 to 15 min, 3 to 4 times per day.
- Wear supporting stockings to decreasing pooling of fluid by compress the leg vessels and promoting circulations.
- cutting down salt consumption in diet to prevent water and sodium reabsorption.
- Advice to losing weight, if appropriate.
- Instruct patient to do regular exercise to promote the circulation and improve venous return.
- Instruct to avoid prolonged sitting or standing to avoid pooling of blood in lower extremities.
- Follow the regular movement in the extremity while traveling to stimulate blood flow.
- Avoid exposure to extremes of temperature, such as hot baths, showers, and saunas.
- Dressing warmly in cold weather.

Case Scenario

Mrs B, a 70-year-old woman with congestive heart failure, presents with fluid overload symptoms. Nursing intervention involves initiating diuretic therapy, monitoring fluid intake/output, and adjusting diet to restore balance. Through close monitoring and patient education, nurses aim to alleviate symptoms and prevent complications, highlighting the essential role of nursing in managing fluid and electrolyte imbalance.

Questions Bank

1. What is electrolyte?
2. What is osmosis?
3. What is diffusion?
4. What is intracellular fluid?
5. What is extracellular fluid?
6. Explain the movement of body fluids.
7. What is dehydration?
8. State the types of dehydration.
9. Explain the stages of dehydration.
10. List the clinical manifestations of dehydration.
11. Discuss the management of dehydration.
12. What is vomiting?
13. Explain the mechanism of vomiting.
14. Enlist the classification of vomiting.
15. Describe the types of vomiting.
16. State the complications of vomiting.
17. Discuss the management of vomiting.
18. What is dyspnea?
19. List the causes of dyspnea.
20. Explain the pathological changes of dyspnea.
21. Discuss the management of dyspnea.
22. Define cough.
23. List the causes of cough.
24. State the types of cough.
25. Explain the pathophysiology of cough.
26. Discuss the management of cough.
27. What is respiratory obstruction?
28. What are causes of respiratory obstruction?
29. List the cause for airway obstruction.
30. Describe the pathophysiology of airway obstruction.
31. Discuss the management of airway obstruction.

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