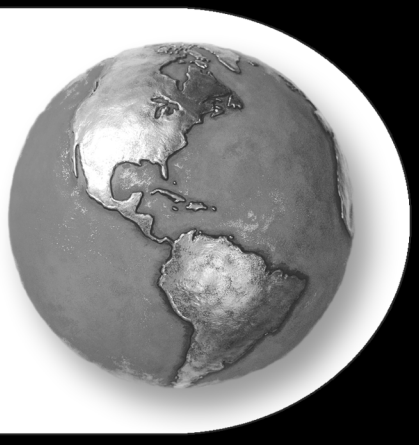
UNIT 4

ADULT NURSING



Nursing care of the adult client in today's changing health care environment is a challenge to the skill and knowledge of the professional nurse. Holistic care requires that nurses not only meet a client's physical needs through technical skills and sound clinical judgment, they also must be aware of a client's psychosocial needs. The role of client advocate puts the nurse in a unique position to help clients achieve the highest level of wellness.

This unit presents a comprehensive review of nursing care of adult clients with specific health problems. It begins with a section on multisystem stressors (such as infection, pain, and surgery). These stressors are common to many areas of nursing practice and may be applied to clients with various levels of health care needs. Issues related to aging are also presented.

The unit is further divided according to specific body systems. For each system there is a review of anatomy and physiology. Each step of the nursing process (assessment, analysis, planning, intervention, and evaluation) is then reviewed for the system, followed by consideration of the major health problems of that system. A discussion of complementary and alternative therapies is also included at the end of this unit. Congenital disorders will be discussed in Unit 5.

UNIT OUTLINE

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Multisystem Stressors

STRESS AND ADAPTATION

Definitions

A. Stress: tension resulting from changes in the internal or external environment; either physiologic, psychologic, developmental, or social
B. Stressors: agents or forces threatening an individual's ability to meet his or her needs
C. Adaptation: an individual's (or the body's) reaction to and attempt to deal with stress

General Characteristics

A. A certain amount of stress is necessary for life and growth, but excessive and continuous stress can be detrimental.
B. Success of adaptation depends on perception of stressor(s), the individual's coping mechanisms, and biologic adaptive resources.
C. Types of stressors: physical, chemical, microbiologic, psychologic, social, and age-related growth and development.

General Adaptation Syndrome

Response to Stress

A. Caused by release of certain adaptive hormones
B. Three stages
  1. Alarm reaction
    a. Sympathetic nervous system is activated (fight-or-flight response)
    b. Results in increased heart rate, blood pressure, and respirations; dilated pupils; increased state of alertness; increased blood sugar and coagulability; increased tension of skeletal muscles
  2. Resistance: body adapts to stressor; uses physical, physiologic, and psychologic coping mechanisms.
  3. Exhaustion: adaptive resources are depleted, overwhelmed, or insufficient; if stress is excessive and continues, death will occur without support.

Stress Management/Nursing Responsibilities

A. Instruct the client concerning ways to manage stress
  1. Eat a well-balanced diet.
  2. Get sufficient amount of rest.
  3. Exercise regularly.
  4. Use relaxation methods and techniques: such as deep breathing, guided imagery, progressive muscle relaxation, relaxation response, meditation, yoga, biofeedback.
  5. Engage in a social support system.

INFLAMMATORY RESPONSE

A reaction of the body at the cellular level in response to injury or noxious stimuli.

Causes

A. Physical irritants (e.g., trauma or a foreign body)
B. Chemical irritants (e.g., strong acids or alkalis)
C. Microorganisms (e.g., bacteria and viruses)

Components

A. Vascular response: transitory period of localized vasoconstriction, followed by vasodilation, increased capillary permeability, and blood stasis
B. Formation of inflammatory exudate
  1. Composition: water, colloids, ions, and defensive cells
  2. Functions: dilution of toxins, transportation of nutrients to area of injury for tissue repair, transportation of protective cells that phagocytize and destroy bacteria
C. Defense cell response: migration of leukocytes to affected area for phagocytosis of foreign bodies and dead cells
D. Healing: resolution of inflammation and regeneration of tissue or replacement with scar tissue

Assessment Findings

A. Local: pain, swelling, heat, redness, and impaired function of part (five cardinal signs of inflammation)
B. Systemic (appear with moderate to severe response): fever, leukocytosis, chills, sweating, anorexia, weight loss, general malaise

IMMUNE RESPONSE

The essence of the immune system response is recognition, neutralization, elimination, and metabolism of foreign substance with or without injury to the body's own tissue.

Functions of the Immune System

A. Defense: protection against antigens. An *antigen* is a protein or protein complex recognized as nonself.
B. Homeostasis: removal of worn out or damaged components (e.g., dead cells).
C. Surveillance: ability to perceive or destroy mutated cells or nonself cells.

Alterations in Immune Functioning

See Table 4-1.

Types of Immunity

There are two major types of immunity: natural (or innate) and acquired.

A. Natural (innate) immunity: immune responses that exist without prior exposure to an immunologically active substance. Genetically acquired immunity is natural immunity.
B. Acquired immunity
  1. Immune responses that develop during the course of a person's lifetime.
  2. Acquired immunity may be further classified as naturally or artificially acquired, active or passive. Active immunity results when the body produces its own antibodies in response to an antigen. Passive immunity results when an antibody is transferred artificially.
    a. Naturally acquired active immunity: results from having the disease and recovering successfully
    b. Naturally acquired passive immunity: antibodies obtained through placenta or breast milk
    c. Artificially acquired active immunity: conferred by immunization with an antigen
    d. Artificially acquired passive immunity: antibodies transferred from sensitized person (e.g., immune serum globulin [gamma globulin])

Table 4-1 Alterations in Immune Functioning

Immune Function	Hypofunction	Hyperfunction
Defense	Immunosuppression with increased susceptibility to infection; includes disorders such as neutropenia, AIDS, immunosuppression secondary to drugs and hypo- or agammaglobulinemia.	Inappropriate and abnormal response to external antigens; an allergy.
Homeostasis	No known effect	Abnormal response where antibodies react against normal tissues and cells; an *autoimmune disease*.
Surveillance	Inability of the immune system to perceive and respond to mutated cells, suspected mechanism in cancer.	No known effect.

Components of Immune Response

A. Located throughout the body
B. Organs include thymus, bone marrow, lymph nodes, spleen, tonsils, appendix, Peyer's patches of small intestine.
C. Main cell types are WBCs (especially lymphocytes, plasma cells, and macrophages); all originate from the same stem cell in bone marrow, then differentiate into separate types.
  1. Granulocytes
    a. Eosinophils: increase with allergies and parasites
    b. Basophils: contain histamine and increase with allergy and anaphylaxis
    c. Neutrophils: involved in phagocytosis
  2. Monocytes (macrophages) (e.g., histiocytes, Kupffer cells): involved in phagocytosis
  3. Lymphocytes (T cells and B cells): involved in cellular and humoral immunity

Classification of Immune Responses

Cellular Immunity

A. Mediated by T cells: persist in tissues for months or years
B. Functions: transplant rejection, delayed hypersensitivity, tuberculin reactions, tumor surveillance/destruction, intracellular infections

Humoral Immunity

A. Mediated by B cells
  1. Production of circulating antibodies (gamma globulin)
  2. Only survive for days
B. Functions: bacterial phagocytosis, bacterial lysis, virus and toxin neutralization, anaphylaxis, allergic hay fever and asthma

NUTRITION

Basic Concepts

Principles

A. Essential nutrients: carbohydrates, fats, proteins, minerals, vitamins, and water that must be supplied to the body in specified amounts.
B. Foods: the sources of nutrients, provide energy to help build, repair, and maintain tissue and regulate body processes.
C. Malnutrition: results from deficiency, excess, or imbalance of required nutrients.

Carbohydrates (Sugars and Starches)

A. Major source of food energy; 4 kcal/g; composed of carbon, hydrogen, and oxygen
B. Classification
  1. Monosaccharides: simplest form of carbohydrate
    a. Glucose (dextrose): found chiefly in fruits and vegetables; oxidized for immediate energy
    b. Fructose: found in honey and fruits
    c. Galactose: not free in nature; part of milk sugar
  2. Disaccharides: double sugars
    a. Sucrose: found in table sugar, syrups, and some fruits and vegetables
    b. Lactose: found in milk
    c. Maltose: intermediate product in the hydrolysis of starch
  3. Polysaccharides: composed of many glucose molecules
    a. Starch: found in cereal grains, potatoes, root vegetables, and legumes
    b. Glycogen: synthesized and stored in the liver and skeletal muscles
    c. Cellulose, hemicellulose, pectins, gums, and mucilages: indigestible polysaccharides
  4. Dietary fiber: includes several polysaccharides plus other substances that are not digestible by GI enzymes.
    a. Dietary fiber (roughage) holds water so that stools are soft and bulky; increases motility of the small and large intestine and decreases transit time; reduces intraluminal pressure in the colon.
    b. Sources: wheat bran, unrefined cereals, whole wheat, raw fruits and vegetables, dried fruits.
C. Functions of carbohydrates
  1. Cheapest and most abundant source of energy; only source of energy for central nervous system
  2. To spare protein for tissue building when sufficient carbohydrate is present
  3. Necessary for the complete oxidation of fats (to prevent ketosis)
D. Dietary sources: grains, fruits, vegetables, nuts, milk, sugars ("empty calories," contain few nutrients)

Lipids (Fats)

A. Most concentrated source of energy in foods; 9 kcal/g; contain carbon, hydrogen, oxygen
B. Include fats, oils, resins, waxes, and fatlike substances such as glycerides, phospholipids, sterols, and lipoproteins
C. Fatty acids
  1. Saturated fatty acids: usually solid at room temperature; predominantly present in animal fats
  2. Monounsaturated fatty acids: present in oleic acid found in olive oil, peanut oil
  3. Polyunsaturated fatty acids: usually liquid at room temperature; predominantly present in plant fats and fish
  4. Essential fatty acids: cannot be manufactured by the body (e.g., linoleic fatty acid)
  5. Nonessential fatty acids: can be synthesized by the body
D. Functions of lipids
  1. Most concentrated source of energy
  2. Insulation and padding of body organs
  3. Component of the cell membrane
  4. Carrier of the fat-soluble vitamins A, D, E, K
  5. Help maintain body temperature
E. Dietary sources: oil from seeds of grains, nuts, vegetables; milk fat, butter, cream cheese; fat in meat; lard, bacon fat; fish oil; egg yolk
F. Cholesterol: essential constituent of body tissues
  1. A component of cell membranes
  2. A precursor of steroid hormones
  3. Can be manufactured in the body
  4. Present in animal fats
  5. Dietary sources: egg yolk, brains, liver, butter, cream, cheese, shellfish
G. Indications for low-fat diet
  1. Cardiovascular disease
  2. Gallbladder disease
  3. Malabsorption syndromes, cystic fibrosis, pancreatitis

Proteins

A. Organic compounds that may be composed of hundreds of amino acids; 4 kcal/g; contain nitrogen in addition to carbon, hydrogen, and oxygen
B. Classification
  1. Complete protein: contains all the essential amino acids; usually from animal food sources.
  2. Incomplete protein: lacks one or more essential amino acids; usually from plant food sources.

C. Amino acids
  1. Essential amino acids: eight amino acids that cannot be synthesized in the body and must be taken in food.
  2. Nonessential amino acids: 12 amino acids that can be synthesized in the body.

D. Functions of proteins
  1. Necessary for growth and continuous replacement of cells throughout life
  2. Play a role in the immune processes
  3. Participate in regulating body processes such as fluid balance, muscle contraction, mineral balance, iron transport, buffer actions
  4. Provide energy if necessary

E. Dietary sources: meat, fish, eggs, milk, cheese, poultry, grains, nuts, legumes (soybeans, lentils, peanuts, peanut butter)

F. Deficiencies
  1. Conditions
    a. Kwashiorkor (protein depletion that develops over short period of time)
    b. Marasmus (severe tissue wasting from inadequate intake of calories and proteins)
  2. Manifestations
    a. Generalized weakness
    b. Weight loss
    c. Lowered resistance to infection
    d. Slow wound healing and prolonged recovery from illness
    e. Growth failure
    f. Brain damage to fetus or infant
    g. Edema due to decreased albumin in blood
    h. Anemia in severe deficiency
    i. Fatty infiltration of liver and liver damage
  3. Risk factors
    a. Chronically ill
    b. Elderly on fixed incomes
    c. Low-income families
    d. Strict vegetarians

G. Indications for high-protein diet
  1. Burns, massive wounds when tissue building desired
  2. Mild to moderate liver disease for organ repair when liver is still functioning
  3. Malabsorption syndromes such as cystic fibrosis
  4. Undernutrition
  5. Pregnancy to meet needs of mother and developing fetus
  6. Pregnancy-induced hypertension to replace protein lost in urine
  7. Nephrosis to replace protein lost in urine
  8. Deficiencies

H. Indications for low-protein diet
  1. Liver failure (liver does not metabolize protein causing nitrogen toxicity to brain)
  2. Kidney failure (kidneys can no longer excrete nitrogenous waste products causing toxic nitrogen levels in the brain)

I. Nursing interventions for clients needing low-protein diet
  1. Increase carbohydrates so energy needs will be met by carbohydrates, not by breakdown of proteins
  2. Protein intake that is allowed will be complete proteins (animal sources)

Energy Metabolism

A. Measurement of energy expressed in terms of heat units called kilocalories (kcal): amount of heat required to raise 1 kg water by 1°C

B. Energy expenditure
  1. Basal metabolism
    a. Amount of energy expended to carry on the involuntary work of the body while at rest
    b. Factors influencing basal metabolic rate (BMR): body surface area, sex, age, body temperature, hormones, pregnancy, fasting, malnutrition
  2. Physical activity: amount of energy expended depends upon the type of activity, the length of time involved, and the weight of the person

C. Factors determining total energy needs
  1. Amount necessary for BMR
  2. Amount required for physical activity
  3. Specific dynamic action of food ingested
  4. Growth
  5. Climate

Minerals

Inorganic compounds that yield no energy; essential structural components involved in many body processes (see Table 4-2).

Vitamins

Organic compounds necessary in small quantities for cellular functions of the body; do not give energy; necessary in many enzyme systems (see Table 4-3).

A. Fat-soluble vitamins (A, D, E, K): can be stored in body; toxic in large amounts.

B. Water-soluble vitamins (B_1 [thiamin]; B_2 [riboflavin]; B_6 [pyridoxine]; B_{12} [hydroxycobalamin]; C [ascorbic acid]; folacin; niacin): cannot be stored in body so must be ingested daily; dissolves in cooking water, toxicity unlikely.

Water

A. Distribution: present in all body tissues; accounts for 50–60% total body weight in adults and 70–75% in infants.
  1. Intracellular fluid: exists within the cells.
  2. Extracellular fluid: includes plasma fluid, interstitial fluid, lymph, and secretions.

Table 4–2 Minerals

Mineral	Functions	Deficiency Syndrome	Food Sources	Comments
Calcium	Development of bones and teeth Transmission of nerve impulses Muscle contraction Permeability of cell membrane Catalyze thrombin formation Maintenance of normal heart rhythm	Rickets, osteoporosis, osteomalacia, stunted growth, fragile bones, tetany, occurs when parathyroids removed	Dairy products; dark green leafy vegetables; broccoli; canned-fish with bones (sardines, salmon) clams, oysters; cooked dried beans; peas	Needs vitamin D, magnesium, and parathormone for utilization. Acid, lactose, and vitamin D favor absorption. Inverse relationship to phosphorus.
Phosphorus	Development of bones and teeth Transfer of energy in cells (ATP) Cell permeability Buffer salts Component in phospholipids	Rickets, stunted growth, poor bone mineralization, muscle weakness	Milk, cheese, meat, fish, poultry, eggs, legumes, nuts, whole-grain cereals	Factors that affect calcium absorption also affect phosphorus. Inverse relationship to calcium.
Magnesium	Constituent of bones and teeth Cation in intracellular fluid Muscle and nerve irritability Activate enzymes in carbohydrate metabolism	Tremor observed in severe alcoholism, diabetic acidosis, severe renal disease	Milk, cheese, meat, nuts, legumes, green leafy vegetables, whole-grain cereals, seafood	Absorption similar to calcium.
Sulfur	Constituent of keratin in hair, skin, and nails Detoxification reactions Constituent of thiamin, biotin, insulin, coenzyme A, melanin, glutathione	None	Protein foods, eggs, meat, fish, poultry, milk, cheese, nuts	Diet adequate in protein provides sufficient sulfur.
Iron	Constituent of hemoglobin, myoglobin, oxidative enzymes	Anemia	Liver, organ meats, meat, poultry, egg yolk, whole-grain cereals, legumes, dark green vegetables, dried fruit	Ascorbic acid enhances absorption.
Iodine	Constituent of thyroxine Regulate rate of energy metabolism	Simple goiter, creatinism, myxedema	Iodized salt, seafood	Allergies to iodine-rich foods may indicate allergy to iodine dyes used in diagnostic tests.
Sodium	Principle cation of extracellular fluid Osmotic pressure Fluid balance Regulate nerve irritability and muscle contraction Pump for active transport of glucose	Rare, seen in persons with SIADH	Table salt, processed meats, canned soups and vegetables	Diet usually provides excess. Increase in clients with cystic fibrosis and persons taking lithium. Decrease intake in clients with hypertension, congestive heart failure, renal failure, and edema.

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Table 4–2 Minerals *(continued)*

Mineral	Functions	Deficiency Syndrome	Food Sources	Comments
Potassium	Principal cation of intracellular fluid Osmotic pressure Fluid balance Acid–base balance Regular heart rhythm Nerve irritability and muscle contraction	Muscle weakness, arrhythmias Deficiency may occur with diabetic acidosis Deficiency may occur with thiazide and loop diuretics	Oranges, bananas, dried fruits, melons, apricots, most fruits and vegetables, whole-grain cereals	Readily absorbed. Increase intake in clients taking thiazide and loop diuretics. Decrease intake for clients in renal failure.
Chlorine	Chief anion of extracellular fluid Constituent of gastric juice Acid–base balance Activate salivary amylase	Seen only after prolonged vomiting	Table salt, processed meats, fish, fruits (dates, bananas)	Rapidly absorbed.

Table 4–3 Vitamins

Vitamin	Functions	Deficiency Syndrome	Food Sources	Comments
Fat Soluble				
Vitamin A (retinol)	Maintenance of mucous membranes Visual acuity in dim light, growth and bone development	Night blindness, xerophthalmia, keratinization of epithelium, poor bone and tooth development	Fish liver oils, liver, butter, cream, whole milk, egg yolk, dark green vegetables, yellow vegetables, yellow fruits, fortified margarine	Bile necessary for absorption. Large amounts are toxic.
Vitamin D (cholecalciferol)	Increase absorption of calcium and phosphorus Bone mineralization	Rickets, osteomalacia, enlarged joints, muscle spasms, delayed dentition	Fish liver oils, fortified milk	Synthesized in skin by activity of ultraviolet light. Large amounts are toxic.
Vitamin E (tocopherol)	Reduces oxidation of vitamin A, phospholipids, and polyunsaturated fatty acids	Hemolysis of red blood cells, deficiency not likely	Vegetable oils, wheat germ, nuts, legumes, green leafy vegetables	Not toxic.
Vitamin K (phylloquinone)	Formation of prothrombin and other clotting proteins	Prolonged clotting time, hemorrhagic disease in newborn and liver disease	Green leafy vegetables, cabbage, liver, alfalfa	Bile necessary for absorption; injectable form may be given in gallbladder and liver disease. Large amounts are toxic.
Water Soluble				
Vitamin B_1 (thiamine)	Involved in carbohydrate metabolism Thiamine pyrophosphate (TPP)	Beriberi, mental depression, polyneuritis, cardiac failure	Enriched cereals, whole grains, meat, organ meats, pork, fish, poultry, legumes, nuts	Very little storage.
Vitamin B_2 (riboflavin)	Coenzyme for transfer and removal of hydrogen Flavin adenine dinucleotide (FAD)	Cheilosis, photophobia, burning and itching of eyes, sore tongue and mouth	Milk, eggs, organ meats, green leafy vegetables	Limited storage.

(continues)

Table 4-3 Vitamins *(continued)*

Vitamin	Functions	Deficiency Syndrome	Food Sources	Comments
Vitamin B_6 (pyridoxine, pyridoxal, pyridoxamine)	Coenzyme for transamination, transsulfuration, and decarboxylation	Convulsions, dermatitis, nervous irritability	Meat, poultry, fish, vegetables, potatoes	Converts glycogen to glucose. Given with isoniazid (INH) to prevent INH side effect of peripheral neuropathy.
Vitamin B_{12} (hydroxy-cobalamin)	Formation of mature red blood cells Synthesis of DNA and RNA	Pernicious anemia, neurologic degeneration, macrocytic anemia	Animal foods only	Intrinsic factor is necessary for absorption.
Vitamin C (ascorbic acid)	Synthesis of collagen Formation of intercellular cement Facilitation of iron absorption	Scurvy, bleeding gums, poor wound healing, cutaneous hemorrhage, capillary fragility	Citrus fruits, tomatoes, melon, raw cabbage, broccoli, strawberries	Most easily destroyed vitamin. Very little storage in body.
Folacin (folic acid)	Maturation of red blood cells, interrelated with vitamin B_{12}	Megaloblastic anemia, tropical sprue	Organ meats, muscle meats, poultry, fish, eggs, green leafy vegetables	Ascorbic acid necessary for utilization.
Niacin (nicotinamide)	Coenzyme to accept and transfer hydrogen, coenzyme for glycolysis	Pellagra, dermatitis, neurologic degeneration, glossitis, diarrhea	Meat, poultry, fish, whole grains, enriched breads, nuts, legumes	Amino acid tryptophan is a precursor.

B. Functions: the medium of all body fluids
  1. Necessary for many biologic reactions.
  2. Acts as a solvent.
  3. Transports nutrients to cells and eliminates waste.
  4. Body lubricant.
  5. Regulates body temperature.

C. Sources
  1. Ingestion of water and other beverages
  2. Water content of food eaten
  3. Water resulting from food oxidation

D. Recommended daily intake
  1. Replacement of losses through the kidneys, lungs, skin, and bowel
  2. Thirst usually a good guide
  3. Approximately 48 oz/day of water from all sources is adequate; requirement is higher if physical activity is strenuous or if sweating is profuse.

Dietary Guides

A. Food pyramid
  1. Foods are grouped by composition and nutrient value: grains; vegetable group; fruit group; meat, poultry, fish, dry beans, eggs and nut group; and milk, yogurt and cheese group.
  2. Greater emphasis on fruits and vegetables with less emphasis on meats and fats than with basic four.
  3. Recommends using fats and sweets sparingly.

B. Recommended daily allowances: established by the Food and Nutrition Board of the National Academy of Science; recommended nutrient intake is provided for infants, children, men, women, pregnant and lactating women; recommendations are stated for protein, kcal, and most vitamins and minerals.

C. Food composition tables: helpful in calculating the nutritive value of the daily diet; list nutrient content of foods.

D. Height and weight charts: ideal or desirable body weight for both men and women at specified heights with a small, medium, or large frame.

E. Exchange lists for meal planning
  1. Foods are separated into six exchange lists.
  2. Specific foods on each list are approximately equal in carbohydrate, protein, fat, and kcal content.
  3. Individual foods on the same list may be exchanged for each other at the same meals.
  4. Food lists are helpful in planning diets for weight control or diabetes.

Nutritional Assessment

Health History

A. Presenting problem
  1. Weight changes
    a. Usual body weight 20% above or below normal standards.

b. Recent loss or gain of 10% of usual body weight.

2. Appetite changes: may increase or decrease from usual.

3. Food intolerances: allergies, fluids, fat, salt, seafood

4. Difficulty swallowing

5. Dyspepsia or indigestion

6. Bowel dysfunction: record frequency, consistency, color of stools.

a. Constipation

b. Diarrhea

B. Lifestyle: eating behaviors such as fast foods, "junk foods," and skipping meals; cultural/religious concerns (vegetarian, kosher foods, exclusion of certain food groups); alcohol, socioeconomic status, living conditions (alone or with family).

C. Use of medications: vitamin supplements, antacids, antidiarrheals, laxatives, diuretics, antihypertensives, immunosuppressants, oral contraceptives, antibiotics, antidepressants, digitalis, anti-inflammatory agents, catabolic steroids.

D. Medical history: gastrointestinal diseases; endocrine diseases; hyperlipidemia; coronary artery disease; malabsorption syndrome; circulatory problems or heart failure; cancer; radiation therapy; chronic lung, renal, or liver disease; food allergies; recent major surgery; eating disorders; obesity.

E. Family history: obesity, allergies, cardiovascular diseases, diabetes, thyroid disease.

F. Dietary history: evaluation of the nutritional adequacy of diet

1. 24-hour recall

2. Food diary for a given number of days

Physical Examination

A. Assess for alertness and responsiveness

B. Record weight in relation to height, body build, and age

C. Inspect posture, muscle tone, skeleton for deformities

D. Elicit reflexes

E. Auscultate heart rate, rhythm; blood pressure

F. Inspect hair, skin, nails, oral mucosa, tongue, teeth

G. Inspect for swelling of legs or feet

H. Anthropometric measurements: indicators of available stores in muscle and fat compartments of body

1. Height/weight ratio (Body Mass Index [BMI])

2. Midarm muscle circumference

3. Skinfold thickness (triceps, biceps, subscapular, abdominal, hip, pectoral, or calf)

Laboratory/Diagnostic Tests

A. Blood studies: serum albumin, iron-binding capacity, hemoglobin, hematocrit, lymphocyte count, blood sugar, total cholesterol, high-density lipids, low-density lipids, triglycerides, serum electrolytes

B. Urine studies, urinalysis, glucose, ketones, albumin, 24-hour creatinine

C. Nitrogen balance studies

D. Feces, hair

E. Intradermal delayed hypersensitivity testing

Analysis

Nursing diagnoses for the client with a nutritional dysfunction may include:

A. Imbalanced nutrition: less than body requirements

B. Imbalanced nutrition: more than body requirements

C. Risk for imbalanced nutrition: more than body requirements

D. Impaired oral mucous membrane

E. Self-care deficit, feeding

F. Disturbed sensory perceptions

G. Risk for impaired skin integrity

H. Impaired swallowing

I. Impaired tissue integrity

J. Activity intolerance

K. Disturbed body image

L. Constipation

M. Diarrhea

N. Deficient fluid volume

O. Excess fluid volume

P. Delayed growth and development

Q. Risk for infection

R. Deficient knowledge

S. Noncompliance

Planning and Implementation

Goals

A. Normal weight will be achieved and maintained.

B. Integrity of oral cavity will be maintained.

C. Client will feed self or receive help with feeding.

D. Normal skin integrity will be achieved/maintained.

E. Client will not aspirate.

F. Normal tissue integrity will be achieved/maintained.

G. Client will be able to exercise normally.

H. Client will maintain/develop satisfactory self-image.

I. Normal bowel functioning will be maintained.

J. Fluid and electrolyte balance will be achieved/maintained.

K. Client will have normal growth and development patterns.

L. Client will not develop infection.

M. Client will demonstrate knowledge of special dietary needs/prescriptions.

N. Client will comply with special diet.

Interventions

Care of the Client on a Special Diet

A. General information: therapeutic diets involve modifications of nutritional components necessitated by a client's disease state or nutritional status or to prepare a client for a procedure.
B. Nursing care in relation to special diets
  1. Assess client's mental, emotional, physical, and economic status; appropriateness of diet to client's condition; and ability to understand diet and comply with it.
  2. Maintain appropriate diet and teach client.
  3. Changing diet means changing lifelong patterns.
  4. Teach client importance of adhering to special diets that are long term.

Weight Control Diets

A. Underweight: 10% or more below individual's ideal weight
  1. Causes: failure to ingest enough kcal, excess energy expenditure, irregular eating habits, GI disturbances, mouth sores, cancer, endocrine disorders, emotional disturbances, lack of education, economic problems.
  2. Treatment: diet counseling, correction of underlying disease, nutritional supplements, behavioral therapy, social service referral.
B. Overweight: 10% or more above individual's ideal weight
C. Obesity: 20% or more above individual's ideal weight
  1. Causes: overeating, underactivity, genetic factors, fat cell theory, alteration in hypothalamic function, endocrine disorders, emotional disturbances.
  2. Treatment: diet counseling, nutritionally balanced diet, behavior modification, increased physical activity, medical treatment of any underlying disease, appropriate referrals.
D. Nursing care
  1. Explain dietary instructions.
    a. Reducing fats and "empty calories" reduces caloric intake without sacrificing nutritional intake
    b. Increasing exercise increases metabolism
  2. Caution against fad diets that may be nutritionally inadequate.
  3. Encourage support groups if indicated.

Diabetic Diet (Consistent carbohydrates)

A. Prescribed for clients with diabetes mellitus.
B. Purposes include: attain or maintain ideal body weight, ensure normal growth, maintain plasma glucose levels as close to normal as possible.
C. Principles
  1. Distribution of kcal: protein 12–20%; carbohydrates 55–60%; fats (unsaturated) 20–25%.
  2. Daily distribution of kcal: equally divided among breakfast, lunch, supper, snacks.
  3. Use foods high in fiber and complex carbohydrates.
  4. Avoid simple sugars, jams, honey, syrup, frosting.
D. Teach client to utilize exchange lists.
E. New recommendations include low-fat, high fiber diet.

Low-Sodium Diet (No-added-salt diet)

A. Purpose is to restrict sodium intake to less than 2300 mg of sodium per day for clients with hypertension or cardiac disease.
B. One method is the DASH (Dietary Approaches to Stop Hypertension) Eating Plan.
C. Food choices
  1. Choose and prepare food with little salt.
  2. Continue to meet potassium requirement of 4700 mg/day.
  3. Avoid table salt, processed meats, canned soups, snack food containing salt.
  4. Teach client to read labels of prepared food.

Protein-Modified Diets

A. Gluten-free diet
  1. Purpose is to eliminate gluten (a protein) from the diet.
  2. Indicated in malabsorption syndromes such as sprue and celiac disease.
  3. Eliminate all barley, rye, oats, and wheat (BROW).
  4. Avoid: cream sauces, breaded foods, cakes, breads, muffins.
  5. Allow corn, rice, and soy flour.
  6. Teach client to read labels of prepared foods.
B. PKU (Phenylketonuria) diet
  1. Purpose is to control intake of phenylalanine, an amino acid that cannot be metabolized.
  2. Diet will be prescribed until at least age 6 to prevent brain damage and mental retardation.
  3. Avoid: breads, meat, fish, poultry, cheeses, legumes, nuts, eggs.
  4. Give Lofenalac formula.
  5. Teach family to use low-protein flour for baking.
  6. Sugar substitutes such as Nutrasweet contain phenylalanine and must not be used.
C. Low-purine diet
  1. Indicated for gout, uric acid kidney stones, and uric acid retention.
  2. Purpose is to decrease the amount of purine, a precursor to uric acid.

3. Teach client to avoid: organ meats, other meats, fowl, fish and lobster, lentils, dried peas and beans, nuts, oatmeal, whole wheat.
4. Eggs are not high in purine.

Fat-Restricted Diets

Purpose is to restrict amount of fats ingested for clients with chronic pancreatitis, malabsorption syndromes, gallbladder disease, cystic fibrosis, and hyperlipidemia, and to control weight.

Bariatric Diet

A. Prescribed for clients after bariatric weight loss surgeries for obesity.
B. After surgery, small stomach will hold about 1 oz.
1. First week: nutritious liquids; Second week: Pureed, high-protein foods
2. Avoid high carbohydrates
3. Possible complication: Dumping Syndrome (nausea, hypotension, hypoglycemia)
4. Client is educated before surgery about post-operative diet.

Renal Diet

A. Prescribed for clients with end-stage renal disease (ESRD).
B. Principles
1. Prevent accumulation of protein waste between dialysis treatments.
2. Potassium is restricted to 3000–4000 mg/day. (Restrict milk intake to ½ cup/day due to high potassium content.)
3. Limit sodium to 3 grams/day (No-added-salt diet).
4. Teach client to measure proper food choices and to measure fluid intake and output.

Consistency Modifications

A. Clear liquid diet
1. Purpose is to rest GI tract and maintain fluid balance.
2. Indications include difficulty chewing or swallowing; before certain diagnostic tests to reduce fecal material; immediate postoperative period (until bowel sounds have returned) to maintain electrolyte balance; and nausea, vomiting, and diarrhea.
3. Foods allowed: "see-through foods" include water, tea, broth, jello, apple juice, clear carbonated beverages, and frozen ice pops.
4. Not nutritionally adequate.

B. Full liquid diet
1. Used as a transition diet between clear liquid and soft diet; usually short term.
2. Foods allowed: clear liquids, milk and milk products, all fruit juices, cooked and strained cereals.
3. Can be nutritionally adequate.

C. Soft diet
1. Used as a transition diet between full liquid and regular diet.
2. Indications include postoperatively, mild GI disturbances, chewing difficulties from lack of teeth or oral surgery.
3. Foods allowed: foods low in fiber, connective tissue and fat (full liquid diet, pureed vegetables, eggs cooked any way except fried, tender meat, potatoes, cooked fruit).
4. Nutritionally adequate.

D. Bland diet
1. Promotes healing of the gastric mucosa and is chemically and mechanically nonstimulating.
2. Foods allowed: soft diet without spices.

E. Low-residue diet
1. Residue is the indigestible substances left in digestive tract after food has been digested.
2. Indications include colon, rectal, or perineal surgery to reduce pressure on the operative site; prior to examination of the lower bowel to enhance visualization; internal radiation for cancer of the cervix; Crohn's disease or regional enteritis; ulcerative colitis to reduce irritation of the large bowel; and diarrhea.
3. Teach client to avoid foods high in fiber, foods having skins and seeds, and milk and milk products.

Evaluation

A. Client's weight is within normal limits.
B. No lesions in oral cavity.
C. Client feeds self or receives needed assistance with feeding.
D. Skin and tissue integrity is maintained.
E. Client demonstrates ability to exercise.
F. Client makes positive statements about self-image.
G. Client's bowel functioning is normal.
H. Serum electrolytes are within normal limits.
I. Client will exhibit growth and development patterns appropriate for age.
J. Client shows no evidence of infection.
K. Client states reason for special diet.
L. Client describes foods allowed and not allowed on prescribed diet.
M. Client adheres to prescribed diet.

Enteral Nutrition

Preferred method for nutritional support for the malnourished client whose GI system is intact.

Oral Feeding

A. Always the first choice.
B. Oral formula supplements may be used between meals to provide added kcal and nutrients.
1. Offer small quantities several times a day.
2. Vary flavors, avoid taste fatigue.
3. Chill and serve over ice.

Tube Feeding

A. Used for clients who have a functioning GI tract but cannot ingest food orally
  1. Feeding tubes
    a. Short term: nasogastric tube
    b. Long term: esophagostomy, gastrostomy, or enterostomy tube
  2. Formulas: nutritionally adequate, tolerated by client, easily prepared, easily digested, usual concentration 1 kcal/mL
  3. Feeding schedules
    a. Intermittent: usually 4–6 times per day, volumes up to 400 mL, by slow gravity drip over 30–60 minutes
    b. Continuous: usually administered by pump through a duodenal or proximal jejunostomy feeding tube
  4. Nursing responsibilities
    a. Administer formulas at room temperature (refrigerate unused portion).
    b. Gradually increase rate and concentration until desired amount is attained if there are no signs of intolerance (e.g., gastric residual greater than 120 mL, nausea, vomiting, diarrhea, distention, diaphoresis, increased pulse, glycosuria, aspiration).
    c. Check tube placement and elevate head of bed (see also Nasogastric Tubes).
    d. Monitor I&O, serum electrolytes, fractional urines, serum glucose, daily weights; keep a stool record as well as an ongoing assessment of tolerance.

Parenteral Nutrition

Nutrients are infused directly into a vein for clients who are unable to eat or digest food through the GI tract, who refuse to eat, or who have inadequate oral intake.

Total Parenteral Nutrition (TPN)

A. Involves the infusion of nutrients through a central vein catheter. A central vein is needed because its larger caliber and higher blood flow will quickly dilute the hypertonic hyperalimentation solution to isotonic concentrations.
B. Hyperalimentation solutions
  1. Hypertonic glucose of 20–70%, amino acids, water, vitamins, and minerals with lipid emulsions given in a separate solution.
  2. Three-in-one solutions
    a. Lipids mixed with dextrose and amino acids in pharmacy.
    b. Prepared by pharmacy in a 3-liter container and administered over 24 hours.
C. Nursing responsibilities
  1. For details of nursing care of the client with a central venous line, see IV Therapy.
  2. Inspect solution before hanging.
    a. Check for correct solution and additives against physician's order.
    b. Check expiration date.
    c. Observe fluid for cloudiness or floating particulate matter.
  3. Control flow rate of solution.
    a. Verify order and monitor flow rate.
    b. Administration via pump is required.
    c. Tubing with in-line filter is required.
    d. Never attempt to speed up or slow down infusion rate.
      1) Speeding up infusion causes large amounts of glucose to enter body, causing hyperosmolar state.
      2) Slowing down infusion can cause hypoglycemic state, as it takes time for the pancreas to adjust to reduced glucose level.
  4. Monitor fluid balance.
  5. Assess client for signs and symptoms of infection (fever, chills, elevated WBC count).
  6. Obtain fractional urines or Accu-Chek every 6 hours.
  7. Administer sliding scale insulin for hyperglycemia, as ordered.
  8. Provide psychological support.
  9. Encourage exercise regimen.

IV Lipid Emulsions

A. May be given through a central vein or peripherally in order to prevent essential fatty acid deficiency in long-term TPN clients, or to provide supplemental kcal IV.
B. Nursing care
  1. Protect the stability of the emulsion.
    a. Administer in its own separate IV bottle and IV tubing, and piggyback the emulsion into the Y connector closest to the catheter insertion. Follow hospital policy and manufacturer's recommendations for specific products. Some hospital facilities combine TPN and lipid into one bag.
    b. Inspect solution for evidence of separation of oil, frothiness, inconsistency, particulate matter; discard solution if any of these signs of instability occur.
    c. Do *not* shake the bottle; this might cause aggregation of fat globules.
    d. Discard partially used bottles.
  2. Control the infusion rate accurately and safely.
    a. If using gravity method, lipid emulsion must hang higher than hyperalimentation to prevent backflow.
    b. Pump is preferred but may not be possible due to viscous nature of emulsion.
  3. Prevent and assess for adverse reactions.
    a. Administer slowly according to package insert over first 30 minutes; if no adverse reactions, increase rate to complete

infusion over the specified number of hours.
   b. Obtain baseline vital signs; repeat after first 30 minutes, and then every 4 hours until completion.
   c. Acute reactions may include: fever, chills, dyspnea, nausea, vomiting, headache, lethargy, syncope, chest or back pain, hypercoagulability, thrombocytopenia.
4. Evaluate tolerance and client response.

Peripheral Vein Parenteral Nutrition (PPN)

A. Can be used for short-term support, when the central vein is not available, and as a supplemental means of obtaining nutrients. Client must be able to tolerate a relatively high fluid volume.
B. Solution contains the same components as central vein therapy, but lower concentrations (less than 20% glucose).
C. Care is the same as for the client receiving hyperalimentation centrally.
D. Phlebitis and thrombosis are common and IV sites will need frequent changing.

INFECTION

Infection is an invasion of the body by pathogenic organisms that multiply and produce injurious effects. Communicable disease is an infectious disease that may be transmitted from one person to another.

Chain of Events

A. Causative agent: invading organism (e.g., bacteria, virus)
B. Reservoir: environment in which the invading organism lives and multiplies
C. Portal of exit: mode of escape from reservoir (e.g., respiratory tract, GI tract)
D. Mode of transmission: method by which invading organism is transported to new host (e.g., direct contact, air, food)
E. Portal of entry: means by which organism enters new host (e.g., respiratory tract, broken skin)
F. Susceptible host: susceptibility determined by factors such as number of invading organisms, duration of exposure, age, state of health, nutritional status

Nursing Responsibilities in Prevention of Spread of Infection

A. Maintain an environment that is clean, dry, and well ventilated.
B. Use proper handwashing before and after client contact and after contact with contaminated material.
C. Disinfect and handle wastes and contaminated materials properly.
D. Prevent transmission of infectious droplets.
   1. Teach clients to cover mouth and nose when sneezing or coughing.
   2. Place contaminated tissues and articles in paper bag before disposing.
E. Institute proper isolation techniques as required by specific disease
F. Use surgical aseptic technique when appropriate: caring for open wounds, irrigating, or entering sterile cavities.
G. Practice standard precautions when caring for all clients regardless of their diagnosis in order to minimize contact with blood and body fluids and prevent the transmission of specific infections such as hepatitis B and human immunodeficiency virus (HIV).
   1. Hands must always be washed before and after contact with clients even when gloves have been used.
   2. If hands come in contact with blood, body fluids, or human tissue they should be immediately washed with soap and water.
   3. Gloves should be worn before touching blood or body fluids, mucous membranes, or nonintact skin.
   4. Gloves should be changed between each client contact and as soon as possible if torn.
   5. Wear masks and protective eyewear during procedures that are likely to generate splashes of blood or other body fluids.
   6. Wear gowns during procedures that are likely to generate splashes of blood or other body fluids and when cleaning spills from incontinent clients or changing soiled linen.
   7. Disposable masks should be used when performing CPR.
   8. Dispose of used needles properly. They should be promptly placed in a puncture-resistant container (i.e., sharps container). They *should not* be recapped, bent, broken, or removed from syringes.

PAIN

Pain is an unpleasant sensation, entirely subjective, that produces discomfort, distress, or suffering. "Pain is what the person says it is and exists when the person says it does." It is considered the "fifth vital sign" and is included in the routine patient assessment (Daniels, et al.)

Gate Control Theory

A. Substantia gelatinosa in the dorsal horn of the spinal cord acts as a gate mechanism that can close to keep pain impulses from reaching the brain, or can open to allow pain impulses to ascend to the brain.

B. Most pain impulses are conducted over small-diameter nerve fibers; if predominant nerve message is pain, the gate opens and allows pain impulses to reach the brain.
C. The gate can be closed by conflicting impulses from the skin conducted over large-diameter nerve fibers, by impulses from the reticular formation in the brainstem, or by impulses from the entire cerebral cortex or thalamus.

Acute Pain and Chronic Pain

A. Acute pain
  1. Short duration; may last from split second to about 6 months.
  2. Serves the purpose of warning the client that damage or injury has occurred in the body that requires treatment.
  3. Subsides as healing occurs.
  4. Usually associated with autonomic nervous system symptoms, e.g., increased pulse and blood pressure, sweating, pallor.
B. Chronic pain
  1. Prolonged duration; lasts for 6 months or longer.
  2. Serves no useful purpose.
  3. Persists long after injury has healed.
  4. Rarely accompanied by autonomic nervous system activity.

Assessment of Pain

See Table 4-4.

General Nursing Interventions

A. Establish nurse-client relationship.
  1. Let the client know that you believe that his pain is real.
  2. Respect the client's attitudes and behavioral responses to pain using a standardized pain scale appropriate to age and condition.
  3. Document effectiveness of interventions in a timely manner.
B. Assess characteristics of pain and evaluate client's response to interventions.
C. Promote rest and relaxation.
  1. Prevent fatigue.
  2. Teach relaxation techniques, e.g., slow, rhythmic breathing, guided imagery.
D. Institute comfort measures.
  1. Positioning: support body parts.
  2. Decrease noxious stimuli such as noise or bright lights.
E. Provide cutaneous stimulation: massage, pressure, baths, vibration, heat, cold packs; increased input of large-diameter fibers closes gate.
F. Relieve anxiety and fears.
  1. Spend time with client.
  2. Offer reassurance, explanations.
G. Provide distraction and diversion, e.g., music, puzzles.
H. Administer pain medication as needed.
  1. Administer pain medication in early stages before pain becomes severe.
  2. Administer pain medication prior to procedure that produces discomfort.
  3. If pain is present most of the day, a preventative approach may be used, e.g., an around-the-clock schedule may be ordered in place of a prn schedule.
  4. Document effectiveness of intervention.
I. Teach client about pain and pain control measures, e.g., relaxation techniques, cutaneous stimulation.

Table 4–4 Pain Assessment

Influencing factors
- Past experience with pain
- Age (tolerance generally increases with age)
- Culture and religious beliefs
- Level of anxiety
- Physical state (fatigue or chronic illness may decrease tolerance)

Characteristics of pain
- Location
- Quality
- Intensity
- Timing and duration
- Precipitating factors
- Aggravating factors
- Alleviating factors
- Interference with activities of daily living
- Patterns of response

Specific Medical and Surgical Therapies for Pain

See also Narcotic and Nonnarcotic Analgesics in Unit 2.

Nonnarcotic Analgesics

A. Salicylates (ASA, aspirin [Ecotrin] choline magnesium trisalicylate [Trillisate], diflunisal [Dolobid], salsalate [Disalcid])
B. Acetaminophen (Datril, Tylenol)
C. Nonsteroidal anti-inflammatory drugs (NSAIDs: ibuprofen [Motrin], indomethacin [Indocin], piroxicam [Feldene]) (See Table 2-5).

Adjuvants

A. Includes several classes of drugs that may either:
  1. Potentiate the effects of narcotic or nonnarcotic analgesics, e.g., hydroxyzine (Vistaril, Atarax)

2. Have independent analgesic properties in certain situations, e.g., tricyclic antidepressants such as amitriptyline (Elavil) for neuropathic pain
3. Help control signs and symptoms associated with pain, e.g., anxiety, depression, nausea, and insomnia

Patient-Controlled Analgesia (PCA)

A. Type of intravenous pump that allows the client to administer narcotic analgesic (e.g., morphine) on demand within preset dose and frequency limits.
B. Goal is to achieve more constant level of analgesia as compared to prn IM injections; also, in general, causes less sedation and lower risk of respiratory depression.
C. Used most often for postoperative pain management; also used for intractable pain in terminal illness.
D. PCA pump may be used solely on PCA mode or may be combined with a continuous basal mode where client is receiving continuous infusion of narcotic in addition to self-administered bolus injections.
E. The dose of the analgesic bolus and the time interval between boluses (lockout period) is preset on the pump by the RN according to physician's orders.
F. Nursing Interventions
1. Instruct client in use of PCA pump
   a. Demonstrate how to push control button.
   b. Explain concept of client-controlled analgesia.
2. Assess client's level of consciousness, respiratory rate, and degree of pain relief frequently.
3. Keep control button within client reach.
4. Educate the family to contact the nurse if client's pain is not controlled, instead of family members pushing the button.

Intraspinal Narcotic Infusion

A. Involves intraspinal infusion of narcotics or local anesthetic agents for relief of acute or chronic pain.
B. Medication is infused through catheter placed in the subarachnoid (intrathecal) or epidural space in the thoracic or lumbar area.
C. Repeated injections of narcotics produce analgesia without many of the side effects associated with systemic narcotics (e.g., sedation).
D. Indications
1. Temporary intraspinal narcotic therapy is used most frequently for postoperative pain.
2. For chronic pain, e.g., management of chronic cancer pain, the catheter may be tunneled under the skin and implanted subcutaneously in the abdomen; an implantable infusion device may be used to provide continuous narcotic infusion.

E. Nursing interventions
1. Monitor client closely for respiratory depression especially during initiation of treatment. (May be reversed with naloxone [Narcan]).
2. Assess for other side effects:
   a. Urinary retention: Foley catheter may be used in post-op client until infusion is discontinued
   b. Pruritus: may be treated with antihistamine or medication rate reduction
   c. Nausea and vomiting
3. Check insertion site frequently for signs of infection.

Electrical Stimulation Techniques for Pain Control

A. Transcutaneous electrical nerve stimulator (TENS)
1. Noninvasive alternative to traditional methods of pain relief
2. Used in treating acute pain (e.g., post-op pain) and chronic pain (e.g., chronic low back pain)
3. Consists of impulse generator connected by wires to electrodes on skin; produces tingling, buzzing sensation in the area.
4. Mechanism based on gate-control theory: electrical impulse stimulates large diameter nerve fibers to "close the gate."
5. Nursing responsibilities
   a. Do not place electrodes over incision site, broken skin, carotid sinus, eyes, laryngeal or pharyngeal muscles.
   b. Do not use in client with cardiac pacemaker.
   c. Provide skin care.
      1) Remove electrodes once a day; wash area with soap and water and air dry.
      2) Wipe area with skin prep pad before reapplying electrode.
      3) Assess area for signs of redness; reposition electrodes if redness persists for more than 30 minutes.

B. Dorsal column stimulator
1. Used in selected clients for whom conventional methods of pain relief have not been effective.
2. Electrode is surgically placed over the dorsal column of the spinal cord via laminectomy; connected by wires to a transmitter that may be worn externally or be implanted subcutaneously.

Neurosurgical Procedures for Pain Control

A. Performed for persistent intractable pain of high intensity
B. Involves surgical destruction of nerve pathways to block transmission of pain

C. Types
  1. Neurectomy: interruption of cranial or peripheral nerves by incision or injection
  2. Rhizotomy: interruption of posterior nerve root close to the spinal cord
    a. Laminectomy is necessary.
    b. Results in permanent loss of sensation and position sense in affected parts.
  3. Chordotomy: interruption of pain-conducting pathways within the spinal cord
    a. Laminectomy usually required.
    b. May be done by percutaneous needle insertion.
    c. Interrupts conduction of pain and temperature sense in affected parts.
  4. Sympathectomy: interruption of afferent pathways in the sympathetic division of the autonomic nervous system; used to control pain from causalgia and peripheral vascular disease.

D. Nursing responsibilities
  1. Provide pre- and post-op care for a laminectomy.
  2. Assess extremities for sensation (e.g., touch, pain, temperature, pressure, position sense) and movement.
  3. Provide safety measures to protect client from injury and carefully monitor skin for signs of damage or pressure.
  4. Teach client ways to compensate for loss of sensation in affected parts.
    a. Visually inspect skin for signs of injury or pressure.
    b. Check temperature of bath water.
    c. Avoid use of hot water bottles, heating pads.
    d. Avoid extremes of temperature.

Acupuncture

A. A Chinese technique of pain control by insertion of fine needles at various points on the body to promote the flow of chi (life energy).
B. Based on Eastern philosophy where insertion of needles is thought to block energy flow and restore the body's harmony
C. Mechanism of action: two theories
  1. Trigger points: the needles stimulate hypersensitive areas in muscle that produce local and referred pain. Extinction of the trigger point alleviates the referred pain.
  2. Endorphin system: needle insertion activates production of endorphins (body's natural opiates).
D. Acupressure: a less invasive variation; uses finger pressure and massage

Hypnosis

A. Has been used in dental procedures, labor and delivery, pain control in cancer.
B. Mechanism is thought to be related to positive suggestions that alter client's perception of pain.

Behavioral Techniques

A. Types
  1. Operant conditioning: based on decreasing positive reinforcement for pain behaviors
  2. Biofeedback: teaches clients to control physiologic responses to pain (e.g., muscle tension, heart rate, blood pressure) and to replace them with a state of relaxation.
B. Work best in conjunction with other types of pain management and stress reduction techniques.

FLUIDS AND ELECTROLYTES

Basic Principles

Fluids

A. Water constitutes over 50% of individual's weight; largest single component.
B. Body water divided into two compartments
  1. Intracellular: within cells
  2. Extracellular: outside cells, further divided into interstitial and intravascular fluid
C. Fluids in two compartments move among cells, tissue spaces, and plasma.

Electrolytes

A. Salts or minerals in extracellular or intracellular body fluids
B. If positively charged, called cations; if negatively charged, called anions
C. Common electrolytes and normal blood values
  1. Sodium (Na)—135–148 mEq/liter
  2. Potassium (K)—3.5–5 mEq/liter
  3. Calcium (Ca)—8.5–10.5 mg/dL
  4. Magnesium (Mg)—1.8–2.7 mEq/liter
  5. Chloride (Cl)—98–106 mEq/liter

Movement of Fluids and Electrolytes

A. Diffusion: movement of particles from an area of greater concentration to an area of lesser concentration as part of random activity
B. Active transport: movement across cell membranes requiring energy from an outside source
C. Osmosis: movement of water through a semipermeable membrane
D. Osmolality: concentration of body fluids

Fluid and Electrolyte Imbalances

See Table 4-5.
A. Hypovolemia: extracellular fluid volume deficit
B. Hypervolemia: extracellular fluid volume excess

Table 4–5 Fluid and Electrolyte Imbalances

Imbalance	Causes	Assessment Findings	Nursing Interventions
Hypovolemia (extracellular fluid volume deficit)	Hemorrhage, diarrhea, vomiting, kidney disease, diaphoresis, burns, fever, draining fistulas, sequestration of fluids (peritonitis, edema associated with burns)	Nausea and vomiting, weakness, weight loss, anorexia, longitudinal wrinkles of the tongue, dry skin and mucous membranes, decreased fullness of neck veins, postural hypotension, oliguria to anuria, shock	Measure I&O. Weigh daily. Monitor closely and regulate isotonic IV infusion. Monitor blood pressure (determine lying down, sitting, and standing). Report urine output less than 30 mL/hr. Carefully assess skin and mucous membranes. Monitor for signs of shock.
Hypervolemia (extracellular fluid volume excess)	Excess or too rapid administration of any isotonic solution; side effect of corticosteroid administration; cardiac, liver, or renal disease; cerebral damage; stress	Weight gain, pitting edema, dyspnea, cough, diaphoresis, frothy or pink-tinged sputum, edema of the eyelids, distended neck veins, elevated blood pressure, moist rales (crackles)	Weigh daily. Measure I&O. Regulate IV fluids/administration of diuretics strictly and monitor carefully. Monitor abdominal girth. Assess for pitting edema. Restrict sodium and water intake.
Water excess syndromes	Excessive intake of water, inability to excrete water due to kidney or brain damage, excessive administration of electrolyte-free solutions, poor salt intake, use of diuretics, irrigation of nasogastric tube with plain water, administration of excessive amount of ice chips to a vomiting client or one with a nasogastric tube	Polyuria (in absence of renal disease), oliguria (with renal disease), twitching, hyper irritability, disorientation, coma, convulsions, abdominal cramps	Measure I&O. Weigh daily. Restrict oral and IV intake. Replace fluid losses with isotonic solutions. Use normal saline solution for nasogastric tube irrigation.
Water deficit syndromes	Increased water output due to watery diarrhea, diabetic acidosis, excess TPN; dysphagia; impaired thirst mechanism; coma; general debility; diaphoresis; excess protein intake without sufficient water intake	Thirst, poor skin turgor, dry skin and mucous membranes, dry furrowed tongue, sunken eyeballs, weight loss, elevated temperature, apprehension, oliguria to anuria	Measure I&O. Weigh daily. Assess skin frequently. Ensure that clients with a high solute intake receive adequate water. Assess vital signs frequently, particularly temperature. Monitor TPN infusions accurately.
Hyperkalemia	Renal insufficiency, adrenocortical insufficiency, cellulose damage (burns), infection, acidotic states, rapid infusion of IV solutions with potassium, overzealous administration of potassium-conserving diuretics	Thready, slow pulse; shallow breathing; nausea and vomiting; diarrhea; intestinal colic, irritability; muscle weakness, numbness, flaccid paralysis; tingling; difficulty with phonation, respiration	Administer Kayexalate as ordered. Administer/monitor IV infusion of glucose and insulin. Control infection. Provide adequate calories and carbohydrates. Discontinue IV or oral sources of potassium.

(continues)

Table 4–5 Fluid and Electrolyte Imbalances *(continued)*

Imbalance	Causes	Assessment Findings	Nursing Interventions
Hypokalemia	Anorexia, alcoholism, gastric and intestinal suction, GI surgery, vomiting, diarrhea, laxative abuse, thiazide diuretics, steroid therapy, stress, alkalotic states	Thready, rapid, weak pulse; faint heart sounds; decreased blood pressure; skeletal muscle weakness; decreased or absent reflexes; shallow respirations; malaise; apathy; lethargy; loss of orientation; anorexia, vomiting, weight loss, gaseous intestinal distention	Be especially cautious if administering drugs that are not potassium sparing. Administer potassium supplements to replace losses. Monitor acid–base balance. Monitor pulse, blood pressure, and ECG.
Hypernatremia	Excessive/rapid IV administration of normal saline solution, inadequate water intake, kidney disease	Dry, sticky mucous membranes; flushed skin; rough, dry tongue; firm skin turgor; intense thirst; edema; oliguria to anuria	Weigh daily. Assess degree of edema frequently. Measure I&O. Assess skin frequently and institute nursing measures to prevent breakdown. Encourage sodium-restricted diet.
Hyponatremia	Decreased sodium intake, increased sodium excretion through diaphoresis or GI suctioning, adrenal insufficiency	Nausea and vomiting; abdominal cramps; weight loss; cold, clammy skin; decreased skin turgor; fingerprinting over the sternum; shrunken tongue; apprehension; headache; convulsions; confusion; weakness; fatigue; postural hypotension; rapid, thready pulse	Provide foods high in sodium. Administer normal saline solution IV. Assess blood pressure frequently (measure lying down, sitting, and standing).
Hypercalcemia	Hyperparathyroidism, immobility, increased vitamin D intake, osteoporosis and osteomalacia (early stages)	Nausea and vomiting, anorexia, constipation, headache, confusion, lethargy, stupor, decreased muscle tone, deep bone and/or flank pain	Encourage mobilization. Limit vitamin D and calcium intake. Administer diuretics. Protect from injury.
Hypocalcemia	Acute pancreatitis, diarrhea, hypoparathyroidism, lack of vitamin D in diet, long-term steroid therapy	Painful tonic muscle spasms, facial spasms, fatigue, laryngospasm, positive Trousseau's and Chvostek's signs, convulsions, dyspnea	Administer oral calcium lactate or IV calcium chloride or gluconate. Provide safety by padding side rails. Administer dietary sources of calcium. Provide quiet environment.
Hypermagnesemia	Renal insufficiency, dehydration, excessive use of magnesium-containing antacids or laxatives	Lethargy, somnolence, confusion, nausea and vomiting, muscle weakness, depressed reflexes, decreased pulse and respirations	Withhold magnesium-containing drugs/foods. Increase fluid intake (unless contraindicated).
Hypomagnesemia	Low intake of magnesium in diet, prolonged diarrhea, massive diuresis, hypoparathyroidism	Paresthesias, confusion, hallucinations, convulsions, ataxia, tremors, hyperactive deep reflexes, muscle spasm, flushing of the face, diaphoresis	Provide good dietary sources of magnesium.

C. Water excess: hypo-osmolar imbalances; water intoxication or solute deficit
D. Water deficit: hyperosmolar imbalances; water depletion or solute excess
E. Hyperkalemia: potassium excess, serum potassium above 5.5 mEq/liter
F. Hypokalemia: potassium deficit, serum potassium below 3.5 mEq/liter
G. Hypernatremia: sodium excess, serum sodium level above 148 mEq/liter
H. Hyponatremia: sodium deficit, serum sodium level below 135 mEq/liter
I. Hypercalcemia: calcium excess, serum calcium level above 10.5 mg/dL
J. Hypocalcemia: calcium deficit, serum calcium level below 8.5 mg/dL
K. Hypermagnesemia: magnesium excess, serum magnesium level above 2.7 mEq/liter
L. Hypomagnesemia: magnesium deficit, serum magnesium level below 1.8 mEq/liter

ACID-BASE BALANCE

Basic Principles

A. Normal pH of the body is 7.35–7.45.
B. Buffer or control systems maintain normal pH. In acidic state, kidneys excrete acids and reabsorb bicarbonate while the respiratory system gives off carbon dioxide. In alkalotic states, the kidneys excrete bicarbonate and the respiratory system retains carbonic acid.

See Table 4-6.

Table 4–6 Normal Blood Gas Values

pH	$PaCO_2$	PaO_2	HCO_3
7.35–7.45	35–45 mm Hg	80–100 mm Hg	22–26 mEq/L

Acid-Base Imbalances

See Table 4-7.
A. Metabolic acidosis: a primary deficit in the concentration of base bicarbonate in the extracellular fluid; decreased pH and bicarbonate, decreased pCO_2 (if respiratory compensation)
B. Metabolic alkalosis: a primary excess of base bicarbonate in the extracellular fluid; elevated pH and bicarbonate, elevated pCO_2 (if respiratory compensation)
C. Respiratory acidosis: a primary excess of carbonic acid in the extracellular fluid; decreased pH, elevated pCO_2 and bicarbonate (if renal compensation)
D. Respiratory alkalosis: a primary deficit of carbonic acid in the extracellular fluid; elevated pH, decreased pCO_2 and bicarbonate (if renal compensation)

Table 4–7 Acid-Base Imbalances

Imbalance	Causes	Assessment Findings	Nursing Interventions
Metabolic acidosis	Diabetic ketoacidosis, uremia, starvation, diarrhea, severe infections, renal tubular acidosis	Headache, nausea and vomiting, weakness, lethargy, disorientation, tremors, convulsions, coma	Administer sodium bicarbonate as ordered and monitor for signs of excess. Monitor for signs of hyperkalemia. Provide alkaline mouthwash (baking soda and water) to neutralize acids. Lubricate lips to prevent dryness from hyperventilation. Measure I&O. Institute seizure precautions. Monitor arterial blood gases and electrolytes.
Metabolic alkalosis	Severe vomiting, nasogastric suctioning, diuretic therapy, excessive ingestion of sodium bicarbonate, biliary drainage	Nausea and vomiting, diarrhea, numbness and tingling of extremities, tetany, bradycardia, decreased respirations	Replace fluid and electrolyte losses (potassium and chloride). Institute seizure precautions. Measure I&O. Assess for signs of hypokalemia. Monitor arterial blood gases and electrolytes.

(continues)

Table 4–7 Acid–Base Imbalances *(continued)*

Imbalance	Causes	Assessment Findings	Nursing Interventions
Respiratory acidosis	COPD, barbiturate or sedative overdose, acute airway obstruction, weakness of respiratory muscles	Headache, weakness, visual disturbances, rapid respirations, confusion, drowsiness, tachycardia, coma	Place in semi-Fowler's position. Maintain patent airway. Turn, cough, and deep breathe. Perform postural drainage. Administer fluids to help liquefy secretions (unless contraindicated). Administer low-concentration oxygen therapy. Monitor arterial blood gases and electrolytes. Administer prophylactic antibiotics as ordered.
Respiratory alkalosis	Hyperventilation, mechanical overventilation, encephalitis	Numbness and tingling of mouth and extremities, inability to concentrate, rapid respirations, dry mouth, coma	Offer reassurance. Encourage breathing into a paper bag or voluntary breath holding. Ensure adequate rest. Provide sedation as ordered. Monitor mechanical ventilation, arterial blood gases, and electrolytes.

E. Compensation
  1. If the metabolic system is causing the problem, the respiratory system attempts to correct the problem or compensate.
    a. Compensation for metabolic acidosis is known as Kussmaul or "air hunger" respirations in which client breathes deeply to blow off acid (CO_2).
    b. Compensation for metabolic alkalosis is slow breathing to conserve CO_2.
  2. If the respiratory system is causing the problem, the metabolic system attempts to correct the problem or compensate.
    a. Compensation for respiratory acidosis is a rise in HCO_3.
    b. Respiratory alkalosis is such a rapid process there might not be significant compensation.

INTRAVENOUS THERAPY

Purposes

A. Maintenance of fluid and electrolyte balance
B. Replacement of fluid and electrolyte loss
C. Provision of nutrients
D. Provision of a route for medications

Nursing Interventions

A. Select correct solution after checking physician's order.
B. Note clarity of solution.
C. Calculate flow rate (Intravenous Calculations, Unit 2). Time-tape bag to assist in monitoring flow rate.
D. Assess infusion rate and site at least hourly.
E. Use infusion pump if administering medications (e.g., aminophylline, heparin, insulin).
F. Maintain I&O record.
G. Provide tubing change and IV site change according to hospital policy. Intravenous Nurses Society standards recommend IV site and tubing change every 48 hours.
H. Discontinue IV if complications occur.

Complications of Intravenous Therapy

See Table 4-8.

Central Lines

Uses

A. Administration of TPN
B. Measurement of central venous pressure (CVP)
C. IV therapy when suitable peripheral veins are not available
D. Long-term antibiotic therapy
E. Chemotherapy

Table 4–8 Complications of IV Therapy

Complication	Nursing Manifestation	Interventions
Infiltration	Blanching of skin, swelling, pain at site; cool to touch; decreased infusion rate	Discontinue IV. Restart in a new site. May apply warm compresses to increase fluid absorption.
Extravasation	Infusion of a vesicant into the surrounding tissue; redness, heat, pain at site	Discontinue IV. Restart in a new site. May apply warm compress.
Phlebitis	Redness, heat, and swelling at site; possible pain and red line along course of vein	Discontinue IV. Restart in new site. Apply warm compresses to site.
Pyrogenic reaction	Fever, chills, general malaise, nausea, vomiting, headache, backache	Discontinue infusion immediately. Monitor vital signs and notify physician. Retain IV equipment for culture/lab study.
Air embolism	Dyspnea, cyanosis, hypotension, tachycardia, loss of consciousness	Stop infusion immediately. Turn client on left side with his head down. Administer oxygen. Notify physician.
Circulatory overload	Apprehension, shortness of breath, coughing, frothy sputum, crackles, engorged neck veins, increased blood pressure and pulse	Slow down IV rate. Monitor vital signs. Notify physician.

Types

A. Nontunneled catheters: inserted into subclavian vein for short-term access
  1. Subclavian catheters: single lumen
  2. Multilumen catheters: double, triple, or quadruple lumens for simultaneous infusion of fluids or for blood drawing with fluid infusion.

B. Tunneled catheters: long, silicone catheter threaded through subcutaneous layer to prevent infection with long-term use; catheter tip is located in the superior vena cava.
  1. Hickman/Broviac catheters: single- or double-lumen catheters with external presentation; need to be flushed daily with a heparinized saline solution and must be clamped when not in use; repair kit available.
  2. Groshong catheters: similar to Hickman/Broviac; difference is in valve at closed distal end of catheter that opens when used and remains closed at other times, preventing blood backup into catheter; no clamping is necessary; flushing is done daily with saline in a vigorous manner.
  3. Implantable ports (portacath): totally internal device consists of subcutaneous self-sealing injection port and a tunneled catheter; flushing is done with a heparinized saline solution every 28 days; access must be with a special noncoring needle.
  4. Peripherally inserted central catheter (PICC): short-term long lines that can be inserted by qualified nurses; inserted via a vessel in the antecubital fossa (median or cephalic); flushing is with a heparinized saline solution.

Care of the Client with a Central Venous Line (CVL)

A. Assist physician with placement; catheters should initially be flushed with saline. Have fluids or cap and flush available (heparin or saline).

B. Confirm placement in superior vena cava by X-ray prior to catheter use.

C. Institute nursing measures to prevent infection (particularly important with TPN because high concentration of glucose encourages growth of bacteria).
  1. Change dressings
    a. Usually 3 times per week and as needed (e.g., when loose or wet) but agency policies may vary.
    b. Use sterile technique and apply sterile occlusive dressing.
  2. Monitor for signs of infection: redness, drainage, odor at site, or elevated temperature.
  3. Do not piggyback anything into a TPN infusion line except intralipids.

D. Monitor for infiltration: check for swelling of neck, face, and shoulder, and pain in upper arm.

E. Prevent catheter occlusion.
  1. Keep infusion continuous.
  2. Use infusion pump.
  3. Check for kinks in tubing.
  4. Evaluate for catheter migration or dislodgment.

F. Prevent air embolism.
  1. Tighten and tape all tubing connections to prevent accidental disconnection.

2. Clamp catheter (except Groshong) and instruct client to perform Valsalva maneuver when changing or detaching tubing.
3. Check tubing for cracks or perforations.

G. Maintain proper infusion rate.
1. Monitor rate closely to prevent clotting, fluid depletion, or fluid overload.
2. Never attempt to speed up or slow down infusion.

H. With a multilumen catheter, flush ports not being used to prevent clotting (per agency's protocol).

I. With Hickman/Broviac catheters, Groshongs, PICCs, and implanted port provide other specific care according to agency protocol.

J. If clotting occurs, try to aspirate or add a declotting agent according to agency protocol. Do not irrigate. Do not use force to flush.
1. Streptokinase requires 1 hour waiting time to achieve results.
2. Urokinase requires 10 minutes waiting time to achieve results.

K. When drawing blood specimens, discard initial sample of 10 mL prior to drawing required volume for specimens. Flush with saline prior to flushing with heparinized saline solution or continuing fluids.

Blood Transfusions

See Blood Transfusions.

SHOCK

An abnormal physiologic state in which an imbalance between the amount of circulating blood volume and the size of the vascular bed results in circulatory failure and oxygen and nutrient deprivation of tissues. See Table 4-9 for classification of shock.

Body's Response to Shock

A. Hyperventilation leading to respiratory alkalosis

B. Vasoconstriction: shunts blood to heart and brain

C. Tachycardia

D. Fluid shifts: intracellular to extracellular shift to maintain circulating blood volume

E. Impaired metabolism: tissue anoxia leads to anaerobic metabolism causing increased capillary permeability and lactic acid buildup, resulting in metabolic acidosis

F. Impaired organ function

Table 4-9 Classification of Shock

Type	Characteristics	Causes
Hypovolemic	Decreased circulating blood volume	Blood loss Plasma loss (e.g., burns) Fluid loss (e.g., excessive vomiting or diarrhea)
Cardiogenic	Failure of the heart to pump properly	Myocardial infarction Congestive heart failure Cardiac arrhythmias Pericardial tamponade Tension pneumothorax
Septic	Factors favoring septic shock: • Development of antibiotic-resistant organisms • Invasive procedures such as urinary tract instrumentation • Immunosuppression and old age • Trauma: presence of blood in peritoneal cavity greatly increases likelihood of peritonitis	Release of bacterial toxins that act directly on the blood vessels producing massive vasodilation and pooling of blood; results most frequently from gram-negative septicemia.
Neurogenic	Failure of arteriolar resistance, leading to massive vasodilation and pooling of blood	Interruption of sympathetic impulses from: • Exposure to unpleasant circumstances • Extreme pain • Spinal cord injury • High spinal anesthesia • Vasomotor depression • Head injury
Anaphylactic	Massive vasodilation resulting from allergic reaction causing release of histamine and related substances	Allergic reaction to: • Insect venom or snake venom • Medications or food • Dyes used in radiologic studies

1. Kidney: decreased perfusion can result in renal failure.
2. Lung: shock lung (adult respiratory distress syndrome [ARDS])

Assessment Findings

A. Skin
1. Cool, pale, moist in hypovolemic and cardiogenic shock
2. Warm, dry, pink in septic and neurogenic shock

B. Pulse
1. Tachycardia, due to increased sympathetic stimulation
2. Weak and thready

C. Blood pressure
1. Early stages: may be normal due to compensatory mechanisms
2. Later stages: systolic and diastolic blood pressure drops

D. Respirations: rapid and shallow, due to tissue anoxia and excessive amounts of CO_2 (from metabolic acidosis)

E. Level of consciousness: restlessness and apprehension, progressing to coma

F. Urinary output: decreases due to impaired renal perfusion

G. Temperature: decreases in severe shock (except septic shock).

Nursing Interventions

A. Maintain patent airway and adequate ventilation.
1. Establish and maintain airway.
2. Administer oxygen as ordered.
3. Monitor respiratory status, blood gases.
4. Start resuscitative procedures as necessary.

B. Promote restoration of blood volume; administer fluid and blood replacement as ordered.
1. Crystalloid solutions: Ringer's lactate, normal saline
2. Colloid solutions: albumin, plasmanate, dextran
3. Blood products: whole blood, packed red blood cells, fresh frozen plasma

C. Administer drugs as ordered (see Table 4-10).

D. Minimize factors contributing to shock.
1. Elevate lower extremities to 45° to promote venous return to heart, thereby improving cardiac output.
2. Avoid Trendelenburg's position: increases respiratory impairment.
3. Promote rest by using energy-conservation measures and maintaining as quiet an environment as possible.
4. Relieve pain by cautious use of narcotics.
   a. Because narcotics interfere with vasoconstriction, give only if absolutely necessary, IV and in small doses.
   b. If given IM or subcutaneously, vasoconstriction may cause incomplete absorption; when circulation improves, client may get overdose.
5. Keep client warm.

E. Maintain continuous assessment of the client.
1. Check vital signs frequently.
2. Monitor urine output: report urine output of less than 30 mL/hour.
3. Observe color and temperature of skin.
4. Monitor CVP.
5. Monitor ECG.
6. Check lab studies: CBC, electrolytes, BUN, creatinine, blood gases.
7. Monitor other parameters such as arterial blood pressures, cardiac output, pulmonary artery pressures, pulmonary artery wedge pressures.

F. Provide psychologic support: reassure client to relieve apprehension, and keep family advised.

Table 4–10 Drugs Used to Treat Shock

Generic (Trade) Name	Action
Dopamine (Intropin)	*Low dosage:* Dilates renal, mesenteric, and splanchnic vessels, which in turn increases perfusion of kidneys and urine output. *High dosage:* Increases cardiac contractility; causes vasoconstriction (often given with nitroprusside [Nipride]).
Dobutamine (Dobutrex)	Increases myocardial contractility; vasodilator.
Isoproterenol (Isuprel)	Increases myocardial contractility; decreases peripheral resistance by dilating peripheral vascular bed; usefulness is limited by the tachycardia it produces.
Norepinephrine (Levophed)	Improves cardiac contractility and cardiac output; potent vasoconstrictor.
Sodium nitroprusside (Nipride)	Vasodilator; decreases peripheral resistance and workload of heart, thereby increasing cardiac output; used in cardiogenic shock and hypertensive emergencies.
Digitalis preparations	Improves cardiac performance.
Corticosteroids	Used especially in septic shock; helps to protect cell membranes and decreases the inflammatory response to stress.
Antibiotics	Used in treating infectious processes related to septic shock.

Note: Vasopressors such as Levophed can cause almost complete occlusion of arterioles, causing a decrease of blood flow to larger tissue areas. Therefore, if blood pressure is adequate, a vasodilator such as Nipride could probably be given as well, to modify the vasoconstrictor effects.

MULTIPLE TRAUMA

Assessment and Emergency Care

Airway

A. Assess, establish, and maintain an adequate airway.
  1. Do not hyperextend the neck in a client with suspected cervical spine injury.
  2. Use jaw thrust instead.
B. Administer artificial resuscitation if necessary.
C. Observe for chest trauma such as open sucking wounds or flail chest (see Chest Trauma).
D. Administer high-flow oxygen 85–100% to achieve maximum cellular oxygenation. Monitor for CO_2 retention in clients with COPD.
E. Draw blood samples for ABGs.

Hemorrhage and Shock

A. Deep wounds with pulsating blood flow
  1. Apply firm pressure over the wound with a sterile dressing.
  2. If wound is on a limb, elevate the extremity.
  3. Apply pressure with three fingers over appropriate pressure point.
  4. Once bleeding is controlled, apply a pressure dressing.
  5. Tourniquets should be used only when all other methods have failed.
B. Venous bleeding: apply direct pressure to bleeding site.
C. Never remove any foreign object, such as a knife, from the client; immobilize the object with packing.
D. Assess for and treat shock (see Shock).
E. Administer tetanus booster as ordered.

Neurologic Injuries

A. Establish a baseline level of consciousness and reassess frequently.
B. Inspect the scalp, head, face, and neck for abrasions, hematomas, and lacerations.
C. Gently palpate the head for any injuries.
D. Inspect the nose and ears for leakage of cerebrospinal fluid.
E. Evaluate pupillary size, shape, equality, and reaction to light.
F. Assess for sensation and motor abilities.
G. Observe for signs of increased intracranial pressure.
H. For additional details of care (see Head Injury and Spinal Cord Injury).

Abdominal Injuries

A. Keep client NPO.
B. Assist with insertion of nasogastric tube (for assessment of stomach bleeding and aspiration of stomach contents, which prevents vomiting).
C. Inspect abdomen for injuries.
D. Auscultate bowel sounds.
E. Do not palpate the abdomen (could aggravate possible internal injuries).
F. Prepare client for peritoneal lavage if indicated.
G. Insert Foley catheter.
  1. Measure urine output every 15 minutes.
  2. Assess for hematuria.

Musculoskeletal Injuries

A. Observe for sign of fracture: pain, swelling, tenderness, ecchymosis, crepitation (grating sound), loss of function, exposed bone fragments.
B. Cover open fracture with sterile dressing to prevent infection.
C. Immobilize any suspected fractures by splinting the joint above and below the injury.
D. Perform neurovascular check of area distal to fracture: assess for color, temperature, capillary refill, sensation, movement, pulses.

Sample Questions

1. A client is admitted for treatment of Crohn's disease. Which information is most significant when the nurse assesses nutritional health?
  1. Anthropometric measurements.
  2. Bleeding gums.
  3. Dry skin.
  4. Facial rubor.

2. Total parenteral nutrition (TPN) is ordered for an adult client. Which statement is true regarding TPN?
  1. It contains 20–70% glucose.
  2. The RN will mix the lipids into the TPN bag before administration.
  3. When the client's blood glucose runs high, decrease the TPN rate.
  4. Check the client's potassium level every 6 hours.

3. The nurse has administered analgesia, but the client continues to complain of severe pain. Which of the following actions should be most appropriate for the nurse to take first?
  1. Contact the physician to request additional medication.
  2. Assist the client to a comfortable position and help her relax.
  3. Administer a narcotic analgesic.
  4. Inform the client that she may request additional pain medication in 3 hours.

4. Acetylsalicylic acid is being administered to an adult client. What is the most common mechanism of action for nonnarcotic analgesics?

1. To inhibit prostaglandin synthesis.
2. To alter pain perception in the cerebellum.
3. To directly affect the central nervous system.
4. To target the pain-producing effect of kinins.

5. An adult has been taking acetylsalicylic acid (ASA) 650 mg four times a day for chronic back pain. What complication is possible due to this level of ASA ingestion?

1. Liver failure.
2. Paralytic ileus.
3. Gastrointestinal bleeding.
4. Retinal detachment.

6. Ibuprofen (Motrin) is prescribed for an adult with chronic pain. The nurse must teach the client to observe which dietary precaution while taking ibuprofen?

1. Eat a high-fiber diet.
2. Drink citrus juices daily.
3. Take the medication with milk.
4. Omit spinach and other green leafy vegetables from the client's diet.

7. A post-op surgical client is ordered patient-controlled analgesia (PCA). Which statement by the RN will help reduce anxiety about receiving adequate pain relief?

1. "A PCA is almost always effective."
2. "Your comfort will be assessed frequently."
3. "Have your family push the button for you."
4. "We will have Narcan available if you get too much."

8. Preoperative teaching for an adult who is to have patient controlled analgesia (PCA) following surgery includes telling the client:

1. "You will not be drowsy."
2. "You will experience no pain."
3. "Pain control will be adequate."
4. "You will not have incisional pain but you may have muscle pain."

9. The client's family expresses concern that the client could overdose with a PCA. What protective mechanism prevents drug overdose with a PCA?

1. The nurse controls the amount administered with each dose.
2. Extensive client teaching precedes its use.
3. The client can stop drug administration but not initiate it.
4. After a bolus is administered, there is a mandatory waiting period before another dose is given.

10. A nurse is the first professional to arrive at the scene of a multivehicle accident. An adult was riding a motorcycle. Upon impact, he fell off the bike and it fell back on his legs. What should be the RN's priority action?

1. Assessing blood loss.
2. Monitoring respiratory status.
3. Obtaining vital signs.
4. Removing the bike off him.

11. A nurse stops to help at a motorcycle accident in which an adult is bleeding profusely from a 4-inch gash on the left knee. Which of the following is the best approach for the nurse to take to stop the bleeding?

1. Apply direct pressure to the wound.
2. Move the motorcycle off his legs.
3. Raise the extremity.
4. Wrap a tourniquet above the wound.

12. The nurse is caring for a client who is receiving IV fluids. Which observation by the nurse indicates the IV has infiltrated?

1. Pain at the site.
2. A change in flow rate.
3. Coldness around the insertion site.
4. Redness around the insertion site.

13. The nurse is caring for a client whose arterial blood gases indicate metabolic alkalosis. Which of the following is most likely to cause metabolic alkalosis?

1. Nasogastric suctioning.
2. Diabetic ketoacidosis.
3. COPD.
4. Renal failure.

14. An adult client is admitted with metabolic acidosis. Which set of arterial blood gases should the nurse expect to find in a client with metabolic acidosis?

1. pH 7.28; PCO_2–55; HCO_3–26.
2. pH 7.50; PCO_2–40; HCO_3–31.
3. pH 7.48; PCO_2–30; HCO_3–22.
4. pH 7.30; PCO_2–36; HCO_3–18.

15. A elderly client is hospitalized for the treatment of gastroenteritis complicated by dehydration and hyponatremia. What is an early symptom of hyponatremia that the nurse would expect from this client?

1. Ataxia.
2. Hunger.

3. Thirst.
4. Weakness.

16. An adult has just been brought in by ambulance after a motor vehicle accident and has moderate anxiety. When assessing the client, the nurse would expect which of the following from sympathetic nervous system stimulation?
1. A rapid pulse and increased respiratory rate.
2. Decreased physiologic functioning.
3. Rigid posture and altered perceptual focus.
4. Increased awareness and attending.

17. An adult has received an injection of immunoglobulin. The nurse knows that the client will develop which of the following types of immunity?
1. Active natural immunity.
2. Active artificial immunity.
3. Passive natural immunity.
4. Passive artificial immunity.

18. The nurse knows which of the following is true about immunity?
1. Antibody-mediated defense occurs through the T-cell system.
2. Cellular immunity is mediated by antibodies produced by the B-cells.
3. Antibodies are produced by the B-cells.
4. Lymphocytes increase with an allergic response.

19. An adult is on a clear liquid diet. Which food item can be offered?
1. Milk.
2. Jello.
3. Orange juice.
4. Ice cream.

20. An adult is being taught about a healthy diet. How can the food pyramid help guide the client on his diet?
1. By indicating exactly how many servings of each group to eat.
2. By calculating how many calories the client should have.
3. By suggesting daily food choices.
4. By dividing the food into four basic groups.

21. Before administering a tube feeding the nurse knows to perform which of the following assessments?
1. The gastrointestinal (GI) tract, including bowel sounds, last BM, and distention.
2. The client's neurologic status, especially gag reflex.
3. The amount of air in the stomach.
4. That the formula is used directly from the refrigerator.

22. Which food choice contains the highest kilocalorie?
1. Apple.
2. Bacon.
3. Chicken.
4. Bread.

23. The nurse knows that a client understands a low residue diet when he selects which of the following from a menu?
1. Rice and lean chicken.
2. Strawberry pie.
3. Pasta with vegetables.
4. Tuna casserole.

24. An adult is receiving total parenteral nutrition (TPN). The nurse knows which of the following assessments is essential?
1. Evaluation of the peripheral intravenous (IV) site.
2. Confirmation that the tube is in the stomach.
3. Assessment of the GI tract, including bowel sounds.
4. Fluid and electrolyte monitoring.

25. The nurse knows which of the following statements about TPN and peripheral parenteral nutrition (PPN) is true?
1. TPN is usually indicated for clients needing short-term (less than 3 weeks) nutritional support, whereas PPN is for long-term maintenance.
2. A client needing more than 3000 calories would receive PPN, whereas TPN is given to those requiring less than 3000 calories.
3. TPN is often given to those with fluid restrictions, whereas PPN is used for those without constraints on their fluid intake.
4. TPN is given to those who need to augment oral feedings, whereas PPN is used for those who are nothing by mouth (NPO).

26. What is an important consideration regarding TPN administration?
1. IV site is kept aseptic while infusing the solution.
2. Feeding is poured into a pouch and then infused.
3. Solution is only hung for a maximum of 8 hours at a time.
4. New formula is added as needed so the line does not run dry.

27. An adult has been treated for pulmonary tuberculosis (TB) and is being discharged home with his wife and two young children. His wife asks how TB is passed from one person to another so she can prevent anyone else from catching it. How should the nurse respond?

1. "You should wear gloves when handling his linen and bedding."
2. "You should keep the windows and doors closed so as not to spread the droplets."
3. "He must be careful to cough into a handkerchief that is washed in hot water or discarded."
4. "Make sure to boil all water before drinking or using it."

28. The nurse evaluates a certified nursing assistant (CNA). Which of the following actions by the CNA demonstrates understanding of standard precautions?

1. Wears gloves during all client contact.
2. Cleans blood spills with soap and water.
3. Pours bulk blood and other secretions down a drain connected to a sanitary sewer.
4. Carries blood sample to the lab in an open basket.

29. An adult is on long-term aspirin therapy and is experiencing tinnitus. What is the best interpretation of this occurrence?

1. The aspirin is working correctly.
2. The client has a metal taste in their mouth.
3. The client has an upper GI bleed.
4. The client is experiencing a mild overdosage.

30. An adult is receiving a nonsteroidal anti-inflammatory drug (NSAID). Which of the following would the nurse include in the teaching about this medication?

1. Take the NSAID with ASA for full effect.
2. Take the NSAID with meals.
3. Orange juice will help potential the action of the medication.
4. The NSAID will coat the stomach lining.

31. An adult is to receive an intramuscular (IM) injection of morphine for post-op pain. Which of the following is necessary for the nurse to assess prior to giving a narcotic analgesic?

1. The client's level of alertness and respiratory rate.
2. The last time the client ate or drank something.
3. The client's bowel habits and last bowel movement.
4. The client's history of addictions.

32. An adult is to receive narcotic analgesic via a patient-controlled analgesia (PCA). The nurse is evaluating the client's understanding of the procedure. Which of the following statements by the client indicates that she understands PCA?

1. "When I press this button the machine will always give me more medicine."
2. "I will press the button whenever I begin to experience pain."
3. "I should press this button every hour so the pain doesn't come back."
4. "With this machine I will experience no more pain."

33. An adult suffered second- and third-degree burns over 20% of his body 2 days ago. What is the best way to assess the client's fluid balance?

1. Maintain strict records of intake and output.
2. Weigh the client daily.
3. Monitor skin turgor.
4. Check for edema.

34. A 78-year-old male has been working on his lawn for 2 days, although the temperature has been above 90°F. He has been on thiazide diuretics for hypertension. His lab values are: K 3.7 mEq/L, Na 129 mEq/L, Ca 9.9 mg/dL, and Cl 95 mEq/L. What would be a priority action for this man?

1. Make sure he drinks eight glasses of water a day.
2. Monitor for fatigue, muscle weakness, restlessness, and flushed skin.
3. Look for signs of hyperchloremia.
4. Observe for neurologic changes.

35. An adult who has gastroenteritis and is on digitalis has lab values of: K 3.2 mEq/L, Na 136 mEq/L, Ca 8.8 mg/dL, and Cl 98 mEq/L. The nurse puts which of the following on the client's plan of care?

1. Stop digitalis therapy.
2. Avoid foods rich in potassium.
3. Observe for digitalis toxicity.
4. Observe for Trousseau's and Chvostek's signs.

36. A client on hemodialysis is complaining of muscle weakness and numbness in his legs. His lab results are: Na 136 mEq/L, K 5.9 mEq/L, Cl 100 mEq/L, Ca 8.5 mg/dL. Which electrolyte imbalance is the client suffering from?

1. Hyperkalemia.
2. Hypernatremia.
3. Hypocalcemia.
4. Hypochloremia.

37. A client has cancer that has metastasized to her bones. She is complaining of increased thirst, polyuria, and decreased muscle tone in the legs. Her lab values are: Na 139 mEq/L, K 4.0 mEq/L, Cl 103 mEq/L, and Ca 8.0 mg/dL. What electrolyte imbalance is present?

1. Hypocalcemia.
2. Hypercalcemia.
3. Hyperkalemia.
4. Hypochloremia.

38. An adult who is anxious and hyperventilating has blood gases of: pH 7.47, $PaCO_2$ 33. What is the best initial action for the nurse to take?

1. Try to have the client breathe slower or into a paper bag.
2. Monitor the client's fluid balance.
3. Give O_2 via nasal cannula.
4. Administer sodium bicarbonate.

39. An adult has had gastroenteritis with vomiting for 3 days. He has taken baking soda without relief. His blood gases are as follows: pH 7.49, $PaCO_2$ 45, and HCO_3 30. The nurse would expect which of the following to be included in the plan of care?

1. Have the client drink at least eight glasses of water in the first day.
2. Administer $NaHCO_3$ IV as per physician's orders.
3. Continue sodium bicarbonate for nausea.
4. Monitor electrolytes for hypokalemia and hypocalcemia.

40. An adult's blood gas results are: pH 7.31, $PaCO_2$ 49, and HCO_3 24. What does the nurse interpret this as?

1. Respiratory acidosis.
2. Respiratory alkalosis.
3. Metabolic acidosis.
4. Metabolic alkalosis.

41. An adult who has diabetes has infectious diarrhea. His arterial blood gases are: pH 7.30, $PaCO_2$ 35, and HCO_3 of 19. The nurse would monitor the client for which of the following?

1. Trousseau's sign.
2. Hypokalemia.
3. Hypoglycemia.
4. Respiratory changes.

42. An adult has an IV line in the right forearm infusing D5 ½ NS with 20 mEq of potassium at 75 mL/h. Which statement would be a correct report from the RN?

1. The potassium bag is piggybacked into the dextrose at 75 mL/h.
2. The clamp should be closed below the D5 ½ NS bag.
3. Potassium is on the secondary line.
4. 75 mL will infuse in 1 hour.

43. An adult has a central venous line. Which of the following should the nurse include in the care plan?

1. Complete blood count (CBC) and electrolytes.
2. Regular serial chest X-rays to ensure proper placement of the central line.
3. Continuous infusion of a solution at a keep vein open rate.
4. Any signs of infection, air embolus, and leakage or puncture.

44. An adult has a Hickman-type central venous catheter and needs to have blood drawn from it. Which of the following is the nurse going to do first?

1. Use sterile technique to assemble the supplies needed.
2. Aspirate and discard the first 10 mL of the blood.
3. First flush the catheter with heparinized solution, then withdraw the blood.
4. Remove the cap on the catheter and replace it with a new one.

45. An adult has a central line in his right subclavian vein. The nurse is to change the tubing. Which of the following should be done?

1. Use the present solution with the new tubing.
2. Connect the new tubing to the hub prior to running any fluid through the tubing.
3. Close the roller clamp on the new tubing after priming it.
4. Have the client roll to the right side to prevent an air embolus.

46. An adult suffered a diving accident and is being brought in by an ambulance intubated and on a backboard with a cervical collar. What is the first action the nurse would take on arrival in the hospital?

1. Take the client's vital signs.
2. Insert a large bore IV line.
3. Check the lungs for equal breath sounds bilaterally.
4. Perform a neurologic check using the Glasgow scale.

47. An adult has been shot. His vital signs are blood pressure (BP) 90/60, pulse (P) 120 weak and thready, respirations (R) 20. During the initial assessment, he is placed in a modified Trendelenburg position. What desired effect should the position have on the client?

1. An increase in the client's blood pressure.
2. An increase in the client's heart rate.
3. An increase in the client's respiratory rate.
4. A decrease in blood loss.

48. An adult has been stung by a bee and is in anaphylactic shock. An epinephrine (adrenaline) injection has been given. The nurse would expect which of the following if the injection has been effective?

1. The client's breathing will become easier.
2. The client's blood pressure will decrease.
3. There will be an increase in angioedema.
4. There will be a decrease in the client's level of consciousness.

49. An adult who was in a motor vehicle accident, has been brought to the emergency department. She has a 4-in laceration on her forehead that is bleeding profusely. Her left ankle has an obvious deformity and is splinted. Her vital signs are BP 100/60, P 110, and R 16. What is the first action the nurse should take?

1. Start an IV line for fluids.
2. Place a Foley catheter.
3. Get an ECG.
4. Check her neurologic status.

50. An adult is brought in by ambulance after a motor vehicle accident. He is unconscious, on a backboard with his neck immobilized. He is bleeding profusely from a large gash on his right thigh. What is the first action the nurse should take?

1. Stop the bleeding.
2. Check his airway.
3. Take his vital signs.
4. Find out what happened from eyewitnesses.

Answers and Rationales

1. 1. Anthropometric measurements are the prime parameters used to evaluate fat and muscle stores in the body.

2. 1. The concentration for dextrose in TPN can range from 20–70%.

3. 2. Medication is usually more effective with relieving techniques. Many basic nursing measures reduce or eliminate discomfort. Administering analgesia alone does not replace thoughtful, comprehensive pain management.

4. 1. Nonnarcotic analgesics inhibit prostaglandin synthesis. Prostaglandins increase the sensitivity of peripheral pain receptors to endogenous pain-producing substances.

5. 3. High doses of aspirin are associated with GI bleeding.

6. 3. NSAIDs such as ibuprofen are very irritating to the GI tract and should always be taken with milk or food to minimize the possibility of bleeding.

7. 2. Pain is an individual experience. It is important to reassure the client that assessments will be made frequently and that drug dosages will be adjusted according to the amount of pain the client perceives.

8. 3. Clients should be told that they will be able to control their pain.

9. 4. Immediately after a bolus dose of medication is administered the device enters a mandatory lockout mode where no other boluses of medication can be delivered.

10. 2. In the presence of multiple traumas, maintenance of a patent airway must always be the priority in the sequence of care delivery.

11. 1. Direct pressure to the wound will aid in the development of a blood clot, which is the first step in wound healing and will prevent hemorrhage.

12. 3. Coldness, pallor, and swelling around the insertion site are the best indicators that the fluid has infiltrated into subcutaneous tissue.

13. 1. One cause of metabolic alkalosis is removal of H^+ and Cl^- from the stomach through emesis or gastric suction, resulting in an excess of base.

14. 4. The pH is below the normal range of 7.35–7.45. The PCO_2 is within the normal range of 35–45, and the HCO_3 is below the normal limits of 21–28. These values indicate a metabolic problem because the PCO_2 is within normal limits. It is the low HCO_3 that is causing acidosis.

15. 3. Thirst is the body's attempt to restore blood volume depletion that occurs in hyponatremia.

16. 1. The sympathetic nervous system during moderate anxiety will increase the pulse and respirations.

17. **4.** Passive artificial immunity occurs when antibodies are produced by another person or animal and injected into the recipient.

18. **3.** Antibodies or immunoglobulins are produced by the B cells and are part of the body's plasma proteins.

19. **2.** Plain gelatins can be given on a clear liquid diet, as well as tea, coffee, ginger ale, or lemon-lime soda.

20. **3.** The pyramid helps to guide the client in choosing a variety of foods to obtain the nutrients needed. It also aids in eating more of some groups (bread, cereal, rice, and pasta) and less of others (fats, oils, and sweets).

21. **1.** The GI tract should be assessed before each feeding to ensure functioning and minimal problems.

22. **2.** Bacon contains the highest kilocalorie, as it is from the fat group. Fats yield 9 kcal/g, whereas the other choices, from the carbohydrate and protein groups only yield 4 kcal/g.

23. **1.** A low-residue diet includes rice, lean meats, and eggs.

24. **4.** Clients receiving TPN can experience electrolyte imbalances, hypo- or hyperglycemia, as well as difficulties with fluid balance.

25. **3.** TPN can provide a greater concentration of calories than PPN. Therefore, TPN is given to those with fluid restrictions.

26. **1.** The IV site is kept aseptic by an occlusive dressing. It is a central line and the TPN with its high concentration of glucose provides an ideal medium for pathogens.

27. **3.** TB is spread through residue of evaporated droplets and may remain in the air for long periods of time. Thus care should be given when coughing or sneezing.

28. **3.** Bulk blood and other secretions like suctioned fluids are carefully poured down a drain connected to a sanitary sewer.

29. **4.** Tinnitus is a classic sign of aspirin overdosages, either from too much ingestion or limited excretion.

30. **2.** NSAIDs should be taken with food, milk, or antacid to prevent nausea or vomiting.

31. **1.** A decreasing level of alertness can signal early respiratory depression and a significant drop in the respiratory rate is a warning sign. Both should be taken prior to giving the medication for baseline purposes.

32. **2.** PCA allows the client to administer more analgesic before the pain becomes severe, thus allowing better pain control.

33. **2.** This is the best way to assess fluid balance, especially acute changes in those with large losses or acutely ill.

34. **4.** Neurologic changes can occur from hyponatremia. They include confusion, disorientation, lethargy, seizures, and coma.

35. **3.** Hypokalemia enhances digitalis toxicity and must be observed for carefully.

36. **1.** Potassium is normally 3.5–5.5 mEq/L. Clients with renal failure are prone to hyperkalemia.

37. **1.** The client's calcium is low. The normal values are 8.5–10.5 mg/dL. Hypocalcemia is common among those with bone cancer.

38. **1.** The client is in respiratory alkalosis and needs to increase the carbon dioxide. The easiest way to do this is to try and calm the client and/or have him breathe in and out of a paper bag, thus inhaling the exhaled carbon dioxide.

39. **4.** Hypokalemia and hypocalcemia are both common with metabolic alkalosis as a result of cellular buffering.

40. **1.** A low pH indicates acidosis, whereas the high $PaCO_2$ indicates the problem is respiratory rather than metabolic.

41. **4.** The client is in metabolic acidosis and the body will try to compensate through the respiratory system (with deep breaths), although it cannot completely correct the problem.

42. **4.** The IV fluids will infuse 75 mL/h, as the rate states. The potassium has already been mixed in the bag from pharmacy and infuses from one bag.

43. **4.** All of these are potential problems for those with a central line, which the nurse needs to be observant for.

44. **2.** The first 10 mL are drawn off and discarded. Lab values can be altered by the solution remaining in the catheter from the infusion or flush.

45. **3.** The roller clamp should be closed after priming, otherwise the fluid will continue to flow. Open the roller clamp after inserting the tubing into the hub.

46. 3. The airway is provided by the endotracheal tube. The nurse should assess breathing, the next step in the ABCs.

47. 1. The Trendelenburg position increases the blood return from the legs, thereby raising the blood pressure.

48. 1. The epinephrine would help to ease the client's respiratory distress.

49. 1. Her vital signs indicate that she is probably going into shock. Fluids are the first action to do after assessing ABCs.

50. 2. Airway is the first step of ABCs.

Aging

GENERAL INFORMATION

Aging is a normal developmental process occurring throughout the human life span that causes a mild progressive decline in body system functioning. The older client is generally regarded as one who is 65 years of age or older.

Biologic Theories of Aging

A. Immune system theory
  1. The two primary immune organs, the thymus and bone marrow, are affected by the aging process, which contributes to a decline in T-cell production and stem cell efficiency.
  2. Increase of infections, autoimmune disease, and cancer with aging.

B. Cross-linking theory
  1. Cross-linking is a chemical reaction that binds glucose to protein, which causes abnormal division of DNA, interfering with normal cell functioning and intracellular transport over a lifetime.
  2. Eventually causes tissue and organ failure.

C. Free radical theory
  1. Molecules that are highly reactive as a result of oxygen metabolism in the body.
  2. Over time, cause physical decline by damaging proteins, enzymes, and DNA.
  3. Beta-carotene and vitamins C and E are naturally occurring antioxidants that counteract the free radicals.

D. Stress theory (wear and tear)
  1. The body, like any machine, will eventually "wear out" secondary to repetitive usage, damage, and stress.
  2. While this theory is seen as having some merit, individuals react differently to stress (positive and negative), causing controversy over the concept.

E. Genetics theory
  1. Preprogrammed life expectancy. Cells can only divide a specific number of times.
  2. Life expectancies among family members is similar, i.e., if the parents died over the age of 80, the children are more likely to live to that age.

F. Neuroendocrine theories
  1. Anterior pituitary hormones are thought to contribute to the aging process.
  2. An imbalance of certain chemicals in the brain may contribute to altered cell division within the body.

Age-Related Changes

See Table 4-11.

Psychosocial Changes in the Older Adult

A. A successful aging process includes physical, psychological, social, and cultural factors.
  1. Some cultures have a great respect for older persons.
  2. In the United States, much value is placed on youth.
  3. Be aware of ageism (discrimination against the older adult simply because of age).

B. Developmental tasks for the older adult
  1. Ego integrity vs. despair (Erikson)
    a. With ego integrity, the person's life is felt to have meaning and accomplishment.
    b. With despair, there are feelings of worthlessness for a life not well lived.
  2. Other possible developmental tasks
    a. Successfully adjusting to retirement.
    b. Making safe and satisfactory living arrangements.
    c. Adjusting to reduced income.
    d. Keeping socially active.
    e. Maintaining contact with friends and family.
    f. Making safe decisions about driving a car.
    g. Adjusting to death of spouse/significant other.
    h. Adjusting to idea of one's own death.

Table 4–11 Age-Related Changes

System	Change	Nursing Interventions
Special Senses		
Vision	Presbyopia: decreased ability to focus on near objects (often requiring reading glasses) Decreased lacrimal secretions—chronic dry eye, scratchiness Pupils: smaller—decreased peripheral vision and ability to adapt to the dark; increased sensitivity to glare Lens: larger, more rigid, and discolored (yellow opacity)—decreased depth perception and ability to focus Colors distorted, especially blue/green Red/orange more pleasing	Provide increased illumination without glare. Provide safe environment by orienting client to surroundings and removing potential hazards. Use sunglasses outdoors. Use large-print books. Avoid night driving.
Hearing	Presbycusis: decreased ability to hear pitch or level of sound (first high, then low and background) Tinnitus—"ringing in the ear"; results from decreased blood supply to neurosensory receptors in ear; problems distinguishing horns/sirens	Look directly at the client when speaking and speak clearly and slowly; low-pitched voice heard best. Decrease background noise.
Taste/Smell	Olfactory fibers atrophy—decreased sense of smell, decreased appetite/ability to enjoy foods	Provide attractive meals in comfortable social setting. Vary taste, textures, and colors of foods. Be alert for difficulty chewing or swallowing when selecting foods.
Touch	Sensory nerve receptors less acute—requires stronger stimuli, increased pain tolerance, skin tears, more difficult to distinguish hot, cold, or pressure Fine discrimination abilities impaired, especially hands and feet	Protect skin from injury. Lower bath water temperature to 100–105°F. Provide for safety around hot liquids at mealtimes.
Nervous	Overall intellect remains the same Fewer neurons and reduced blood flow to brain—some short-term memory loss and learning ability slowed Myelin sheath degenerates—decreased reaction time, reduced deep tendon reflexes, and increased time to respond to stimuli Change in sleep patterns	Promote independence in daily activities. Allow ample time for completion of tasks. Offer back rub or warm milk at bedtime. Provide recreational and diversional activities. Maintain environmental stability, minimize frequency of transfers.
Integumentary	Sweat glands diminish—decreased thermoregulation Collagen and subcutaneous fat decreases (subcutaneous medications absorb more slowly)—wrinkles, poor turgor (poor estimate of hydration) Hair follicles decrease/produce less melanin—baldness/gray hair Vascular supply to nailbeds reduced—dull, brittle nails—hard to cut! Delayed wound healing	Provide adequate warmth. Maintain adequate hydration. Avoid overexposure to the sun. Provide adequate heat and humidity in environment. Keep skin clean, dry, lubricated, and pressure free. Decrease frequency of baths. Refer to podiatrist.
Musculoskeletal	Muscle fibers decrease and muscles atrophy—decreased strength and endurance Bone density decreases—osteoporosis, increased fractures Ligaments and tendons lose elasticity—decreased ROM in joints Intervertebral disks narrow—increased spine curves, balance diminishes (center of gravity)	Encourage exercise program. Promote optimum physical activity within level of ability. Maintain optimum nutrition, especially intake of protein, calcium, and vitamins. Encourage use of appropriate adaptive or assistive devices to enhance mobility.

(continues)

Table 4–11 Age-Related Changes *(continued)*

System	Change	Nursing Interventions
Cardiovascular	Increased peripheral resistance/increased blood pressure, especially systolic Baroreceptors less sensitive—decreased sensitivity to change in positions (orthostatic hypotension) Decreased venous valve competency—increased dependent edema Mitral/aortic valves thicker and more rigid—more murmurs without disease Decreased stroke volume and cardiac output Decreased pacemaker cells—possible dysrhythmias	Assess symptoms and make appropriate modifications in care. Teach client to change positions slowly to avoid falls. Minimize edema and fatigue with rest periods and elevation of legs. Teach energy conservation methods in daily activities.
Respiratory	Muscles weaken and atrophy, rib cage calcifies, barrel-shaped chest—increased energy to expand lungs, harder to cough and deep breathe Less tidal volume and increased residual volume secondary to cell fibrosis Alveoli decrease and thicken—less sensitive to hypoxia and hypercapnia Atrophy of cilia—slowed cough reflex, increased risk of infection	Manipulate environment to enhance ventilation. Position client to promote optimum ventilation. Encourage exercises and prescribed pulmonary exercises. Encourage annual influenza vaccines and one-time pneumococcal vaccine.
Gastrointestinal	Decreased smooth muscle tone, difficulty in swallowing (minor) and decreased peristalsis—decreased esophageal motility, increased heartburn and constipation Decrease in digestive enzymes—altered absorption of fats, protein, B_{12}, folic acid, calcium, iron, medications Decreased saliva, loss of teeth Decreased sphincter tone—impactions, incontinence	Assess condition of teeth and mouth, fit and comfort of dentures, and ability to chew. Encourage fluids and foods high in fiber. Encourage optimal activity. Promote independence and privacy in use of bathroom. Keep stool record and observe for constipation.
Renal	Decreased GFR secondary to decreased kidney size and number of nephrons and decreased renal blood flow—ability to concentrate/dilute urine decreased, decreased excretion of medications Decreased bladder capacity and weakened bladder and pelvic muscles—frequency, urgency, nocturia, incontinence, retention, infections Prostate enlargement/obstruction (retention), dribbling, overflow incontinence	Assess voiding patterns. Provide adequate fluids. Establish a bladder program to promote continence (assist to bathroom or offer bedpan every 2–3 hours). Avoid catheterization unless comatose, skin breakdown, or bladder outlet obstruction.
Reproductive		
Female	Diminished vaginal secretions secondary to decreased estrogen—painful intercourse, infections	Promote good perineal care, treat with prescribed creams (e.g., estrogen). Use vaginal lubricant as needed.
Male	Slower erections and ejaculations secondary to sclerosis of penile veins and arteries—decrease in sexual activity	Provide encouragement and discuss modifications of sexual expression as necessary; rest before and after sexual activity.

Psychologic/Social Theories of Aging

A. Activity theory
  1. Maintaining a level of active involvement in life helps the older adult stay psychologically and socially healthy.
  2. As life roles or physical capacity are lost, the older adult will substitute new roles or intellectual activities.

B. Continuity or developmental theory
  1. Adjustment to old age is impacted by individual personality, and the older adult

will exhibit similar choices and decisions to younger years.
   2. This theory allows for great variation in successful aging, as individual habits and preferences are unique.

C. Disengagement theory
   1. Gradual mutual withdrawal between the individual and society as the aging process continues.
   2. While this theory was a major milestone in aging research, it is now felt to be flawed, as many older adults remain engaged in psychosocial aspects of life.

PATTERNS OF HEALTH AND DISEASE IN THE OLDER ADULT

A. Diseases that occur to varying degrees in most older adults
   1. Cataracts
   2. Arteriosclerosis
   3. Benign prostatic hypertrophy (males)

B. Diseases with increased incidence with advancing age
   1. Neoplastic disease
   2. Diabetes mellitus
   3. Dementia disorders

C. Diseases that have more serious consequences in the elderly and make homeostasis more difficult to maintain
   1. Pneumonia
   2. Influenza
   3. Trauma

D. Chronic disease very common
   1. Seventy-nine percent of noninstitutionalized persons over age 70 have at least one chronic disease.
   2. Most common chronic diseases: arthritis, hypertension, heart disease, cancer.
   3. Most hospital visits for persons over 65 are for chronic diseases.

E. Functional disability (inability to perform activities of daily living [ADL])
   1. Thirty-two percent of persons over 65 have some limitation of functions.
   2. Twenty-five percent of persons over 65 require help with at least one ADL or IADL (instrumental activities of daily living; e.g., shopping, paying bills).

F. Chronic vs. acute diseases (see Table 4-12).

Table 4–12 Chronic Disease vs. Acute Disease

Characteristic	Chronic Diseases	Acute Diseases
Cause	Multiple causes; often related to lifestyle	Specific etiologies
Onset	Slow, insidious	Rapid
Duration	Indeterminate; remissions and exacerbations	Short
Understanding of disease	Often difficult because of indeterminate course, remissions, and exacerbations	Simpler because symptoms more overt
Outcomes	Somewhat predictable but often debilitating and associated with long periods of illness Management of condition Lifestyle changes required Individual with disease must assume control of disease	Symptoms resolve with cure of disease Outcomes usually favorable; cures Health care provider directs care and cure

ASSESSMENT

Health History and Gerontologic Focus

A. Assessment of the older adult client is complex
   1. Allow sufficient time to conduct a thorough health history interview.
   2. Depending on the client's stability, the interview may take more than one session.

B. Presenting problem
   1. Assess client systematically depending upon the presenting problem.
   2. Typical presentations of disease may change with age (i.e., client may not exhibit chest pain with a myocardial infarction).
   3. The problem is likely to have multiple contributing factors and affect the client's functional abilities.

C. Mental status and mental health
   1. It is important to obtain a baseline for orientation, memory, level of alertness, and decision-making capabilities.
   2. Assess the client for quality of life issues, mood, affect, and anxiety.

D. Lifestyle and function
   1. Often, there is little correlation between diseases and functional abilities.
   2. The functional assessment provides a clearer picture of physical, psychologic, and social health.
   3. Use the client's own baseline from previous assessments to determine any changes in function.
   4. Have the client demonstrate function wherever possible (i.e., observe gait and balance, drinking a glass of water, dressing self).

E. Medication usage
   1. Ask for information about all types of medications that the client is taking, including prescription medications, nonprescription medications (especially analgesics and laxatives), vitamin supplements, and herbal medications.
   2. Be sure the client understands the purpose, dosage, side effects, and any special considerations or interactions for all medications.
   3. Discuss the client's abilities to obtain medications (i.e., renewing prescriptions, paying for medications).
   4. Polypharmacy is often present. Average older adult takes 11 prescription medications per day.

F. Nutrition and hydration
   1. Obtain food/fluid intake profile (either 24 hours or 3 days).
   2. Determine any difficulties ingesting food/fluids (chewing, salivation, swallowing, manual dexterity, tremors).
   3. Any foods the client is unable to eat (dairy products, sodium, sugar) or foods the client should eat (potassium- or calcium-rich foods/fluids).
   4. Inquire if an adequate amount of water is taken daily to stay hydrated.
   5. Inquire if able to afford/purchase/prepare food.

G. Past medical history
   1. Inquire about all chronic diseases and conditions. Be aware that the client may not even consider certain conditions treatable and therefore does not mention them, e.g., urinary incontinence or pain from arthritis.
   2. Obtain information about previous illnesses, hospitalizations, and surgeries.

Physical Examination

A. Assess body systems as indicated.
B. Note physical changes in the older adult (see Table 4-11).

Laboratory/Diagnostic Tests

A. Laboratory tests as indicated according to symptoms of individual client.
B. Interpret lab test results with aging changes in mind.

ANALYSIS

Nursing diagnoses for older adult clients may include:
A. Activity intolerance
B. Bowel incontinence, constipation, diarrhea
C. Acute or chronic pain
D. Anxiety or death anxiety
E. Deficient fluid volume
F. Risk for infection
G. Impaired memory
H. Impaired physical mobility
I. Impaired oral mucous membrane
J. Imbalanced nutrition: less or more than body requirements
K. Ineffective airway clearance or breathing pattern, or impaired gas exchange
L. Self-care deficits: feeding, bathing/hygiene, dressing/grooming, toileting
M. Disturbed body image or ineffective role performance
N. Disturbed sensory perception
O. Sexual dysfunction
P. Impaired skin integrity
Q. Disturbed sleep pattern
R. Disturbed thought processes
S. Ineffective tissue perfusion
T. Impaired urinary elimination
U. Deficient diversional activity
V. Wandering
W. Impaired social interaction
X. Risk for other-directed violence
Y. Risk for falls or injury
Z. Relocation stress syndrome
AA. Impaired home maintenance

PLANNING AND IMPLEMENTATION

Goals

Client will maintain:
A. Maximum functional independence
B. Normal bowel and bladder elimination patterns
C. Sufficient communication skills
D. Positive self-concept
E. Freedom from injury and infection
F. Optimal cognitive functioning
G. Adequate nutritional status and fluid balance
H. A restful sleep pattern
I. Social contacts and interpersonal needs
J. Treatment regimens as prescribed

INTERVENTIONS

Pharmacotherapy in the Older Adult

A. General information
   1. Decreased body weight, dehydration, alterations in fat to muscle ratio, and slowed organ functioning may cause accumulation of a drug in the body due to higher concentrations in the tissues and slowed metabolism and excretion of the drug.
   2. Multiple chronic diseases affecting older adults may also cause changes in the metabolism and excretion of medications.

3. Medication errors among older community-dwelling adults are estimated to be 25–50%.
4. Drug-drug interactions are increased secondary to older adults often having more than one prescribing health care provider.

B. Nursing care
1. Conduct a "brown bag" evaluation to assess all prescription, over-the-counter, and herbal medications the client may be taking.
2. Assess the client's understanding of the reasons for the drug therapy.
3. Assess the client's vision, memory, judgment, reading level, hand dexterity, and motivation to determine ability to self-medicate.
4. Provide instructions in large-print, premeasured syringes, memory aids, and daily drug dose containers to enhance self-medicating abilities.
5. Check with the pharmacist for any drug-drug interactions if unsure.
6. Before beginning a medication, obtain baseline vital signs, mental status, vision, and bowel/bladder function.
7. Drug-induced side effects may present as confusion, incontinence, falls, or immobility.
8. Assess the client's ability to pay for the prescriptions.
9. If the client requires assistance in taking medications, teach family members. Proper techniques for administering oral medications include: position head forward with neck slightly flexed to facilitate swallowing and avoid risk of aspiration.
10. If client has swallowing difficulties, obtain liquid forms of oral medications wherever possible.
11. Assess client for effectiveness of medications and any adverse reactions.

EVALUATION

A. Client performs self-care activities or caregiver provides assistance as needed.
B. Client is continent of bowel and bladder; voids in adequate amounts and has regular bowel movements.
C. Client is able to successfully communicate needs and concerns.
D. Client makes positive statements about self.
E. Client/caregiver modifies environment to support safety.
F. Client is alert, calm, and oriented, if possible.
G. Skin is intact without pressure ulcers.
H. Client eats a nutritionally balanced diet and maintains a stable weight.
I. Client maintains friends, social interactions, and sexual function.
J. Client describes and adheres to treatment plan.

CONDITIONS

Senile Dementia, Alzheimer's Disease

See also Unit 7.

A. General information
1. In dementia, the elderly client is alert with a progressive decline in memory and cognition accompanied by personality and behavioral changes.
2. Alzheimer's disease accounts for 60–75% of all dementias and is the number one reason for institutionalization of the elderly.
3. Other types of dementias include:
   a. Vascular: small infarctions in the brain result in dementia. Risk factors include hyperlipidemia, hypertension, and smoking.
   b. Frontoparietal: atrophy of neurons in the frontal lobes of the brain. Early symptoms are behavioral rather than cognitive abnormalities. (Pick's disease is most common.)

B. Medical management
1. Rule out other conditions that might be causing symptoms. A definitive diagnosis of Alzheimer's disease can only be made upon autopsy.
2. Medications for treatment include tacrine (Cognex), donepezil (Aricept), rivastigmine (Exelon), or galantamine (Reminyl).
   a. Used in mild to moderate stages of the disease: 25% of clients show symptom improvement, and 80% of clients show a delay in decline of cognition.
   b. Nursing considerations: Monitor for bradycardia and GI side effects, including anorexia and weight loss.
3. Treatment goals are to minimize behavioral symptoms, i.e., agitation, and maximize quality of life.

C. Assessment findings
1. Early in the disease process, may become depressed or anxious. Increased risk of suicide at this time.
2. See Table 4-13, for stages of Alzheimer's disease.

D. Nursing interventions
1. Provide a safe environment, e.g., bed in lowest position; check on client frequently; avoid restraints (increases agitation); use night-lights.
2. Provide structured environment and simple routines, e.g., lowered noise levels; appropriate lighting; confined area for wandering.
3. Enlist caregiver's assistance in assessing routine and establishing plan of care.

Table 4–13 Stages of Alzheimer's Disease

Stage	Timeframe	Clinical Manifestations
Early	2–4 years	Forgetfulness; poor memory (may compensate by using notes) Declining interest in people, environment, and current events Impaired acquisition of new information Impaired judgment; mild cognitive changes job performance declines; may lose job May be apathetic, irritable, or show signs of depression Normal EEG and CT
Middle	2–12 years	Progressive memory loss Disorientation to time, place, and events Impaired ability to follow simple directions or simple math Significant impairment of cognitive function and judgment Wanders at night due to sleep-wake cycle disturbance Neglects personal hygiene and activities of daily living Becomes increasingly irritable, evasive, and anxious May experience episodes of violent behavior EEG—slowing; CT—normal or dilated ventricles
Late	8–12 years	Extreme weight loss secondary to lack of eating Severe impairment of all cognitive functions Unable to communicate (verbal or written) Dependent on others for activities of daily living Incontinent of urine and feces Pathological reflexes can be elicited Motor skills are lost; becomes bedridden EEG—diffuse slowing CT—dilated ventricles and sulcal enlargement

4. Use touch and a calm, relaxed manner in approaching the client.
5. Facilitate effective communication.
   a. Face the client and speak clearly using simple words and short sentences.
   b. Keep directions simple and choices to a minimum (e.g., "Do you want to eat chicken or fish?").
   c. Allow ample time for responses.
6. Encourage orientation with use of calendars and clocks; constantly reorienting the client is frustrating to all; consider validation therapy.
7. Have family bring items that stimulate memory, e.g., photographs and personal belongings, to the room.
8. Encourage mobility and provide opportunities for exercise, including walking and range of motion.
9. Avoid isolating the client; provide some stimulation such as soft music or television.
10. Provide nutritious, high-fiber foods and adequate fluids to maintain weight and hydration. Finger foods are a good choice.
11. Promote bowel and bladder continence by toileting at regular intervals.
12. Provide a simple bedtime routine that facilitates sleep, and encourage daytime activities to avoid excess napping.

ELDER MISTREATMENT

A. General information
   1. Elder mistreatment can take the form of abuse or neglect.
   2. Abuse may be actual injury inflicted or verbal insults, the use of physical or chemical restraints, financial abuse of money or assets, withholding food/fluids/medications, sexual abuse, or abandonment.
   3. The most common type of neglect is self-neglect in which the older adult is unable or unwilling to provide for him/herself. The responsible caregiver may also neglect by not providing necessary services or care.
   4. A range of 4–10% of the older population experience elder mistreatment.

B. Assessment findings
   1. Identify individuals at risk.
      a. Women over 75 years old who live with relatives and are physically, socially, and/or financially dependent.
      b. Persons whose primary caregivers express resentment, anger, or frustration with the older adult.
   2. Clues to mistreatment
      a. Signs and symptoms may include poor hygiene and grooming, failure to thrive

(malnutrition), oversedation, depression, and/or fearfulness.
   b. Skin provides objective evidence. Look for bruises, burns, lacerations, or pressure ulcers.
3. When assessing for mistreatment, the nurse should consider:
   a. Is the person in immediate danger of bodily harm?
   b. Is the person competent to make decisions regarding self care?
   c. What is the degree and significance of the person's functional impairments?
   d. What specific services might help to meet the unmet needs?
   e. Who in the family is involved and to what extent?
   f. Are the client and family willing to accept interventions?

C. Nursing interventions
1. Report suspected mistreatment to adult protective services.
2. Obtain client's consent for treatment.
3. Document nursing assessments of client's physical and emotional status.

OSTEOPOROSIS (See Unit 6)

CEREBRAL VASCULAR ACCIDENT
(See Cerebrovascular Accident [CVA])

BENIGN PROSTATIC HYPERTROPHY
(See Disorder of the Male Reproductive System)

CATARACTS (See Disorders of the Eye)

GLAUCOMA (See Disorders of the Eye)

Sample Questions

51. What pulmonary function is common in elderly clients?
1. Reduction in vital capacity.
2. A decrease in residual volume.
3. An increase in functional alveoli.
4. Blood gases that reflect mild acidosis.

52. Which is a normal sign of aging in the renal system?
1. Intermittent incontinence.
2. Concentrated urine.
3. Microscopic hematuria.
4. A decreased glomerular filtration rate.

53. An elderly client reports using more salt in food to enhance flavor. What explains the reason for this action?
1. A decreased number of taste buds.
2. Confusion because of advanced age.
3. A need for more sodium to ensure renal function.
4. An attempt to compensate for lost fluids.

54. Which assessment finding in the elderly is caused by decreased vessel elasticity and increased peripheral resistance?
1. Confusion and disorientation.
2. An irregular peripheral pulse rate.
3. An increase in blood pressure.
4. Wide QRS complexes on the ECG.

55. Which action by the CNA would the nurse correct in the care of the older client with a hearing problem?
1. Facing the client, speaking slowly and clearly.
2. Examining the ear for cerumen accumulation.
3. Assisting the client with hearing aid placement.
4. Speaking loudly when talking to the client.

56. An elderly client repeatedly talks about how he wishes he was as strong and energetic as he was when he was younger. In planning care for this client, the nurse should include which of the following?
1. Use of the intervention reminiscence.
2. Confrontation of the client about being so grim.
3. Changing the topic whenever he brings it up.
4. Incorporation of a humorous view of the normal loss of strength.

57. An elderly woman is hospitalized for dehydration. During the admission interview, she admits to the nurse that she is depressed. The nurse would expect this client to exhibit which of the following symptoms?
1. Increased energy level.
2. Increased anxiety.
3. Increased autonomy.
4. Increased socialization.

58. Knowing the difference between normal age-related changes and pathologic findings, which finding should the nurse identify as pathologic in a 74-year-old client?
1. Increase in residual lung volume.
2. Decrease in sphincter control of the bladder.
3. Increase in diastolic blood pressure.
4. Decreased response to touch, heat, and pain.

59. A sexually active 63-year-old client complains of painful intercourse secondary to vaginal dryness. Which information is most important for the nurse to include in a teaching plan for this client?

1. Discuss with the client all the medications being taken, including over-the-counter drugs, in order to determine a possible etiology for the dryness.
2. Teach the client alternative methods of intimacy in the form of touch.
3. Instruct the client to use an artificial water-based lubricant in the vagina to decrease the discomfort of intercourse.
4. Prepare the client for a vascular work-up because the dryness is often related to vascular deficiencies.

60. An older client, who has medically controlled manic-depression and asthma has been prescribed cardiac medications for congestive heart failure. He complains to the home care nurse that he is nauseated. It would be justifiable for the nurse to reach which of the following conclusions as to the cause of the client's nausea?

1. The reaction between the new medication regime and the foods caused the nausea.
2. The problem of polypharmacy may exist as the client symptomatology may be a result of multiple drug interactions.
3. The nausea could be psychosomatic and related to the client's depression over having to take new medications.
4. The client may be taking too much of his new medications, which may contribute to his symptoms.

61. An older client has several medications ordered and has difficulty swallowing them. What strategy should the nurse use to administer these medications?

1. Hide the medication by placing them in meat.
2. Crush the medication and mix them with soft foods.
3. Substitute injectable medications.
4. Dissolve medications in liquid.

62. Which of the following measures is necessary to incorporate into a plan of care for a client who is diagnosed with senile dementia?

1. Because these clients are easily bored, they need to be challenged with new activities.
2. Environmental stimuli need to be eliminated.
3. Communicate in simple words, short sentences, and a calm tone of voice.
4. Schedule more demanding activities later in the day.

63. A 76-year-old man who is a resident in an extended care facility is in the late stages of Alzheimer's disease. He tells his nurse that he has sore back muscles from all the construction work he has been doing all day. Which response by the nurse is most appropriate?

1. "You know you don't work in construction anymore."
2. "What type of motion did you do to precipitate this soreness?"
3. "You're 76 years old and you've been here all day. You don't work in construction anymore."
4. "Would you like me to rub your back for you?"

64. An 86-year-old male with senile dementia has been physically abused and neglected for the past two years by his live-in caregiver. He has since moved and is living with his son and daughter-in-law. Which response by the client's son would cause the nurse great concern?

1. "How can we obtain reliable help to assist us in taking care of Dad? We can't do it alone."
2. "Dad used to beat us kids all the time. I wonder if he remembered that when it happened to him?"
3. "I'm not sure how to deal with Dad's constant repetition of words."
4. "I plan to ask my sister and brother to help my wife and me with Dad on the weekends."

65. An alert and oriented 84-year-old client is receiving home care services following a cerebrovascular accident (CVA) that has left her with right-sided hemiparesis. She lives with her middle-aged daughter and son-in-law. The nurse suspects she is being physically abused by her daughter. To elicit information effectively, the nurse should do which of the following?

1. Directly ask the client if she has been physically struck or hurt by anyone.
2. Wait until enough trust has been developed to enable the client to approach the nurse first.
3. Confront the daughter with the suspicions.
4. Interview the son-in-law to gain his perspective of the situation.

Answers and Rationales

51. 1. Muscles weaken reducing capability to cough or deep breathe, which reduces total lung capacity.

52. 4. The glomerular filtration rate is decreased dramatically in the elderly due to changes in the renal tubules.

53. 1. The taste buds begin to atrophy at age 40, and insensitivity to taste qualities occurs after age 60. Studies related to diminished taste indicate that there are changes in the salt threshold for some elderly individuals.

54. 3. The blood pressure increases in response to the thickening of vessels and less distensible arteries and veins. There is also impedance to blood flow and increased systemic vascular resistance, contributing to hypertension.

55. 4. Raising the voice to speak loudly only increases the emission of higher frequency sounds, which the elderly client with presbycusis (a progressive bilateral perceptive loss of hearing in the older individual that occurs with the aging process) will have difficulty hearing.

56. 1. Assisting the older adult in reminiscing, or engaging in a "life review" process, is one way to assist the individual to accomplish developmental tasks. One such task, adjusting to decreasing physical strength, needs to be met to establish and preserve ego integrity.

57. 2. Many psychosocial symptoms occur with depression, including feelings of hopelessness, helplessness, and increased anxiety, which contributes to despair rather than ego integrity.

58. 3. A modest increase in systolic blood pressure, not diastolic blood pressure, is an expected age-related change due to an increase in vascular resistance and vessel rigidity. An increase in diastolic blood pressure, however, is not an expected age-related change. It is pathologic and needs to be monitored.

59. 3. The decrease in vaginal secretions, which contributes to vaginal dryness and subsequent painful intercourse, is a normal age-related change. Using a lubricant will decrease or eliminate this discomfort.

60. 2. Polypharmacy is the prescription, use, or administration of five or more medications. If not coordinated, different physicians, each focusing on a specific disease process, contribute to polypharmacy.

61. 2. Medications, crushed and mixed with soft foods, are easier to digest for persons who have difficulty swallowing.

62. 3. Keep communications simple and concrete. Close-ended questions are more beneficial than open-ended questions, which may require complex answers that serve only to confuse the client. Even if the client isn't able to fully comprehend communications, a calm tone of voice may alleviate any stress.

63. 4. In the late stages of Alzheimer's disease, it is better to go along with the client's reality rather than confront him with logic and reasoning. Asking close-ended, simple questions that relate to his reality is nonthreatening and calming. Note that the nurse responds in a way that is congruent with his main concern, which is his sore back.

64. 2. This statement is a cause for concern. Abusive patterns are highly likely to be passed from parents to children. When children grow up and move into positions where they are caring for their aged parents (role reversal), the abusive behavior can surface.

65. 1. Direct questioning, in an open and accepting manner, is important. Abused elders are often reluctant to report abuse and will not volunteer the information on their own. Clients need to feel free to indicate the existence of an activity about which they may feel embarrassment and shame.

Perioperative Nursing

OVERVIEW

Effects of Surgery on the Client

Physical Effects

A. Stress response (neuroendocrine response) is activated.

B. Resistance to infection is lowered due to surgical incision.

C. Vascular system is disturbed due to severing of blood vessels and blood loss.

D. Organ function may be altered due to manipulation.

Psychologic Effects

Common fears: pain, anesthesia, loss of control, disfigurement, separation from loved ones, alterations in roles or lifestyle.

Factors Influencing Surgical Risk

A. Age: very young and elderly are at increased risk.
B. Nutrition: malnutrition and obesity increase risk of complications.
C. Fluid and electrolyte balance: dehydration, hypovolemia, and electrolyte imbalances can pose problems during surgery.
D. General health status: infection, cardiovascular disease, pulmonary problems, liver dysfunction, renal insufficiency, or metabolic disorders create increased risk.
E. Medications
  1. Anticoagulants (including aspirin and NSAIDs) predispose to hemorrhage; discontinue use according to physician's orders.
  2. Tranquilizers (e.g., phenothiazines) may cause hypotension and potentiate shock.
  3. Antibiotics: aminoglycosides may intensify neuromuscular blockade of anesthesia with resultant respiratory paralysis.
  4. Diuretics: may cause electrolyte imbalances.
  5. Antihypertensives: can cause hypotension and contribute to shock.
  6. Long-term steroid therapy: causes adrenocortical suppression; may need increased dosage during perioperative period.
F. Type of surgery planned: major surgery (e.g., thoracotomy) poses greater risk than minor surgery (e.g., dental extraction).
G. Psychologic status of client: excessive fear or anxiety may have adverse effect on surgery.

PREOPERATIVE PERIOD

Psychologic Support

A. Assess client's fears, anxieties, support systems, and patterns of coping.
B. Establish trusting relationship with client and significant others.
C. Explain routine procedures, encourage verbalization of fears, and allow client to ask questions.
D. Demonstrate confidence in surgeon and staff.
E. Provide for spiritual care if appropriate.

Preoperative Teaching

A. Frequently done on an outclient basis.
B. Assess client's level of understanding of surgical procedure and its implications.
C. Answer questions, clarify and reinforce explanations given by surgeon.
D. Explain routine pre- and post-op procedures and any special equipment to be used.
E. Teach coughing and deep-breathing exercises, splinting of incision, turning side to side in bed, and leg exercises; explain their importance in preventing complications; provide opportunity for return demonstration.
F. Assure client that pain medication will be available post-op.

Physical Preparation

A. Obtain history of past medical conditions, surgical procedures, allergies, dietary restrictions, and medications.
B. Perform baseline head-to-toe assessment, including vital signs, height, and weight.
C. Ensure that diagnostic procedures are performed as ordered. Common tests are:
  1. CBC (complete blood count)
  2. Electrolytes
  3. PT/PTT (prothrombin time; partial thromboplastin time)
  4. Urinalysis
  5. ECG (electrocardiogram)
  6. Type and crossmatch
  7. Chest X-ray
D. Prepare client's skin.
  1. Shower with antibacterial soap to cleanse skin if ordered; client may do this at home the night before surgery if outpatient admission.
  2. Skin prep if ordered: shave or clip hairs and cleanse appropriate areas to reduce bacteria on skin and minimize chance of infection.
E. Administer enema if ordered (usually for surgery on GI tract, gynecologic surgery).
F. Promote adequate rest and sleep.
  1. Provide back rub, clean linens.
  2. Administer bedtime sedation.
G. Instruct client to remain NPO after midnight to prevent vomiting and aspiration during surgery.

Legal Responsibilities

A. Surgeon obtains operative permit (informed consent).
  1. Surgical procedure, alternatives, possible complications, disfigurements, or removal of body parts are explained.
  2. It is part of the nurse's role as client advocate to confirm that the client understands information given.
B. Informed consent is necessary for each operation performed, however minor. It is also necessary for major diagnostic procedures, e.g., bronchoscopy, thoracentesis, etc., where a major body cavity is entered.

C. Adult client (over 18 years of age) signs own permit unless unconscious or mentally incompetent.
  1. If unable to sign, relative (spouse or next of kin) or guardian will sign.
  2. In an emergency, permission via telephone or telegram is acceptable; have a second nurse verify by phone the telephone permission; both nurses will sign the consent form.
  3. Consents are not needed for emergency care if all four of the following criteria are met.
    a. There is an immediate threat to life.
    b. Experts agree that it is an emergency.
    c. Client is unable to consent.
    d. A legally authorized person cannot be reached.

D. Minors (under 18) must have consent signed by an adult (i.e., parent or legal guardian). An emancipated minor (married, college student living away from home, in military service, any pregnant female or any who has given birth) may sign own consent.

E. Witness to informed consent may be nurse, another physician, or other authorized person.

F. If nurse witnesses informed consent, specify whether witnessing explanation of surgery or just signature of client.

Preparation Immediately before Surgery

A. Obtain baseline vital signs; report elevated temperature or blood pressure.

B. Provide oral hygiene and remove dentures.

C. Remove client's clothing and dress in clean gown.

D. Remove nail polish, cosmetics, hair pins, contact lenses, prostheses, and any body jewelry.

E. Instruct client to empty bladder.

F. Check identification band.

G. Administer pre-op medications as ordered.
  1. Narcotic analgesics (meperidine [Demerol], morphine sulfate) relax client, reduce anxiety, and enhance effectiveness of general anesthesia.
  2. Sedatives (secobarbital sodium [Seconal]), sodium pentobarbital [Nembutal] decrease anxiety and promote relaxation and sleep.
  3. Anticholinergics (atropine sulfate, scopolamine [Hyoscine]) and glycopyrrolate (Robinul) decrease tracheobronchial secretions to minimize danger of aspirating secretions in lungs, decrease vagal response to inhibit undesirable effects of general anesthesia (bradycardia).
  4. Droperidol, fentanyl, or a combination may be ordered; should not be given with sedatives because of danger of respiratory depression; also helpful in control of postoperative nausea and vomiting.

H. Elevate side rails and provide quiet environment.

I. Prepare client's chart for OR, including operative permit and complete pre-op check list.

J. Stay with client after pre-op medications have been given and assist with bedpan for toileting needs.

INTRAOPERATIVE PERIOD

Anesthesia

General Anesthesia

A. General information
  1. Drug-induced depression of CNS; produces decreased muscle reflex activity and loss of consciousness.
  2. Balanced anesthesia: combination of several anesthetic drugs to provide smooth induction, appropriate depth and duration of anesthesia, sufficient muscle relaxation, and minimal complications.

B. Stages of general anesthesia: induction, excitement, surgical anesthesia, and danger stage (see Table 4-14).

C. Agents for general anesthesia
  1. Inhalation agents may be gas or liquid.
  2. IV anesthetics: used as induction agents because they produce rapid, smooth

Table 4–14 Stages of Anesthesia

Stage	From	To	Client Status
Stage I (induction)	Beginning administration of anesthetic agent	Loss of consciousness	May appear euphoric, drowsy, dizzy.
Stage II (delirium or excitement)	Loss of consciousness	Relaxation	Breathing irregular; may appear excited; very susceptible to external stimuli.
Stage III (surgical anesthesia)	Relaxation	Loss of reflexes and depression of vital functions	Regular breathing pattern; corneal reflexes absent; papillary constriction.
Stage IV (danger stage)	Vital functions depressed	Respiratory arrest; possible cardiac arrest	No respirations; absent or minimal heartbeat; dilated pupils.

induction; may be used alone in short procedures such as endoscopies.
   a. Common IV anesthetics: methohexital (Brevital), sodium thiopental (Pentathol), midazolam hydrochloride (Versed)
   b. Disadvantages: poor relaxation; respiratory and myocardial depression in high doses; bronchospasm, laryngospasm; hypotension, respiratory depression

3. Dissociative agents: produce state of profound analgesia, amnesia, and lack of awareness without loss of consciousness; used alone in short surgical and diagnostic procedures or for induction prior to administration of more potent general anesthetics.
   a. Agent: ketamine (Ketalar)
   b. Side effects: tachycardia, hypertension, respiratory depression, hallucinations, delirium
   c. Precautions: decrease verbal, tactile, and visual stimulation during recovery period

4. Neuroleptics: produce state of neuroleptic analgesia characterized by reduced motor activity, decreased anxiety, and analgesia without loss of consciousness; used alone for short surgical and diagnostic procedures, as premedication or in combination with other anesthetics for longer anesthesia.
   a. Agent: fentanyl citrate with droperidol (Innovar)
   b. Side effects: hypotension, bradycardia, respiratory depression, skeletal muscle rigidity, twitching
   c. Precautions: reduce narcotic doses by ½ to ⅓ for at least 8 hours postanesthesia as ordered to prevent respiratory depression.

D. Adjuncts to general anesthesia: neuromuscular blocking agents: used with general anesthetics to enhance skeletal muscle relaxation.
   1. Agents: pancuronium (Pavulon), succinylcholine (Anectine), tubocurarine, atracurium besylate (Tracrium), vecuronium bromide (Norcuron)
   2. Precaution: monitor client's respirations for at least 1 hour after drug's effect has worn off.

Regional Anesthesia

A. General information (see also Table 4-15).
   1. Produces loss of painful sensation in one area of the body; does not produce loss of consciousness
   2. Uses: biopsies, excision of moles and cysts, endoscopies, surgery on extremities; childbirth
   3. Agents: lidocaine (Xylocaine), procaine (Novocain), tetracaine (Pontocaine)

Table 4–15 Regional Anesthesia

Types	Method
Topical	Cream, spray, drops, or ointment applied externally, directly to area to be anesthetized.
Local infiltration block	Injected into subcutaneous tissue of surgical area.
Field block	Area surrounding the surgical site injected with anesthetic.
Nerve block	Injection into a nerve plexus to anesthetize part of body.
Spinal	Anesthetic introduced into subarachnoid space of spinal cord producing anesthesia below level of diaphragm.
Epidural	Anesthetic injected extradurally to produce anesthesia below level of diaphragm; used in obstetrics.
Caudal	Variation of epidural block; produces anesthesia of perineum and occasionally lower abdomen; commonly used in obstetrics.
Saddle block	Similar to spinal, but anesthetized area is more limited; commonly used in obstetrics.

Conscious Sedation

A. General information
   1. Intravenous conscious sedation is induced by pharmacologic agents.
   2. Sedative and analgesic medications are used to achieve an altered state of consciousness with minimal risk, relief of anxiety, an amnestic state, and pain relief from noxious stimuli.
   3. These agents may include a combination of a benzodiazepine (midazolam, diazepam) and a narcotic (fentanyl, morphine).
   4. This provides a safe and effective option for clients undergoing minor surgical and diagnostic procedures such as, but not limited to, endoscopic procedures, breast biopsy, dental surgery, and plastic surgery.
   5. Conscious sedation is extremely safe when administered by qualified providers.
      a. Certified registered nurse anesthetists (CRNAs), anesthesiologists, dentists, oral surgeons, and other physicians are qualified providers of conscious sedation.
      b. Specifically trained registered nurses may assist in the administration of conscious sedation.
   6. Verbal communication with the client can be maintained throughout the procedure, client may have a brief period of amnesia which may erase any memory of the procedure.
   7. This will provide reassurance to a cooperative client and help monitor intact neurological status.
   8. Supplemental oxygen should always be given to a client receiving conscious sedation.

9. Constant vigilance in monitoring of cardiorespiratory status (heart rate and rhythm, blood pressure, respiratory rate, and pulse oximetry) is crucial.
10. The provider who monitors the client receiving conscious sedation should have no other responsibilities during the procedure and should never abandon that client for any reason.

POSTOPERATIVE PERIOD

Postoperative Care

Recovery Room (Immediate Postoperative Care)

A. Assess for and maintain patent airway.
1. Position unconscious or semiconscious client on side (unless contraindicated) or on back with head to side and chin extended forward.
2. Check for presence/absence of gag reflex.
3. Maintain artificial airway in place until gag and swallow reflex have returned.

B. Administer oxygen as ordered.
C. Assess rate, depth, and quality of respirations.
D. Check vital signs every 15 minutes until stable, then every 30 minutes.
E. Note level of consciousness; reorient client to time, place, and situation.
F. Assess color and temperature of skin, color of nailbeds, and lips.
G. Monitor IV infusions: condition of site, type, and amount of fluid being infused and flow rate.
H. Check all drainage tubes and connect to suction or gravity drainage as ordered; note color, amount, and odor of drainage.
I. Assess dressings for intactness, drainage, hemorrhage.
J. Monitor and maintain client's temperature; may need extra blankets.
K. Encourage client to cough and deep breathe after artificial airway is removed.
L. If spinal anesthesia used, maintain flat position and check for sensation and movement in lower extremities.

Care on Surgical Floor

A. Monitor respiratory status and promote optimal functioning.
1. Encourage client to cough (if not contraindicated) and deep breathe every 1–2 hours.
2. Instruct client to splint incision while coughing.
3. Assist client to turn in bed every 2 hours.
4. Encourage early ambulation.
5. Encourage use of incentive spirometer every 2 hours: causes sustained, maximal inspiration that inflates the alveoli.
6. Assess respiratory status and auscultate lungs every 4 hours; be alert for any signs of respiratory complications.

B. Monitor cardiovascular status and avoid post-op complications.
1. Encourage leg exercises every 2 hours while in bed.
2. Encourage early ambulation.
3. Apply antiembolism stockings as ordered.
4. Assess vital signs, color and temperature of skin every 4 hours.

C. Promote adequate fluid and electrolyte balance.
1. Monitor IV and ensure adequate intake.
2. Measure I&O.
3. Irrigate NG tube properly, using normal saline solution.
4. Observe for signs of fluid and electrolyte imbalances.

D. Promote optimum nutrition.
1. Maintain IV infusion as ordered.
2. Assess for return of peristalsis (presence of bowel sounds and flatus); peristalsis may take hours to return.
3. Add progressively to diet as ordered and note tolerance.

E. Monitor and promote return of urinary function.
1. Measure I&O.
2. Assess client's ability to void.
3. Report to surgeon if client has not voided within 8 hours after surgery.
4. Check for bladder distention.
5. Use measures to promote urination (e.g., assist male to sit on side of bed, pour warm water over female's perineum).

F. Promote bowel elimination.
1. Encourage ambulation.
2. Provide adequate food and fluid intake when tolerated.
3. Keep stool record and note any difficulties with bowel elimination.

G. Administer post-op analgesics as ordered; provide additional comfort measures.
H. Encourage optimal activity, turning in bed every 2 hours, early ambulation if allowed (generally client will be out of bed within 24 hours; have client dangle legs before getting out of bed).
I. Provide wound care.
1. Check dressings frequently to ensure they are clean, dry, and intact.
2. Observe aseptic technique when changing dressings.
3. Encourage diet high in protein and vitamin C.
4. Report any signs of infection: redness, drainage, odor, fever.

J. Provide adequate psychologic support to client/significant others.
K. Provide appropriate discharge teaching: dietary restrictions, medication regimen, activity limitations, wound care, and possible complications.

Postoperative Complications

Respiratory System

Common post-op complications of respiratory tract are atelectasis and pneumonia.

A. Predisposing factors
  1. Type of surgery (e.g., thoracic or high abdomen surgery)
  2. Previous history of respiratory problems
  3. Age: greater risk over age 40
  4. Obesity
  5. Smoking
  6. Respiratory depression caused by narcotics
  7. Severe post-op pain
  8. Prolonged post-op immobility

B. Prevention: see Care on Surgical Floor.

Cardiovascular System

Common post-op complications of the cardiovascular system are deep vein thrombosis, pulmonary embolism, and shock.

A. Predisposing factors to deep venous thrombosis (DVT)
  1. Lower abdominal surgery or septic diseases (e.g., peritonitis)
  2. Injury to vein by tight leg straps during surgery
  3. Previous history of venous problems
  4. Increased blood coagulability due to dehydration, fluid loss
  5. Venous stasis in the extremity due to decreased movement during surgery
  6. Prolonged post-op immobilization

B. Predisposing factors to pulmonary embolism: may occur as a complication of DVT.

C. Most common causes of shock during post-op period
  1. Hemorrhage
  2. Sepsis
  3. Myocardial infarction and cardiac arrest
  4. Drug reactions
  5. Transfusion reactions
  6. Pulmonary embolism
  7. Adrenal failure

D. Prevention of DVT, pulmonary embolism, and shock: see Care on Surgical Floor.

Genitourinary System

Post-op complications of the genitourinary system often include urinary retention and urinary tract infection.

A. Predisposing factors to urinary retention include:
  1. Anxiety
  2. Pain
  3. Lack of privacy
  4. Narcotics and certain anesthetics that diminish client's sense of a full bladder

B. Prevention and nursing interventions for urinary retention: see Care on Surgical Floor.

C. Post-op urinary tract infections are most commonly caused by catheterization; prevention consists of using strict sterile technique when inserting a catheter, and appropriate catheter care (every 8 hours or according to agency protocol).

Gastrointestinal System

An important GI post-op complication is paralytic ileus (paralysis of intestinal peristalsis).

A. Predisposing factors
  1. Temporary: anesthesia, manipulation of bowel during abdominal surgery
  2. Prolonged: electrolyte imbalance, wound infection, pneumonia

B. Assessment findings
  1. Absent bowel sounds
  2. No passage of flatus
  3. Abdominal distention

C. Nursing interventions
  1. Assist with insertion of nasogastric or intestinal tube with application of suction as ordered.
  2. Keep client NPO.
  3. Maintain IV therapy as ordered.
  4. Assess for bowel sounds every 4 hours; check for abdominal distention, passage of flatus.
  5. Encourage ambulation if appropriate.

Wound Complications

A. Wound infection
  1. Predisposing factors
    a. Obesity
    b. Diabetes mellitus
    c. Malnutrition
    d. Elderly clients
    e. Steroids and immunosuppressive agents
    f. Lowered resistance to infection, as found in clients with cancer
  2. Assessment findings: redness, tenderness, drainage, heat in incisional area; fever; usually occurs 3–5 days after surgery.
  3. Prevention: see Care on Surgical Floor.
  4. Nursing interventions
    a. Obtain culture and sensitivity of wound drainage (*S. aureus* most frequently cultured).
    b. Perform cleansing and irrigation of wound as ordered.
    c. Administer antibiotic therapy as ordered.

B. Wound dehiscence and evisceration
  1. Dehiscence: opening of wound edges
  2. Evisceration: protrusion of loops of bowel through incision; usually accompanied by sudden escape of profuse, pink serous drainage
  3. Predisposing factors to wound dehiscence and evisceration
    a. Wound infection
    b. Faulty wound closure
    c. Severe abdominal stretching (e.g., coughing, retching)

4. Nursing interventions for wound dehiscence
   a. Apply Steri-Strips to incision.
   b. Notify physician.
   c. Promote wound healing.
5. Nursing interventions for wound evisceration
   a. Place client in supine position.
   b. Cover protruding intestinal loops with sterile moist normal saline soaks.
   c. Notify physician.
   d. Check vital signs.
   e. Observe for signs of shock.
   f. Start IV line.
   g. Prepare client for OR for surgical closure of wound.

Sample Questions

66. An adult man is in the postanesthesia care unit (PACU) following a hemicolectomy. How often will the nurse monitor the vital signs?
1. Continuously.
2. Every 5 minutes.
3. Every 15 minutes.
4. On a prn basis.

67. An adult who has had general anesthesia for major surgery is in the PACU. Which of the following indicates the artificial airway should be removed?
1. Gagging.
2. Restlessness.
3. An increase in pain.
4. Clear lungs on auscultation.

68. An adult is 6 days post abdominal surgery. Which sign alerts the nurse to wound evisceration?
1. Acute bleeding.
2. Protruding intestines.
3. Purple drainage.
4. Severe pain.

69. An adult client's wound has eviscerated. Why would the respiratory status need to be assessed?
1. Dehiscence elevates the diaphragm.
2. Coughing increases intestine protrusion.
3. Respiratory arrest commonly accompanies wound dehiscence.
4. Splinting the wound will compromise respiratory status.

70. An adult client has acute leukemia and is scheduled for a Hickman catheter insertion under local anesthesia. What is a major advantage to the client for having regional anesthesia?
1. Retains all reflexes.
2. Remains conscious.
3. Has retroactive amnesia.
4. Is in the OR for a short period of time.

71. An adult male is scheduled for surgery and the nurse is assessing for risk factors. Which of the following are the greatest risk factors?
1. He is 5 ft 4 in tall and weighs 125 lb.
2. He expresses a fear of pain in the post-op period.
3. He is 5 ft 4 in tall, weighs 360 lb, and has diabetes.
4. He expresses a fear of the unknown.

72. The nurse in an outclient department is interviewing an adult 1 week prior to her scheduled elective surgery. In planning for the surgery, which of the following should the nurse include in her teaching?
1. Detailed information about the procedure.
2. Limitations of oral intake the day of the procedure.
3. Writing a list for postoperative complications.
4. The client should not take any of her routine medications the morning of the surgery.

73. The nurse enters a woman's room to administer the ordered pre-op medication for her hysterectomy. During the conversation, the client tells the nurse that she and her husband are planning to have another child in the coming year. The best action for the nurse to take is which of the following?
1. Do not administer the pre-op medication, notify the nursing supervisor and the physician.
2. Go ahead and administer the medication as ordered.
3. Check to see if the client has signed a surgical consent.
4. Send the client to the operating room (OR) without the medication.

74. The nurse administers 10 mg intramuscular (IM) morphine as a pre-op medication, and then discovers that there is no signed operative permit. What is the best action for the nurse to take?
1. Send the client to surgery as scheduled.
2. Notify the nursing supervisor, the OR, and the physician.
3. Cancel the surgery immediately.
4. Obtain the needed consent.

75. An adult received atropine sulfate (Atropine) as a pre-op medication 30 minutes ago and is now complaining of dry mouth and her pulse rate is higher than before the medication was administered. What is the nurse's best interpretation of these finding?

1. The client is having an allergic reaction to the drug.
2. The client needs a higher dose of this drug.
3. This is a normal side effect of Atropine.
4. The client is anxious about the upcoming surgery.

76. An adult who has chronic obstructive pulmonary disease (COPD) is scheduled for surgery and the physician has recommended an epidural anesthetic. Why would an epidural anesthetic be used instead of general anesthesia?

1. There is too high a risk for pressure sores developing.
2. There is less effect on the respiratory system with epidural anesthesia.
3. Central nervous system control of vascular constriction would be affected with general anesthesia.
4. There is too high a risk of lacerations to the mouth, bruising of lips, and damage to teeth.

77. An adult had a bunion removed under an epidural block. In the immediate post-op period, the nurse plans to assess the client for side effects of the epidural block that include which of the following?

1. Headache.
2. Hypotension, bradycardia, nausea, and vomiting.
3. Hypertension, muscular rigidity, fever, and tachypnea.
4. Urinary retention.

78. An adult received droperidol and fentanyl (Innovar) during surgery. In planning postoperative care, the nurse will need to monitor for which of the following during the immediate post-op period?

1. Restlessness and anxiety.
2. Delirium.
3. Dysrhythmias.
4. Respiratory depression.

79. An adult has just arrived on the general surgery unit from the postanesthesia care unit (PACU). Which of the following needs to be the initial intervention the nurse takes?

1. Assess the surgical site, noting the amount and character of drainage.
2. Assess for amount of urinary output and the presence of any distention.
3. Allow the family to visit with the client to decrease the anxiety of the client.
4. Take vital signs, assessing first for a patent airway and the quality of respirations.

80. An adult is receiving morphine via a PCA pump after her surgery. What statement by the nurse would best evaluate the level of pain being experienced?

1. "Please rate your pain on a scale of 1–10."
2. "Is the morphine working for you?"
3. "Are you feeling any pain?"
4. "Do you need the morphine level increased?"

81. A 58-year-old smoker underwent major abdominal surgery 2 days ago. During the respiratory assessment, the nurse notes he is taking shallow breaths and breath sounds are decreased in the bases. What is the best interpretation for these findings?

1. Pneumonia.
2. Atelectasis.
3. Hemorrhage.
4. Thromboembolism.

82. To prevent thromboembolism in the post-op client the nurse should include which of the following in the plan of care?

1. Place a pillow under the knees and restrict fluids.
2. Use strict aseptic technique including handwashing and sterile dressing technique.
3. Assess bowel sounds in all four quadrants on every shift and avoid early ambulation.
4. Assess for Homan's signs on every shift, encourage early ambulation, and maintain adequate hydration.

83. It is 2200 and the nurse notes that an adult male who returned from the PACU at 1400 has not voided. The client has an out of bed order, but has not been up yet. What is the best action for the nurse to take?

1. Insert a Foley catheter into the client.
2. Straight-catheterize the client.
3. Assist the client to stand at the side of his bed and attempt to void into a urinal.
4. Encourage the client to lie on his left side in bed and attempt to void into a urinal.

84. When assessing a post-op client, the nurse notes a nasogastric tube to low constant suction, the absence of a bowel movement since surgery, and

no bowel sounds. Based on these findings, what would be the most appropriate plan of action?

1. Increase the client's mobility and ensure he is receiving adequate pain relief.
2. Increase coughing, turning, and deep breathing exercises.
3. Discontinue the nasogastric tube as the client does not need it any more.
4. Assess for bladder pain and distention.

85. Preoperatively, the client's blood pressure was 110/70. In PACU, the vitals signs are assessed and the blood pressure is now 150/90. The client is complaining of severe pain. What is the nurse aware of due to this finding?

1. Pain does not affect the blood pressure.
2. The blood pressure elevation is an indication of hypovolemic shock.
3. Pain may cause elevated blood pressure.
4. The client needs a medication to lower the blood pressure.

Answers and Rationales

66. 3. While in the postanesthesia care unit (PACU) the client's vital signs are assessed every 15 minutes.

67. 1. The return of the gag reflex usually indicates that the client is able to manage his own secretions and maintain a patent airway.

68. 2. Evisceration is the actual intestinal contents protruding through the abdominal wall.

69. 2. Coughing increases intra-abdominal pressure, which could force loops of bowel out through the open wound.

70. 2. The client receiving regional anesthesia has nerve impulses blocked but does not lose consciousness.

71. 3. Obesity and diabetes are major risk factors with the potential for complications related to anesthesia.

72. 2. Instructions should be given to the client regarding limitations of oral intake to avoid nausea and vomiting from the anesthesia.

73. 1. No client should be administered the pre-op medication until the informed consent has been obtained. Informed consent means that the client understands the information about the surgery. Even if the consent form is signed, the nurse should withhold sedating medication. This client clearly does not understand the planned procedure.

74. 2. If a narcotic, sedative, or tranquilizing drug has been administered before signing of the consent, the drug's effects must be allowed to wear off before consent can be given.

75. 3. These are normal side effects of an anticholinergic drug; adverse side effects would include ECG changes, constipation, and urinary retention.

76. 2. Epidural anesthesia does not cause respiratory depression, but general anesthesia can, especially in a client with COPD.

77. 2. These are all symptoms of sympathetic nervous system blockade, so the client should be closely monitored for these.

78. 4. Depression of respiratory rate has been reported and tends to last longer than the analgesic effect when Innovar is used during surgery.

79. 4. A specific assessment priority is the evaluation of a patent airway and respiratory and circulatory adequacy.

80. 1. The client should obtain relief from pain, and using a scale to assess this is a more objective measure.

81. 2. Atelectasis occurs commonly after abdominal surgery, especially in smokers. This occurs when mucus blocks the bronchioles and causes decreased breath sounds and shallow breathing.

82. 4. Thromboembolism can be related to dehydration and immobility. These measures help prevent hypovolemia and subsequent sludging of cells. A positive Homan's sign is often associated with thromboembolism.

83. 3. Nursing interventions to facilitate voiding include ambulation and normal positioning for voiding. The normal voiding position for the male is standing.

84. 1. Paralytic ileus can be related to immobility and inadequate pain medication as well as bowel manipulation and the anesthetic used during surgery.

85. 3. Physical pain may increase circulating catecholamines, resulting in hypertension. The nurse should assess the pain, provide comfort measures and analgesia, and then reassess the blood pressure.

Oncologic Nursing

PATHOPHYSIOLOGY AND ETIOLOGY OF CANCER

Evolution of Cancer Cells

A. All cells constantly change through growth, degeneration, repair, and adaptation. Normal cells must divide and multiply to meet the needs of the organism as a whole, and this cycle of cell growth and destruction is an integral part of life processes. The activities of the normal cells in the human body are all coordinated to meet the needs of the organism as a whole, but when the regulatory control mechanisms of normal cells fail, and growth continues in excess of the body's needs, neoplasia results.
B. The term neoplasia refers to both benign and malignant growths, but malignant cells behave very differently from normal cells and have special features characteristic of the cancer process.
C. Because the growth control mechanism of normal cells is not entirely understood, it is not clear what allows the uncontrolled growth, therefore no definitive cure has been found.

Characteristics of Malignant Cells

Differentiation

A. Cancer cells are mutated stem cells that have undergone structural changes so that they are unable to perform the normal functions of specialized tissue (un- or dedifferentiation).
B. They may function in a disorderly way or cease normal function completely, only functioning for their own survival and growth.
C. The most undifferentiated cells are also called anaplastic.

Rate of Growth

A. Cancer cells have uncontrolled growth or cell division.
B. Rate at which a tumor grows involves both increased cell division and increased survival time of cells.
C. Malignant cells do not form orderly layers, but pile on top of each other to eventually form tumors.

Spread (Invasion and Metastasis)

A. Cancer cells are less adhesive than normal cells, more easily dissociated from their location.
B. Lack of adhesion and loss of contact inhibition make it possible for a cancer to spread to distant parts of the body (metastasis).
C. Malignant tumors are not encapsulated and expand into surrounding tissue (invasion).

Etiology (Carcinogenesis)

Actual cause of cancer is unknown but there are a number of theories; it is currently thought that there are probably multiple etiologies.

Environmental Factors

A. Majority (over 80%) of human cancers related to environmental carcinogens
B. Types
  1. Physical
    a. Radiation: X-rays, radium, nuclear explosion or waste, ultraviolet
    b. Trauma or chronic irritation
  2. Chemical
    a. Nitrites and food additives, polycyclic hydrocarbons, dyes, alkylating agents
    b. Drugs: arsenicals, stilbestrol, urethane
    c. Cigarette smoke
    d. Hormones

Genetics

A. Some cancers show familial pattern.
B. May be caused by inherited genetic defects.

Viral Theory

A. Viruses have been shown to be the cause of certain tumors in animals.
B. Oncoviruses (RNA-type viruses) thought to be culprit.
C. Viruses (HTLV-I, Epstein-Barr, Human Papilloma Virus) linked to human tumors.

Immunologic Factors

A. Failure of the immune system to respond to and eradicate cancer cells
B. Immunosuppressed individuals more susceptible to cancer

DIAGNOSIS OF CANCER

Classification and Staging

Tissue of Origin

A. Carcinoma: arises from surface, glandular, or parenchymal epithelium.
  1. Squamous cell carcinoma: surface epithelium
  2. Adenocarcinoma: glandular or parenchymal tissue
B. Sarcoma: arises from connective tissue.
C. Leukemia: starts in blood-forming tissues (i.e., bone marrow)
D. Lymphoma and multiple myeloma: starts in cells of immune system

Stages of Tumor Growth

A. Several staging systems, important in selection of therapy
  1. TNM system: uses letters and numbers to designate the extent of the tumor.
    a. T: stands for primary growth; 1–4 with increasing size. T1S indicates carcinoma in situ.
    b. N: stands for lymph node involvement; 0–4 indicates progressively advancing nodal disease.
    c. M: stands for metastasis; 0 indicates no distant metastases, 1 indicates presence of metastases.
  2. Stages 0-IV: all cancers divided into five stages incorporating size, nodal involvement, and spread.
B. Cytologic diagnosis of cancer (e.g., Pap smear)
  1. Involves study of shed cells
  2. Classified by degree of cellular abnormality
    a. Normal
    b. Probably normal (slight changes)
    c. Doubtful (more severe changes)
    d. Probably cancer or precancerous
    e. Definitely cancer

Client Factors

Early detection of cancer is crucial in reducing morbidity and mortality. Clients need to be taught about:
A. Seven warning signs of cancer (see Table 4-16).
B. Breast self-examination (BSE).
C. Importance of rectal exam for those over age 40
D. Hazards of smoking
E. Oral self-examination as well as annual exam of mouth and teeth
F. Hazards of excess sun exposure
G. Importance of Pap smear
H. Physical exam with lab work-up: every 3 years ages 20–40; yearly age 40 and over
I. Testicular self-examination (TSE)
  1. Testicular cancer: Most common cancer in young men between the ages of 15 and 34. Most testicular cancers are found by men themselves, by accident or when doing TSE.
  2. Testicular self-examination: Ideally, should be performed monthly, after a warm shower or bath, when the skin of the scrotum is relaxed. Standing in front of a mirror, the man should gently roll each testicle between the thumb and fingers of both hands. The testes are smooth, oval-shaped, and rather firm.
  3. Warning signs that men should look for:
    a. Painless swelling
    b. Feeling of heaviness
    c. Hard lump (size of a pea)
    d. Sudden collection of fluid in the scrotum
    e. Dull ache in the lower abdomen or in the groin
    f. Pain in a testicle or in the scrotum
    g. Enlargement or tenderness of the breasts

Table 4–16 Seven Warning Signs of Cancer (Caution)

C	– Change in bowel or bladder habits
A	– A sore that doesn't heal
U	– Unusual bleeding or discharge
T	– Thickening or lump in breast (or elsewhere)
I	– Indigestion or dysphagia
O	– Obvious change in wart or mole
N	– Nagging cough or hoarseness

TREATMENT OF CANCER

Chemotherapy

Principles

A. Based on ability of drug to kill cancer cells; normal cells may also be damaged, producing side effects. Effect is greatest on rapidly dividing cells, such as bone marrow cells, the GI tract, and hair.
B. Different drugs act on tumor cells in different stages of the cell growth cycle.

Types of Chemotherapeutic Drugs

See Unit 2.
A. Antimetabolites: foster cancer cell death by interfering with cellular metabolic process.
B. Alkylating agents: act with DNA to hinder cell growth and division.
C. Plant alkaloids: obtained from the periwinkle plant; makes the host's body a less favorable environment for the growth of cancer cells.
D. Antitumor antibiotics: affect RNA to make environment less favorable for cancer growth.
E. Steroids and sex hormones: alter the endocrine environment to make it less conducive to growth of cancer cells.

Major Side Effects and Nursing Interventions

A. GI System
  1. Nausea and vomiting
    a. Administer antiemetics routinely every 4–6 hours as well as prophylactically before chemotherapy is initiated.
    b. Withhold foods/fluids 4–6 hours before chemotherapy.
    c. Provide bland foods in small amounts after treatments.
  2. Diarrhea
    a. Administer antidiarrheals.
    b. Maintain good perineal care.
    c. Give clear liquids as tolerated.
    d. Monitor potassium, sodium, and chloride levels.
  3. Stomatitis
    a. Provide and teach the client good oral hygiene, including avoidance of commercial mouthwashes.
    b. Rinse with viscous lidocaine before meals to provide an analgesic effect.
    c. Perform a cleansing rinse with plain water or dilute a water-soluble lubricant such as hydrogen peroxide after meals.
    d. Apply water-soluble lubricant such as K-Y jelly to lubricate cracked lips.
    e. Advise client to suck on Popsicles to provide moisture.

B. Hematologic System
  1. Thrombocytopenia
    a. Teach client the importance of avoiding bumping or bruising the skin.
    b. Protect client from physical injury.
    c. Avoid aspirin or aspirin products.
    d. Avoid giving IM injections.
    e. Monitor blood counts carefully.
    f. Assess for and teach signs of increased bleeding tendencies (epistaxis, petechiae, ecchymoses).
  2. Leukopenia
    a. Use careful handwashing technique.
    b. Maintain reverse isolation if white blood cell count drops below 1000/mm^3.
    c. Assess for signs of respiratory infection.
    d. Instruct client to avoid crowds/persons with known infection.
  3. Anemia
    a. Provide for adequate rest periods.
    b. Monitor hemoglobin and hematocrit.
    c. Protect client from injury.
    d. Administer oxygen as necessary.

C. Integumentary System—Alopecia
  1. Explain that hair loss is not permanent.
  2. Offer support and encouragement.
  3. Scalp tourniquets or scalp hypothermia via ice pack may be ordered to minimize hair loss with some agents.
  4. Advise client to obtain a wig before initiating treatments.

D. Renal System
  1. May cause direct damage to kidney by excretion of metabolites; encourage fluids and frequent voiding to prevent accumulation of metabolites in bladder.
  2. Increased excretion of uric acid may damage kidneys.
  3. Administer allopurinol (Zyloprim) as ordered to prevent uric acid formation; encourage fluids when administering allopurinol.

E. Reproductive System
  1. Damage may occur to both men and women resulting in infertility and/or mutagenic damage to chromosomes.
  2. Banking sperm often recommended for men before chemotherapy.
  3. Clients and partners advised to use reliable methods of contraception during chemotherapy.

F. Neurologic System
  1. Plant alkaloids (vincristine) cause neurologic damage with repeated doses.
  2. Peripheral neuropathies, hearing loss, loss of deep tendon reflexes, and paralytic ileus may occur.

Radiation Therapy

Principles

A. Radiation therapy uses ionizing radiation to kill or limit the growth of cancer cells, may be internal or external.

B. It not only injures the cell membrane, but destroys or alters DNA so that the cells cannot reproduce.

C. Like chemotherapy, effect cannot be limited to cancer cells only; all exposed cells, including normal ones, will be injured, causing side effects. Localized effects are related to area of body being treated; generalized effects may be related to cellular breakdown products.

D. Types of energy emitted:
  1. Alpha: particles cannot pass through skin, rarely used
  2. Beta: particles cannot pass through skin, somewhat more penetrating than alpha, generally emitted from radioactive isotopes, used for internal source
  3. Gamma rays (electromagnetic or X-rays): penetrate deeper areas of body, most common form of external radiotherapy

Methods of Delivery

A. External radiation therapy: beams high-energy rays directly to the affected area.

B. Internal radiation therapy: radioactive material is injected or implanted in the client's body for a designated period of time.
  1. Sealed implants: a radioisotope enclosed in a container so it does not circulate in

the body; client's body fluids should not become contaminated with radiation.
2. Unsealed sources: a radioisotope that is not encased in a container and does circulate in the body and contaminates body fluids.

Factors Controlling Exposure

A. Half-life: time required for half of radioactive atoms to decay
   1. Each radioisotope has a different half-life.
   2. At the end of the half-life, the danger from exposure decreases.
B. Time: the shorter the duration, the less the exposure
C. Distance: the greater the distance from the radiation source the less the exposure
D. Shielding: all radiation can be blocked; rubber gloves stop alpha and usually beta rays; thick lead or concrete stops gamma rays
E. These factors affect health care worker's exposure as well as client's.
   1. Health care worker at greater risk from internal than external sources
   2. Film badge can measure the amount of exposure received
   3. No pregnant nurses or visitors permitted near radiation source

Side Effects of Radiation Therapy and Nursing Interventions

A. Skin: itching, redness, burning, oozing, sloughing
   1. Keep skin free from foreign substances.
   2. Avoid use of medicated solutions, ointments, or powders that contain heavy metals such as zinc oxide.
   3. Avoid pressure, trauma, infection to skin; use bed cradle.
   4. Wash affected areas with plain water and pat dry; avoid soap.
   5. Use cornstarch, olive oil for itching; avoid talcum powder.
   6. If sloughing occurs, use a sterile dressing with micropore tape.
   7. Teach client to avoid exposing skin to heat, cold, or sunlight and to avoid constricting or irritating clothing.
B. Anorexia, nausea, and vomiting
   1. Arrange mealtimes so they do not directly precede or follow therapy.
   2. Encourage bland foods.
   3. Provide small, attractive meals.
   4. Avoid extremes of temperature.
   5. Administer antiemetics as ordered before meals.
C. Diarrhea
   1. Encourage low-residue, bland, high-protein foods.
   2. Administer antidiarrheal drugs as ordered.
   3. Provide good perineal care.
   4. Monitor electrolytes, particularly sodium, potassium, and chloride.
D. Anemia, leukopenia, and thrombocytopenia
   1. Isolate from those with known infections.
   2. Provide frequent rest periods.
   3. Encourage high-protein diet.
   4. Instruct client to avoid injury.
   5. Assess for bleeding.
   6. Monitor CBC, leukocytes, and platelets.

Bone Marrow Transplant

A. General information
   1. Treatment alternative for a variety of diseases
      a. Malignancies including several types of leukemias
      b. Blood disorders including severe aplastic anemia, thalassemia
      c. Solid tumors such as breast cancer and brain tumors; treatment for these diseases frequently causes bone marrow destruction; autologous bone marrow transplant may be indicated (Bone marrow harvested before chemotherapy or radiation destroys it and infused after therapy completed)
      d. Other conditions including malignant infantile osteopetrosis, some inherited metabolic disorders
   2. Types
      a. Autologous: client transplant with own harvested marrow
      b. Syngeneic: transplant between identical twins
      c. Allogeneic: transplant from a genetically nonidentical donor
         1) Most common transplant type
         2) Sibling most common donor
   3. Procedure
      a. Donor suitability determined through tissue antigen typing; includes human leukocyte antigen (HLA) and mixed leukocyte culture (MLC) typing.
      b. Donor bone marrow is aspirated from multiple sites along the iliac crests under general anesthesia.
      c. Donor marrow is infused IV into the recipient.
   4. Early evidence of engraftment seen during the second week post-transplant; hematologic reconstitution takes 4–6 weeks; immunologic reconstitution takes months.
   5. Hospitalization of 2 or 3 months required.
   6. Prognosis is highly variable depending on indication for use.
B. Complications
   1. Failure of engraftment
   2. Infection: highest risk in first 3–4 weeks
   3. Pneumonia: nonbacterial or interstitial pneumonias are principal cause of death during first 3 months post-transplant

4. Graft vs. host disease (GVHD): principal complication; caused by an immunologic reaction of engrafted lymphoid cells against the tissues of the recipient
   a. Acute GVHD: develops within first 100 days post-transplant and affects skin, gut, liver, marrow, and lymphoid tissue
   b. Chronic GVHD: develops 100–400 days post-transplant; manifested by multiorgan involvement
5. Recurrent malignancy
6. Late complications such as cataracts, endocrine abnormalities

C. Nursing care: pretransplant
1. Recipient immunosuppression attained with total body irradiation (TBI) and chemotherapy to eradicate existing disease and create space in host marrow to allow transplanted cells to grow.
2. Provide protected environment.
   a. Client should be in a laminar airflow room or on strict reverse isolation; surveillance cultures done twice a week.
   b. Objects must be sterilized before being brought into the room.
   c. When working with children introduce new people where they can be seen, but outside child's room so child can see what they look like without isolation garb.
3. Monitor central lines frequently; check patency and observe for signs of infection (fever, redness around site).
4. Provide care for the client receiving chemotherapy and radiation therapy to induce immunosuppression.
   a. Administer chemotherapy as ordered, assist with radiation therapy if required.
   b. Monitor side effects and keep client as comfortable as possible.
   c. Monitor carefully for potential infection.
   d. Client will become very ill; prepare client and family.

D. Nursing care: post-transplant
1. Prevent infection.
   a. Maintain protective environment.
   b. Administer antibiotics as ordered.
   c. Assess all mucous membranes, wounds, catheter sites for swelling, redness, tenderness, pain.
   d. Monitor vital signs frequently (every 1–4 hours as needed).
   e. Collect specimens for cultures as needed and twice a week.
   f. Change IV setups every 24 hours.
2. Provide mouth care for stomatitis and mucositis (severe mucositis develops about 5 days after irradiation).
   a. Note tissue sloughing, bleeding, changes in color.
   b. Provide mouth rinses, viscous lidocaine, and antibiotic rinses.
   c. Do not use lemon and glycerin swabs.
   d. Administer parenteral narcotics as ordered if necessary to control pain.
   e. Provide care every 2 hours or as needed.
3. Provide skin care: skin breakdown may result from profuse diarrhea from the TBI.
4. Monitor carefully for bleeding.
   a. Check for occult blood in emesis and stools.
   b. Observe for easy bruising, petechiae on skin, mucous membranes.
   c. Monitor changes in vital signs.
   d. Check platelet count daily.
   e. Replace blood products as ordered (all blood products should be irradiated).
5. Maintain fluid and electrolyte balance and promote nutrition.
   a. Measure I&O carefully.
   b. Provide adequate fluid, protein, and caloric intake.
   c. Weigh daily.
   d. Administer fluid replacement as ordered.
   e. Monitor hydration status: check skin turgor, moisture of mucous membranes, urine output.
   f. Check electrolytes daily.
   g. Check urine for glucose, ketones, protein.
   h. Administer antidiarrheal agents as needed.
6. Provide client teaching and discharge planning concerning:
   a. Home environment (e.g., cleaning, pets, visitors)
   b. Diet modifications
   c. Medication regimen: schedule, dosages, effects, and side effects
   d. Communicable diseases and immunizations
   e. Daily hygiene and skin care
   f. Fever
   g. Activity

Sample Questions

86. A woman is undergoing chemotherapy treatment for uterine cancer. She asks the nurse how chemotherapeutic drugs work. The most accurate explanation would include which statement?

1. They affect all rapidly dividing cells.
2. Molecular structure of the DNA segment is altered.
3. Chemotherapy only kills cancer cells.
4. The cancer cells are sensitive to drug toxins.

87. An adult experiences severe vomiting from cancer chemotherapy drugs. Which acid-base imbalance should the nurse anticipate?

1. Ketoacidosis.
2. Metabolic acidosis.
3. Metabolic alkalosis.
4. Respiratory alkalosis.

88. A woman loses most of her hair as a result of cancer chemotherapy. The nurse understands that which of the following is true about chemotherapy-induced alopecia?

1. New hair will be gray.
2. Avoid the use of wigs.
3. The hair loss is temporary.
4. Pre-chemo hair texture will return.

89. An adult is diagnosed with Hodgkin's disease Stage 1A. He is being treated with radiation therapy. To minimize skin damage from radiation therapy, the nursing care plan should include which of the following?

1. Avoid washing with water.
2. Apply a heating pad to the site.
3. Cover the area with an airtight dressing.
4. Avoid applying creams and powders to the area.

90. An adult develops a second-degree or second-level skin reaction from radiation therapy. When evaluating his symptoms, which of the following would not be present?

1. Scaly skin.
2. An itchy feeling.
3. Dry desquamation.
4. Reddening of the skin.

91. The nurse is teaching the client about signs of radiation-induced thrombocytopenia. Which symptom would be included in the teaching?

1. Fatigue.
2. Shortness of breath.
3. Elevated temperature.
4. A tendency to bruise easily.

92. The nurse is caring for a client who is receiving radiation therapy. Which activity by the client indicates further instruction on the side effects of radiation therapy?

1. Using an electric razor.
2. Eating a high-protein diet.
3. Taking his children to see Santa at the mall.
4. Calling the doctor for a temperature of 101°F (38.3°C).

93. A man says to the nurse, "I don't understand how my wife could have come down with cancer. She doesn't smoke or drink. How do people get cancer?" Which of the following should be included in the nurse's response? Select the one or all that apply.

___ Bacteria.
___ Viruses.
___ Dietary factors.
___ Genetic factors.

94. A woman has breast cancer. Her physician has just told her that her cancer has been staged as "T2, N1, M0," and the client asks the nurse what this means. What is the nurse's best response?

1. "The primary tumor is 2 cm in diameter, she has one positive lymph node, and no metastasis."
2. "There are two primary tumors, one involved lymph node chain, and no metastasis."
3. "The primary tumor is between 2 cm and 5 cm in size, she has metastasis to one movable lymph node, and no distant metastasis."
4. "There is carcinoma in situ, no regional lymph node metastasis, and the presence of distant metastasis cannot be assessed."

95. The nurse at a senior citizen center is teaching a class on the early warning signals of cancer. Which of the following will be a part of the teaching plan for this class?

1. Reduction in the amount of dietary fat.
2. Stop cigarette smoking.
3. Avoid overexposure to the sun.
4. Practice monthly breast self-exam (BSE).

96. Which statement tells the nurse that a man needs further information about testicular self-examination (TSE)?

1. "The best time to perform TSE is immediately before sexual intercourse."
2. "It's normal to find one testis lower than the other."
3. "I should have my doctor examine any lumps I find, even though they might be benign."
4. "That cord-like thing that I feel on the top and back of the testicle is not something to be worried about."

97. Which of the following actions is vital for the nurse to perform when assessing a client receiving chemotherapy?

1. Checking complete vital signs every 8 hours.
2. Taking rectal temperatures every 4 hours to check for infection.

3. Testing emesis for blood.
4. Avoiding fresh fruits and vegetables if absolute white blood count (WBC) is less than 1000/mm^3.

98. An adult asks the nurse how the chemotherapy that she is receiving for her lung cancer works. What is the nurse's best response?

1. Block the sodium-potassium pump in the cell wall and cause cellular death due to an excess of intracellular potassium.
2. Prevent the entry of oxygen into the cell and cause cellular death due to cellular anoxia.
3. Shrink the size of the existing tumor, which causes the release of antitumor metabolites that are toxic to further tumor cell growth.
4. Destroy enough of the tumor so that the body's immune system can eradicate the remaining cells.

99. An adult, diagnosed with multiple myeloma, is receiving cyclophosphamide (Cytoxan). The nurse must include which of the following interventions in the nursing care plan of this client?

1. High-flow oxygen delivery to combat interstitial pneumonitis, which routinely develops with cyclophosphamide therapy.
2. Encouraging the client to empty his bladder every 2 to 3 hours to prevent development of hemorrhagic cystitis.
3. Application of an ice cap to reduce or prevent alopecia.
4. Antiemetic therapy for 7–10 days after cyclophosphamide administration, or until blood studies show nadir is reached.

100. An adult is receiving cancer chemotherapy and demonstrates alteration in her oral mucous membranes. Which of the following should be included in her plan of care?

1. Brushing teeth and flossing after every meal and at bedtime.
2. Using normal saline mouth rinses every 2 hours while awake.
3. No use of dentures until mucous membranes have healed.
4. Bland, mechanical, soft diet until mucous membranes have healed.

101. Ten days ago, a client received chemotherapy for his non-Hodgkin's lymphoma, stage IV. Drugs administered through his vascular access device ("Port-a-cath") included doxorubicin, cyclophosphamide, vincristine, and prednisone (CHOP protocol). This morning, his blood work is as follows: WBC: 1500/mm^3; hemoglobin (Hgb): 7.6 gm/dl; RBC 3,000,000/mm^3; hematocrit (Hct) 22.3%; platelets 20,000/mm^3. The nurse knows that the client's plan of care will include which of the following interventions?

1. Insertion of two extra IV lines for blood administration.
2. Cutting fingernails and toenails to prevent scratching that could lead to bleeding or infection.
3. Providing the client with a low-residue diet.
4. Using a soft toothbrush and avoiding dental floss.

102. An adult who is receiving external radiation therapy for Hodgkin's disease makes all of the following statements to her nurse. Which statement tells the nurse that the client needs further teaching about the care she requires because of her radiation therapy?

1. "I will check my mouth frequently for signs of irritation."
2. "I know that if I get tired easily, it may be from the radiation and doesn't necessarily mean my Hodgkin's disease is getting worse."
3. "I will use a good quality lotion on my skin to keep the radiation from burning it."
4. "I may lose some of my hair during radiation and foods may not taste right."

103. A client asks the nurse to explain how the radiation therapy she will be receiving for her neck cancer is effective. What is the nurse's best response?

1. Radiation causes breakage in the strands of the DNA helix, which leads to cell death.
2. Radiation is antagonistic to glucose, which cells need for energy and replication; radiation prevents glucose from entering cells, leading to cell death.
3. Cell walls are broken down by gamma rays during radiation therapy, leading to cell death.
4. Oxygen cannot enter cells that have been irradiated, so the cell converts to anaerobic metabolism that causes its death.

104. The nurse manager on the oncology unit is assessing the knowledge level of the staff in regard to safety requirements for the client receiving internal radiation therapy. Which observation by the nurse manager indicates that further instruction is necessary?

1. The physical therapist is ambulating the client in the hall.
2. The nurse uses rubber gloves when emptying the bedpan.

3. The dietitian provides a low-residue diet for the client.
4. The housekeeping staff calls for Radiation Safety personnel to inspect the room before the client is discharged.

105. A woman is receiving internal radiation therapy for cancer of the cervix. Which statement indicates to the nurse that the client understands precautions necessary during her treatment?
1. "I should get out of bed and walk around in my room at least every other hour."
2. "My seven-year-old twins should not come to visit me while I'm receiving treatment."
3. "I will try not to cough, because the force might make me expel the applicator."
4. "I know that my primary nurse has to wear one of those badges like the people in the X-ray department wear, but they aren't necessary for anyone else who comes in here."

106. An adult is receiving internal radiation therapy for cancer of the cervix. Her radiation source, a rod, becomes dislodged. What will be the nurse's first action?
1. Notify the Radiation Safety personnel at once and await further information.
2. Use long-handled forceps to remove the rod and place in a lead-lined container.
3. Apply two sets of rubber gloves and pick up the rod; place it in a white plastic "biohazard" bucket and call Radiation Safety personnel for a special pick-up.
4. Use long-handled forceps to pick up rod; clean with normal saline, and reinsert into client's vagina, stopping when the rod meets resistance. This indicates that it is against the cervix.

107. In caring for the client receiving external radiation therapy, the nurse assesses for which of the following side effects?
1. Extravasation injury at the IV site used for contrast media injection.
2. Generalized or local edema.
3. Infection and bleeding.
4. Allergic reactions, particularly anaphylaxis.

Answers and Rationales

86. 1. There are numerous mechanisms of action for cancer chemotherapeutic drugs, but most affect rapidly dividing cells. The drugs interfere with cell division and prevent rapid division of cells.

87. 3. Severe vomiting results in a loss of hydrochloric acid and acids from extracellular fluids, leading to metabolic alkalosis.

88. 3. Alopecia from chemotherapy is only temporary.

89. 4. Creams and powders, many of which contain heavy metals, will further irritate skin sensitized by radiation therapy and reduce the effectiveness of therapy by blocking radiation.

90. 4. Reddening of the skin will not be seen in a second-level or second-degree reaction. A second-degree skin reaction would be evidenced by scaly skin, an itchy feeling, and dry desquamation.

91. 4. Clients with decreased platelet count (thrombocytopenia) bleed easily. Thrombocytes are clotting cells.

92. 3. People being treated with radiation therapy should avoid crowds because of the increased risk of infection. Crowds at Christmastime can be very large and children are frequent carriers of infection.

93. Bacteria should be marked. *Helicobacter pylori*, which causes stomach ulcers, has been linked to stomach cancer.

Viruses should be marked. Viruses are thought to insinuate themselves into the genetic structure of cells, thereby altering future generations of that cell. Epstein-Barr is strongly implicated in the development of Burkitt's lymphoma. Some types of human papilloma virus, which causes genital warts, cause cancer of the cervix.

Dietary factors should be marked. Approximately 40–60% of all environmental cancers are thought to have links to dietary factors such as fats, alcohol, foods containing nitrates/nitrites, and salt-cured and smoked meats.

Genetic factors should be marked. Genetics are involved in cancer cell development. Damage to the DNA in certain populations of cells may lead to mutant cells being transmitted to future generations. Examples of cancers associated with familial inheritance include breast, colon, and rectal cancers.

94. 3. In the TNM staging classification system, T refers to the primary tumor, and T2 is between 2 cm and 5 cm without extension to chest wall or skin. The N refers to regional lymph node involvement, with N1 indicating spread to an ipsilateral movable node. N0 indicates no regional lymph node spread; N2 indicates metastasis to an ipsilateral axillary node fixed to another node or other structure. M refers to distant metastasis,

with MX indicating that metastasis cannot be assessed, M0 that there is no distant spread, and M1 that there is spread present.

95. 4. Only this answer, practicing breast self-exam, will yield a "warning signal of cancer" (i.e., a breast lump). Be certain that your response answers the question, not just that it contains factual information.

96. 1. The man is mistaken (and needs more teaching) if he says that testicular self-exam should be performed immediately prior to sexual intercourse. The best time to do TSE is when the scrotum is relaxed, such as after a warm bath or shower.

97. 3. Because of the bleeding disorders common in clients receiving chemotherapy, all body secretions, including emesis, should be assessed for obvious and occult blood.

98. 4. Each time the tumor is exposed to the chemotherapeutic drug, a certain percentage of cells are killed. (The exact percentage is determined by the drug dosage used.) Because a *percentage* of tumor is killed, a part of tumor will remain after therapy. It is up to the body's immune system to destroy the remaining tumor, which an intact immune system may be able to do if the tumor is made small enough.

99. 2. If the metabolites of cyclophosphamide are allowed to accumulate in the bladder, the subsequent irritation of the bladder wall capillaries will cause hemorrhagic cystitis. This condition is preventable; if it develops, one of its serious sequelae is bladder fibrosis. In addition to monitoring BUN and creatinine prior to administration, the nurse must promote hydration of at least 3 liters a day and frequent voiding.

100. 2. The client will use normal saline mouth rinses every 2 hours while awake and every 6 hours at night to aid in the removal of thick secretions, debris, and bacteria.

101. 4. By using a soft toothbrush and avoiding dental floss, the client promotes a healthy oral cavity without risking bleeding or disruption of skin integrity, which could lead to infection.

102. 3. It is important to protect skin from irritation, and lotions, creams, powders, and ointments can all contribute to skin problems. Clients are advised to consult their radiation oncologists for troublesome skin problems and should be advised that after treatment, reepithelialization will occur.

103. 1. There are two types of ionizing radiation: electromagnetic rays and particulate radiation. Either of these can cause tissue disruption, the most harmful of which is the alteration in the structure of the cell's DNA molecules; this will lead to cell death.

104. 1. The client will be restricted to her room to minimize exposure of staff, visitors, and other clients to the radiation source.

105. 2. Visitors younger than 18 years of age, and pregnant visitors, are not allowed during internal radiation therapy.

106. 2. Long-handled forceps and a lead-lined container (sometimes called a "lead pig") must be kept in the room of any client receiving internal radiation therapy for this very occurrence.

107. 3. If bone marrow-producing sites are included in the field being irradiated, anemia, leukopenia (low white blood cells), and thrombocytopenia (low platelets) may occur; these may lead to infection and/or bleeding.

The Neurosensory System

OVERVIEW OF ANATOMY AND PHYSIOLOGY

The Nervous System

The functional unit of the nervous system is the nerve cell, or neuron. The nervous system consists of the central nervous system (CNS), which includes the brain and spinal cord, and the peripheral nervous system (PNS), which includes the cranial nerves and the spinal nerves. The autonomic nervous system (ANS) is a subdivision of the PNS that automatically controls body functions such as breathing and heartbeat. It is further divided into the sympathetic and parasympathetic nervous systems. The special senses of vision and hearing are also covered in this section.

Neuron

A. Primary component of the nervous system; composed of cell body (gray matter), axon, and dendrites
B. *Axon:* elongated process or fiber extending from the cell body; transmits impulses (messages) away from the cell body to dendrites or directly to the cell bodies of other neurons; neuron usually has only one axon.
C. *Dendrites:* short, branching fibers that receive impulses and conduct them toward the nerve cell body. Neurons may have many dendrites.
D. *Synapse:* junction between neurons where an impulse is transmitted
E. *Neurotransmitters:* chemical agents (e.g., acetylcholine, norepinephrine) involved in the transmission of impulse across synapse
F. *Myelin sheath:* a wrapping of myelin (a whitish, fatty material) that protects and insulates nerve fibers and enhances the speed of impulse conduction
  1. Both axons and dendrites may or may not have a myelin sheath (myelinated/unmyelinated)
  2. Most axons leaving the CNS are heavily myelinated by Schwann cells

Functional Classification

A. Afferent (sensory) neurons: transmit impulses from peripheral receptors to the CNS
B. Efferent (motor) neurons: conduct impulses from CNS to muscles and glands
C. Internuncial neurons (interneurons): connecting links between afferent and efferent neurons

Central Nervous System: Brain and Spinal Cord

Brain

A. *Cerebrum:* outermost area (cerebral cortex) is gray matter; deeper area is composed of white matter
  1. Two hemispheres: right and left
  2. Each hemisphere divided into four lobes; many of the functional areas of the cerebrum have been located in these lobes (see Figure 4-1).
    a. Frontal lobe
      1) Personality, behavior
      2) Higher intellectual functioning
      3) Precentral gyrus: motor function
      4) Broca's area: specialized motor speech area
    b. Parietal lobe
      1) Postcentral gyrus: registers general sensation (e.g., touch, pressure)
      2) Integrates sensory information
    c. Temporal lobe
      1) Hearing, taste, smell
      2) Wernicke's area: sensory speech area (understanding/formulation of language)
    d. Occipital lobe: vision

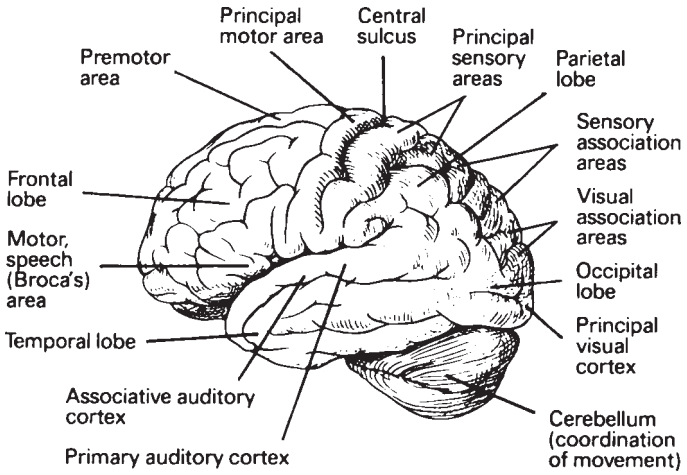


Figure 4–1 Side view of the brain, showing principal functional areas

  3. Corpus callosum: large fiber tract that connects the two cerebral hemispheres
  4. Basal ganglia: islands of gray matter within white matter of cerebrum
    a. Regulate and integrate motor activity originating in the cerebral cortex
    b. Part of extrapyramidal system
B. Diencephalon: connecting part of the brain, between the cerebrum and the brain stem. Contains several small structures; the thalamus and hypothalamus are most important.
  1. Thalamus
    a. Relay station for discrimination of sensory signals (e.g., pain, temperature, touch).
    b. Controls primitive emotional responses (e.g., rage, fear).
  2. Hypothalamus
    a. Found immediately beneath the thalamus.
    b. Plays major role in regulation of vital functions such as blood pressure, sleep, food and water intake, and body temperature.
    c. Acts as control center for pituitary gland and affects both divisions of the autonomic nervous system.
C. Brain stem
  1. Contains midbrain, pons, and medulla oblongata.
  2. Extends from the cerebral hemispheres to the foramen magnum at the base of the skull.
  3. Contains nuclei of the cranial nerves and the long ascending and descending tracts connecting the cerebrum and the spinal cord.
  4. Contains vital centers of respiratory, vasomotor, and cardiac functions.
D. Cerebellum: coordinates muscle tone and movements and maintains position in space (equilibrium).

Spinal Cord

A. Serves as a connecting link between the brain and the periphery.
B. Extends from foramen magnum to second lumbar vertebra.
C. H-shaped gray matter in the center (cell bodies) surrounded by white matter (nerve tracts and fibers).
D. Gray matter
  1. Anterior horns: contain cell bodies giving rise to efferent (motor) fibers
  2. Posterior horns: contain cell bodies connecting with afferent (sensory) fibers from dorsal root ganglion
  3. Lateral horns: in thoracic region, contain cells giving rise to autonomic fibers of sympathetic nervous system
E. White matter
  1. Ascending tracts (sensory pathways)
    a. Posterior columns: carry impulses concerned with touch, pressure, vibration, and position sense.
    b. Spinocerebellar: carry impulses concerned with muscle tension and position sense to cerebellum.
    c. Lateral spinothalamic: carry impulses resulting in pain and temperature sensations.
    d. Anterior spinothalamic: carry impulses concerned with crude touch and pressure.
  2. Descending tracts (motor pathways)
    a. Corticospinal (pyramidal, upper motor neuron): conduct motor impulses from motor cortex to anterior horn cells (cross in the medulla).
    b. Extrapyramidal: help to maintain muscle tone and to control body movement, especially gross automatic movements such as walking.
F. Reflex arc
  1. Reflex consists of an involuntary response to a stimulus occurring over a neural pathway called a reflex arc.
  2. Not relayed to and from brain; takes place at cord levels.
  3. Components
    a. Sensory receptor: receives/reacts to a stimulus.
    b. Afferent pathway: transmits impulses to spinal cord.
    c. Interneuron: synapses with a motor neuron (anterior horn cell).
    d. Efferent pathway: transmits impulses from motor neuron to effector.
    e. Effector: muscle or organ that responds to stimulus.

Supporting Structures

A. Skull
  1. Rigid; numerous bones fused together.
  2. Protects and supports the brain.
B. Spinal column
  1. Consists of 7 cervical, 12 thoracic, and 5 lumbar vertebrae, as well as sacrum and coccyx.
  2. Supports the head and protects the spinal cord.
C. Meninges
  1. Membranes between the skull and brain and the vertebral column and spinal cord.
  2. Layers
    a. Dura mater: outermost layer, tough, leathery
    b. Arachnoid mater: middle layer, weblike
    c. Pia mater: innermost layer, delicate, clings to surface of brain
  3. Area between arachnoid and pia mater is called subarachnoid space.
D. Ventricles
  1. Four fluid-filled cavities connecting with one another and the spinal canal.
  2. Produce and circulate cerebrospinal fluid.
E. Cerebrospinal fluid (CSF)
  1. Surrounds brain and spinal cord.
  2. Offers protection by functioning as a shock absorber.
  3. Allows fluid shifts from the cranial cavity to the spinal cavity.
  4. Carries nutrients to and waste products away from nerve cells.
F. Vascular supply
  1. Two internal carotid arteries anteriorly.
  2. Two vertebral arteries leading to basilar artery posteriorly.
  3. These arteries communicate at the base of the brain through the circle of Willis.
  4. Anterior, middle, and posterior cerebral arteries are the main arteries for distributing blood to each hemisphere of the brain.
  5. Brain stem and cerebellum are supplied by branches of the vertebral and basilar arteries.
  6. Venous blood drains into dural sinuses and then into internal jugular veins.
G. Blood-brain barrier: protective barrier preventing harmful agents from entering the capillaries of the CNS; protects brain and spinal cord.

Peripheral Nervous System

Spinal Nerves

A. 31 pairs: carry impulses to and from spinal cord.
B. Each segment of the spinal cord contains a pair of spinal nerves (one for each side of the body).
C. Each nerve is attached to the spinal cord by two roots.
  1. Dorsal (posterior) root: contains afferent (sensory) nerve whose cell body is in the dorsal root ganglion.
  2. Ventral (anterior) root: contains efferent (motor) nerve whose nerve fibers originate in the anterior horn cell of the spinal cord (lower motor neuron).

Table 4–17 Cranial Nerves

Name and Number	Function
Olfactory: cranial nerve I	Sensory: carries impulses for sense of smell
Optic: cranial nerve II	Sensory: carries impulses for vision
Oculomotor: cranial nerve III	Motor: muscles for pupillary constriction, elevation of upper eyelid; 4 out of 6 extraocular movements
Trochlear: cranial nerve IV	Motor: muscles for downward, inward movement of eye
Trigeminal: cranial nerve V	Mixed: impulses from face, surface of eyes (corneal reflex); muscles controlling mastication
Abducens: cranial nerve VI	Motor: muscles for lateral deviation of eye
Facial: cranial nerve VII	Mixed: impulses for taste from anterior tongue; muscles for facial movement
Acoustic: cranial nerve VIII	Sensory: impulses for hearing (cochlear division) and balance (vestibular division)
Glossopharyngeal: cranial nerve IX	Mixed: impulses for sensation to posterior tongue and pharynx; muscles for movement of pharynx (elevation) and swallowing
Vagus: cranial nerve X	Mixed: impulses for sensation to lower pharynx and larynx; muscles for movement of soft palate, pharynx, and larynx; parasympathetic
Spinal accessory: cranial nerve XI:	Motor: movement of sternomastoid muscles and upper part of trapezius muscles
Hypoglossal: cranial nerve XII	Motor: movement of tongue

Cranial Nerves

A. 12 pairs: carry impulses to and from brain (see Table 4-17).
B. May have sensory, motor, or mixed functions.

Autonomic Nervous System

A. Part of the peripheral nervous system
B. Includes those peripheral nerves (both cranial and spinal) that regulate functions occurring automatically in the body; ANS regulates smooth muscle, cardiac muscle, and glands.
C. Components
  1. Sympathetic nervous system: generally accelerates some body functions in response to stress; "fight or flight"
  2. Parasympathetic nervous system: controls normal body functioning
D. Effects of ANS activity: see Table 4-18.

Vision

External Structures of Eye

A. Eyelids (palpebrae) and eyelashes: protect the eye from foreign particles
B. Conjunctiva
  1. Palpebral conjunctiva: pink; lines inner surface of eyelids.
  2. Bulbar conjunctiva: white with small blood vessels, covers anterior sclera.
C. Lacrimal apparatus (lacrimal gland and its ducts and passages): produces tears to lubricate the eye and moisten the cornea; tears drain into the nasolacrimal duct, which empties into nasal cavity.
D. Movement of the eye is controlled by six extraocular muscles.

Internal Structures of Eye

A. Three layers of the eyeball
  1. Outer layer
    a. Sclera: tough, white connective tissue ("white of the eye"); located anteriorly and posteriorly
    b. Cornea: transparent tissue through which light enters the eye; located anteriorly
  2. Middle layer
    a. Choroid: highly vascular layer, nourishes retina; located posteriorly
    b. Ciliary body: anterior to choroid, secretes aqueous humor; muscles change shape of lens
    c. Iris: pigmented membrane behind cornea, gives color to eye; located anteriorly. Pupil is a circular opening in the middle of the iris that constricts or dilates to regulate amount of light entering eye.
  3. Inner layer: retina
    a. Light-sensitive layer composed of rods and cones (visual cells)
      1) Cones: specialized for fine discrimination and color vision
      2) Rods: more sensitive to light than cones, aid in peripheral vision
    b. Optic disk: area in retina for entrance of optic nerve, has no photoreceptors
B. Lens: transparent body that focuses image on retina
C. Fluids of the eye
  1. Aqueous humor: clear, watery fluid in anterior and posterior chambers in anterior part of eye; serves as refracting medium and provides nutrients to lens and cornea; contributes to maintenance of intraocular pressure.
  2. Vitreous humor: clear, gelatinous material that fills posterior cavity of eye; maintains transparency and form of eye.

Table 4–18 Effects of Autonomic Nervous System Activity

Effector	Sympathetic (Adrenergic) Effects	Parasympathetic (Cholinergic) Effects
Eye	Dilates pupil (mydriasis)	Constricts pupil (miosis)
Glands of head		
Lacrimal	No effect	Stimulates secretion
Salivary	Scanty thick, viscous secretions, dry mouth	Copious thin, watery secretions
Heart	Increases rate and force of contraction	Decreases rate
Blood vessels	Constricts smooth muscles of skin, abdominal blood vessels, and cutaneous blood vessels Dilates smooth muscle of bronchioles, blood vessels of heart, and skeletal muscles	No effect
Lungs	Bronchodilation	Bronchoconstriction
GI tract	Decreases motility Constricts sphincters Possibly inhibits secretions Inhibits activity of gallbladder and ducts Inhibits glycogenolysis in liver	Increases motility Relaxes sphincters Stimulates secretion Stimulates activity of gallbladder and ducts
Adrenal gland	Stimulates secretion of epinephrine and norepinephrine	No effects
Urinary tract	Relaxes detrusor muscle Contracts trigone sphincter (prevents voiding)	Contracts detrusor muscle Relaxes trigone sphincter (allows voiding)

Visual Pathways

A. Retina (rods and cones) translates light waves into neural impulses that travel over the optic nerves.
B. Optic nerves for each eye meet at the optic chiasm.
  1. Fibers from median halves of the retinas cross here and travel to the opposite side of the brain.
  2. Fibers from lateral halves of retinas remain uncrossed.
C. Optic nerves continue from optic chiasm as optic tracts and travel to the cerebrum (occipital lobe), where visual impulses are perceived and interpreted.

Hearing

External Ear

A. Auricle (pinna): outer projection of ear composed of cartilage and covered by skin; collects sound waves.
B. External auditory canal: lined with skin; glands secrete cerumen (wax), providing protection; transmits sound waves to tympanic membrane.
C. Tympanic membrane (eardrum): at end of external canal; vibrates in response to sound and transmits vibrations to middle ear.

Middle Ear

A. Ossicles
  1. 3 small bones: malleus (hammer) attached to tympanic membrane, incus (anvil), stapes (stirrup)
  2. Ossicles are set in motion by sound waves from tympanic membrane.
  3. Sound waves are conducted by vibration to the footplate of the stapes in the oval window (an opening between the middle ear and the inner ear).
B. Eustachian tube: connects nasopharynx and middle ear; brings air into middle ear, thus equalizing pressure on both sides of eardrum.

Inner Ear

A. Cochlea
  1. Contains organ of Corti, the receptor end-organ for hearing.
  2. Transmits sound waves from the oval window and initiates nerve impulses carried by cranial nerve VIII (acoustic branch) to the brain (temporal lobe of cerebrum).
B. Vestibular apparatus
  1. Organ of balance.
  2. Composed of three semicircular canals and the utricle.

ASSESSMENT

Health History

Nervous System

A. Presenting problem: symptoms may include behavior changes, memory loss, mood changes, nervousness or anxiety, headache, seizures, syncope, vertigo, loss of consciousness; problems with speech, vision, or smell; motor problems (paralysis, tremor); sensory problems (pain, paresthesias)
B. Lifestyle: drug and alcohol intake, exposure to toxins, recent travel, employment, stressors
C. Use of medications: prescribed and over-the-counter (OTC)

D. Past medical history
  1. Perinatal exposure to toxic agents, X-rays; difficult labor and delivery
  2. Childhood and adult: history of systemic diseases; seizures; loss of consciousness; head trauma

E. Family history: may uncover diseases with hereditary or congenital background

Eye

A. Presenting problem: symptoms may include blurred vision, decreased vision, or blind spots; pain, redness, excessive tearing; double vision (diplopia); drainage

B. Use of eyeglasses, contact lenses; date of last eye exam

C. Lifestyle: occupation (exposure to fumes, smoke, or eye irritant); use of safety glasses

D. Use of medications: cortisone preparations may contribute to formation of glaucoma and cataracts

E. Past medical history: systemic diseases; previous childhood or adult eye disorders, eye trauma

F. Family history: many eye disorders may be inherited

Ear

A. Presenting problem: symptoms may include hearing loss, tinnitus (ringing in ear), dizziness or vertigo, pain, drainage

B. Lifestyle: occupation (exposure to excessive noise levels), swimming habits

C. Use of medications: ototoxic drugs; aspirin (tinnitus)

D. Past medical history
  1. Perinatal: rubella in first trimester of pregnancy
  2. Childhood and adult: otitis media, perforated eardrum, measles, mumps, allergies, tonsillectomy, and adenoidectomy

E. Family history: hearing loss in family members

Physical Examination

Nervous System

A. Neurologic examination
  1. Mental status exam (cerebral function); see also Unit 7.
    a. General appearance and behavior
    b. Level of consciousness; see Neuro Check.
    c. Intellectual function: memory (recent and remote), attention span, cognitive skills
    d. Emotional status
    e. Thought content
    f. Language/speech
      1) Expressive aphasia: inability to speak
      2) Receptive aphasia: inability to understand spoken words
      3) Dysarthria: difficult speech due to impairment of muscles involved with production of speech
  2. Cranial nerves (see Table 4-17)
  3. Cerebellar function: posture, gait, balance, coordination
  4. Motor function: muscle size, tone, strength; abnormal or involuntary movements
  5. Sensory function: light touch, superficial pain, temperature, vibration, and position sense
  6. Reflexes
    a. Deep tendon: grade from 0 (no response) to 4 (hyperactive); 2 is normal
    b. Superficial
    c. Pathologic: Babinski's reflex (dorsiflexion of great toe with fanning of other toes) indicates damage to corticospinal tracts (see Figure 4-2)

Figure 4–2 Pathologic reflex (Babinski)

B. Neuro check
  1. Level of consciousness (LOC)
    a. Orientation to time, place, and person
    b. Speech: clear, garbled, rambling
    c. Ability to follow commands
    d. If client does not respond to verbal stimuli, apply a painful stimulus (e.g., pressure on nailbeds, squeeze trapezius muscle); note response to pain:
      1) Appropriate: withdrawal, moaning
      2) Inappropriate: nonpurposeful
    e. Abnormal posturing (may occur spontaneously or in response to stimulus)
      1) Decorticate posturing: extension of legs, internal rotation and adduction of arms with flexion of elbows, wrists, and fingers (damage to corticospinal tracts; cerebral hemispheres)
      2) Decerebrate posturing: back arched, rigid extension of all four extremities with hyperpronation of arms and plantar flexion of feet (damage to upper brain stem, midbrain, or pons)

Subscale	Response	Score
Best eye opening (E)	Spontaneous	4
	To voice	3
	To pain	2
	None	1
Best verbal response (V)	Oriented	5
	Confused conversation	4
	Inappropriate words	3
	Incomprehensible sounds	2
	None	1
Best motor response, upper limb (M)	Obeys commands	6
	Localizes to pain	5
	Flexor withdrawal (decorticate posturing)	4
	Abnormal flexion (decerebrate posturing)	3
	Extension	2
	Flaccid	1

Figure 4-3 Glasgow Coma Scale

2. Glasgow coma scale (see Figure 4-3)
   a. Objective evaluation of LOC, motor/verbal response; a standardized system for assessing the degree of neurologic impairment in critically ill clients.
   b. Cannot replace a complete neurologic check, but can be used as an aid in evaluation and to eliminate ambiguous terms such as stupor and lethargy.
   c. A score of 15 indicates client is awake and oriented; the lowest score, 3, is deep coma; a score of 7 or below is considered coma.
3. Pupillary reaction and eye movements
   a. Observe size, shape, and equality of pupils (note size in millimeters)
   b. Reaction to light: pupillary constriction
   c. Corneal reflex: blink reflex in response to light stroking of cornea
   d. Oculocephalic reflex (doll's eyes): present in unconscious client with intact brain stem
4. Motor function
   a. Movement of extremities (paralysis)
   b. Muscle strength
5. Vital signs: respiratory patterns (may help localize possible lesion)
   a. Cheyne-Stokes respiration: regular, rhythmic alternating between hyperventilation and apnea; may be caused by structural cerebral dysfunction or by metabolic problems, such as diabetic coma.
   b. Central neurogenic hyperventilation: sustained, rapid, regular respirations (rate of 25/minute) with normal blood oxygen levels; usually due to brain stem dysfunction.
   c. Apneustic breathing: prolonged inspiratory phase, followed by a 2- to 3-second pause; usually indicates dysfunction of respiratory center in pons.
   d. Cluster breathing: clusters of irregular breathing, irregularly followed by periods of apnea; usually caused by a lesion in upper medulla and lower pons.
   e. Ataxic breathing: breathing pattern completely irregular; indicates damage to respiratory centers of the medulla.

Eye

A. Visual acuity: Snellen chart
B. Visual fields (peripheral vision)
   1. Confrontation method
   2. Perimetry: more precise method
C. External structures
   1. Position and alignment of eyes
   2. Eyebrows, eyelids, lacrimal apparatus, conjunctiva, sclera, cornea, iris, pupils (size, shape, equality, and reaction to light)
D. Extraocular movements; note paralysis, nystagmus (rapid, abnormal movement of the eyeball)
E. Corneal reflex

Ear

A. Inspection and palpation of auricle, preauricular area, and mastoid area
B. Hearing acuity
   1. Whispered voice or ticking watch tests: gross estimation
   2. Audiometry: more precise method
C. Tuning fork tests distinguish between sensorineural and conductive hearing loss.
   1. Conductive hearing loss: secondary to problem in external or middle ear; transmission of sound waves to inner ear impaired
   2. Sensorineural (perceptive) hearing loss: disease of inner ear or cranial nerve VIII (acoustic branch)
   3. Weber's test: handle of vibrating tuning fork placed on midline of client's skull, sound should be heard equally in midline or in both ears; in conductive hearing loss, sound is louder in poorer ear; in sensorineural hearing loss, sound is louder in better ear.
   4. Rinne's test: tuning fork placed on mastoid process (bone conduction) until sound no longer heard, then placed in front of the ear (air conduction); sound should be heard longer (almost twice as long) with air conduction than with bone conduction; bone conduction greater than air conduction indicates conductive hearing deficit.

Laboratory/Diagnostic Tests

Nervous System

A. Lumbar puncture (LP)
- **1.** A hollow spinal needle introduced into subarachnoid space of spinal canal between L_4/L_5 for diagnostic or therapeutic reasons
- **2.** Purposes
  - a. Measures CSF pressure (normal opening pressure 60–150 mm H_2O)
  - **b.** Obtain specimens for lab analysis (protein [normally not present], sugar [normally present], cytology, C&S)
  - **c.** Check color of CSF (normally clear) and check for blood
  - **d.** Inject air, dye, or drugs into the spinal canal
- **3.** Nursing care: pretest
  - **a.** Have client empty bladder.
  - **b.** Position client in lateral recumbent position with head and neck flexed onto the chest and knees pulled up.
  - **c.** Explain the need to remain still during the procedure.
- **4.** Nursing care: posttest
  - **a.** Ensure labeling of CSF specimens in proper sequence.
  - **b.** Keep client flat for 12–24 hours as ordered.
  - **c.** Force fluids.
  - **d.** Check puncture site for bleeding, leakage of CSF.
  - **e.** Assess sensation and movement in lower extremities.
  - **f.** Monitor vital signs.
  - **g.** Administer analgesics for headache as ordered.

B. X-rays of skull and spine
- **1.** Used to detect atrophy, erosion, or fractures of bones; calcifications
- **2.** Pretest nursing care: remove hairpins, glasses, hearing aids.

C. Computerized tomography (CT scan)
- **1.** Skull/spinal cord are scanned in successive layers by a narrow beam of X-rays; computer uses information obtained to construct a picture of the internal structure of the brain; contrast medium may or may not be used.
- **2.** Used to detect intracranial and spinal cord lesions and monitor effects of surgery or other therapy.
- **3.** Nursing care
  - **a.** Explain appearance of scanner.
  - **b.** Instruct client to lie still during procedure.
  - **c.** Check for allergy to iodine if contrast material is used.
  - **d.** Remove hairpins, etc.

D. Magnetic resonance imaging (MRI)
- **1.** Also known as nuclear magnetic resonance (NMR)
- **2.** Computer-drawn, detailed pictures of structures of the body through use of large magnet, radio waves
- **3.** Used to detect intracranial and spinal abnormalities associated with disorders such as cerebrovascular disease, tumors, abscesses, cerebral edema, hydrocephalus, multiple sclerosis
- **4.** Nursing care
  - **a.** Instruct client to remove jewelry, hairpins, glasses, wigs (with metal clips), and other metallic objects.
  - **b.** Be aware that this test cannot be performed on anyone with orthopedic hardware, intrauterine devices, pacemaker, internal surgical clips, or other fixed metallic objects in the body.
  - **c.** Inform client of need to remain still while completely enclosed in scanner throughout the procedure, which lasts 45–60 minutes.
  - **d.** Teach relaxation techniques to assist client to remain still and to help prevent claustrophobia.
  - **e.** Warn client of normal audible humming and thumping noises from the scanner during test.
  - **f.** Have client void before test.
  - **g.** Sedate client if ordered.

E. Brain scan
- **1.** Injection of radioactive isotope, followed by scanning of head; isotopes will accumulate in abnormal lesions and be recorded by the scanner.
- **2.** Used to detect intracranial masses, vascular lesions, infarcts, hemorrhage
- **3.** Nursing care: check for allergy to iodine.

F. Myelography

G. Cerebral angiography
- **1.** Injection of radiopaque substance into the cerebral circulation via carotid, vertebral, femoral, or brachial artery followed by X-rays
- **2.** Used to visualize cerebral vessels and detect tumors, aneurysms, occlusions, hematomas, or abscesses
- **3.** Nursing care: pretest
  - **a.** Explain that client may have warm, flushed feeling and salty or metallic taste in mouth during procedure.
  - **b.** Check for allergy to iodine.
  - **c.** Keep NPO after midnight or offer clear liquid breakfast only.
  - **d.** Take baseline vital signs and neuro check.
  - **e.** Administer sedation if ordered.
- **4.** Nursing care: posttest
  - **a.** Maintain pressure dressing over site if femoral or brachial artery used; apply ice as ordered.

b. Maintain bed rest until next morning or as ordered.
c. Monitor vital signs and neuro checks frequently; report any changes immediately.
d. Check site frequently for bleeding or hematoma; if carotid artery used, assess for swelling of neck, difficulty swallowing or breathing.
e. Check pulse, color, and temperature of extremity distal to site used.
f. Keep extremity extended and avoid flexion.

H. Echoencephalography: use of ultrasound to detect midline shift of intracranial contents due to brain tumors, hematomas.
I. Electroencephalography (EEG)
1. Graphic recording of electrical activity of the brain by several small electrodes placed on the scalp
2. Used to detect focus or foci of seizure activity and to quantitatively evaluate level of brain function (determine brain death)
3. Pretest nursing care: withhold sedatives, tranquilizers, stimulants for 2–3 days.
4. Posttest nursing care: remove electrode paste with acetone and shampoo hair.

Eye

A. Ophthalmoscopic exam
B. Refraction: detects refractive errors and provides information for prescription of eyeglasses and contact lenses
C. Perimetry: assesses peripheral vision, visual fields
D. Tonometry: measures intraocular pressure (normal: 12–20 mm Hg)

Ear

A. Otoscopic exam
B. Audiometry: screening test for hearing loss and diagnostic test to determine degree and type of hearing loss
C. Vestibular function
1. Caloric test
2. Electronystagmography (ENG)

ANALYSIS

Nursing diagnoses for clients with disorders of the neurosensory system may include:
A. Imbalanced nutrition: less than body requirements
B. Ineffective thermoregulation
C. Autonomic dysreflexia
D. Constipation
E. Bowel incontinence
F. Impaired urinary elimination
G. Urinary retention
H. Ineffective tissue perfusion: cerebral
I. Ineffective airway clearance
J. Ineffective breathing pattern
K. Risk for injury
L. Risk for aspiration
M. Risk for disuse syndrome
N. Risk for impaired skin integrity
O. Impaired verbal communication
P. Sexual dysfunction
Q. Impaired physical mobility
R. Feeding self-care deficit
S. Impaired swallowing
T. Bathing/hygiene self-care deficit
U. Dressing/grooming self-care deficit
V. Toileting self-care deficit
W. Disturbed sensory perception: visual, auditory, kinesthetic, gustatory, tactile, olfactory
X. Unilateral neglect
Y. Disturbed thought processes

PLANNING AND IMPLEMENTATION

Goals

A. Nutritional state will be optimal.
B. Normal body temperature will be maintained.
C. Complications will be recognized early and treated promptly.
D. Adequate bowel and bladder elimination will be maintained.
E. Cerebral perfusion will be improved.
F. Adequate respiratory function will be maintained.
G. Client will remain free from any injury resulting from neurosensory deficits.
H. Client's skin integrity will be maintained.
I. Client's ability to communicate will be improved.
J. Sexual health will return to optimal level.
K. Mobility will be restored to optimal level.
L. Maximum independence in self-care activities will be attained.
M. Sensory perception will be improved.
N. Optimal cognitive functioning will be attained.

Interventions

Care of the Unconscious Client

A. Maintain a clear, patent airway.
1. Place client in a side-lying or three-quarters prone position to prevent tongue from obstructing airway.
2. If tongue is obstructing, insert oral airway.
3. Prepare for insertion of a cuffed endotracheal or tracheostomy tube as the client's condition requires.
4. Suction as needed.
5. Check respiratory rate, depth, and quality every 1–2 hours and as needed.

6. Auscultate breath sounds for crackles (rales), rhonchi, or absent breath sounds every 4 hours and before and after suctioning.

B. Take vital signs and perform neuro checks at specified intervals as ordered; report any significant changes immediately.

C. Maintain fluid and electrolyte balance and ensure adequate nutrition.
1. Administer IV fluids, nasogastric tube feedings as ordered.
2. Maintain accurate I&O.
3. Assess client's hydration status: skin turgor, check for dry mucous membranes.
4. Provide mouth care to keep mucous membranes clean, moist, and intact.

D. Provide for client's safety.
1. Keep side rails up at all times.
2. Avoid restraints if at all possible.
3. Observe client carefully for seizures and intervene to avoid precipitating factors: fever, hypoxia, electrolyte imbalance.
4. Protect client if seizure occurs.
5. Speak softly and use client's name during nursing care.
6. Touch client as gently as possible.
7. Protect client's eyes from corneal irritation.
   a. Check for corneal reflex.
   b. Instill artificial tears as ordered; patch eye.

E. Prevent complications of immobility.
1. Keep skin clean, dry, and pressure free.
2. Turn and reposition client every 2 hours.
3. Perform passive range-of-motion (ROM) exercises every 4 hours.
4. Use nursing measures to prevent deformities: footboard/high-topped sneakers to prevent footdrop, splint to prevent wrist drop.

F. Maintain adequate bladder and bowel elimination.
1. Urinary: indwelling catheter (may use external device in male)
2. Bowel: stool softeners and suppositories as ordered

Care of the Client with Increased Intracranial Pressure (ICP)

A. General information
1. An increase in intracranial bulk due to an increase in any of the major intracranial components: brain tissue, CSF, or blood.
2. Increased ICP may be caused by tumors, abscesses, hemorrhage, edema, hydrocephalus, inflammation.
3. Untreated increased ICP can lead to displacement of brain tissue (herniation).
4. Presents life-threatening situation because of pressure on vital structures in the brain stem, nerve tracts, and cranial nerves.

B. Assessment findings
1. Earliest sign: decrease in LOC; progresses from restlessness to confusion and disorientation to lethargy and coma
2. Changes in vital signs (may be a late sign)
   a. Systolic blood pressure rises while diastolic pressure remains the same (widening pulse presence)
   b. Pulse slows
   c. Abnormal respiratory patterns (e.g., Cheyne-Stokes respirations)
   d. Elevated temperature
3. Pupillary changes
   a. Ipsilateral (same side) dilation of pupil with sluggish reaction to light from compression of cranial nerve III
   b. Pupil eventually becomes fixed and dilated.
4. Motor abnormalities
   a. Contralateral (opposite side) hemiparesis from compression of corticospinal tracts
   b. Decorticate or decerebrate rigidity
5. Headache, projectile vomiting, papilledema (edema of the optic disc)

C. Nursing care
1. Maintain patent airway and adequate ventilation.
   a. Prevention of hypoxia and hypercarbia (increased CO_2) important: hypoxia may cause brain swelling and hypercarbia causes cerebral vasodilation, which increases ICP.
   b. Before and after suctioning, hyperventilate the client with a resuscitator bag connected to 100% oxygen. Limit suctioning to 10–15 seconds.
   c. Assist with mechanical hyperventilation as indicated: produces hypocarbia (decreased CO_2) causing cerebral vasoconstriction and decreased ICP.
2. Monitor vital signs and neuro checks frequently to detect rises in ICP.
3. Maintain fluid balance: fluid restriction to 1200–1500 mL/day may be ordered.
4. Position client with head of bed elevated to 30–45° and neck in neutral position unless contraindicated (improves venous drainage from brain).
5. Prevent further increases in ICP.
   a. Maintain quiet, comfortable environment.
   b. Avoid use of restraints.
   c. Prevent straining at stool; administer stool softeners and mild laxatives as ordered.
   d. Prevent vomiting; administer antiemetics as ordered.
   e. Prevent excessive coughing.
   f. Avoid clustering nursing care activities together.
6. Prevent complications of immobility.
7. Administer medications as ordered.

a. Hyperosmotic agents (mannitol [Osmitrol]) to reduce cerebral edema; monitor urine output every hour (should increase).
b. Corticosteroids (dexamethasone [Decadron]); anti-inflammatory effect reduces cerebral edema
c. Diuretics (furosemide [Lasix]) to reduce cerebral edema.
d. Anticonvulsants (phenytoin [Dilantin]) to prevent seizures.
e. Analgesics for headache as needed
1) Small doses of codeine
2) Stronger opiates may be contraindicated since they potentiate respiratory depression, alter LOC, and cause pupillary changes.

8. Assist with ICP monitoring when indicated.
a. ICP monitoring records the pressure exerted within the cranial cavity by the brain, cerebral blood, and CSF.
b. Types of monitoring devices
1) Intraventricular catheter: inserted in lateral ventricle to give direct measurement of ICP; also allows for drainage of CSF if needed
2) Subarachnoid screw (bolt): inserted through skull and dura mater into subarachnoid space
3) Epidural sensor: least invasive method; placed in space between skull and dura mater for indirect measurement of ICP
c. Monitor ICP pressure readings frequently and prevent complications.
1) Normal ICP reading is 0–15 mm Hg; a sustained increase above 15 mm Hg is considered abnormal.
2) Use strict aseptic technique when handling any part of the monitoring system.
3) Check insertion site for signs of infection; monitor temperature.
4) Assess system for CSF leakage, loose connections, air bubbles in lines, and occluded tubing.

9. Provide intensive nursing care for client treated with barbiturate therapy or administration of paralyzing agents.
a. Intravenous administration of barbiturates may be ordered to induce coma artificially in the client who has not responded to conventional treatment.
b. Paralytic agents such as vecuronium bromide (Norcuron) may be administered to paralyze the client.
c. Reduces cellular metabolic demands that may protect the brain from further injury.
d. Constant monitoring of the client's ICP, arterial blood pressures, pulmonary pressures, arterial blood gases, serum barbiturate levels, and ECG is necessary.
e. EEG monitoring as necessary.
f. Provide appropriate nursing care for the client on a ventilator.

10. Observe for hyperthermia secondary to hypothalamus damage.

Care of the Client with Hyperthermia

A. General information
1. Abnormal elevation of body temperature to 41°C (106°F) or above
2. Caused by dysfunction of hypothalamus (temperature regulating center) from edema, head injury, hemorrhage, CVA, brain tumor, or intracranial surgery
3. Hyperthermia increases cerebral metabolism; predisposes to seizures; may cause neurologic damage if prolonged

B. Nursing care
1. Remove blankets and excess clothing if temperature rises above 38.4°C (101°F).
2. Maintain room temperature at 21.1°C (70°F).
3. Administer antipyretic drugs (acetaminophen [Tylenol]) orally or rectally every 4 hours as ordered.
4. Increase fluid intake to 3000 mL/day unless contraindicated (in increased ICP).
5. Monitor vital signs, especially temperature, every 2–4 hours (more often if hypothermia is used).
6. Monitor urine output and urine specific gravity and assess for signs of dehydration.
7. Observe for seizure activity and protect client if seizures occur.
8. Change linen frequently if client is diaphoretic (sweating profusely).
9. Apply methods for inducing hypothermia as ordered: cool or tepid sponge baths, fans, hypothermia blanket. (See also Unit 3.)
10. Provide special care for the client with a hypothermia blanket. (See also Unit 3.)
a. Reduce temperature gradually to prevent shivering and serious dysrhythmias; chlorpromazine (Thorazine) may be given for shivering.
b. Provide frequent skin care to prevent breakdown.
1) Check every hour for signs of tissue damage or frostbite.
2) Apply lotion to skin to prevent drying.
3) Turn every 2 hours if not contraindicated because of increased intracranial pressure.
c. Monitor core body temperature.

Care of the Client with Diminished Eyesight

A. Always speak and identify yourself upon entering the room to prevent startling the client.

B. Orient the client to his surroundings.
  1. Walk the client around the room and have him touch the objects in the room, e.g., table, chair.
  2. Keep personal belongings and objects in the room in the same place in order to increase client's independence and sense of security.
  3. Explain noises or other activities going on in the room.
C. Provide safety measures.
  1. Keep call bell nearby.
  2. Keep at least one side rail up.
  3. Keep the room orderly and free of clutter.
D. Assist the client in walking by having him take your arm; walk a half step in front of the client.
E. Offer explanations to the client and tell him what to expect next.
F. Provide mental stimulation and prevent sensory deprivation by providing frequent contacts with the staff, visitors, use of radio, TV, etc.

Communicating with the Client with Impaired Hearing

A. Attract the client's attention by raising an arm or hand.
B. Face the client directly when speaking.
C. Do not obscure the client's view of your mouth in any way.
D. Initially state the topic or subject of your conversation to give the client clues as to what you are going to say.
E. Speak slowly and distinctly, but do not overaccentuate words.
F. Speak in a normal tone of voice; do not shout.
G. Verify that the client has understood you, if necessary.

Irrigation of the Ear

A. Introduction of fluid into external auditory canal for cleansing purposes; may be used to apply antiseptic solutions.
B. Nursing care
  1. Explain procedure to the client.
  2. Prepare supplies needed: irrigating solution (about 500 mL normal saline at body temperature), irrigating syringe, basin, towel, cotton-tipped applicators, cotton balls.
  3. Assist client to a sitting or lying position with head tilted toward the affected ear.
  4. Straighten ear canal by pulling auricle upward and backward (down and backward on a child under 3 years).
  5. Insert tip of syringe into auditory meatus and direct the solution gently upward toward the top of the canal.
  6. Collect returning fluid in basin.
  7. Dry the outer ear with cotton balls.
  8. Instruct client to lie on affected side to encourage drainage of solution.
  9. Record the procedure and results.

EVALUATION

A. Client maintains normal weight; no evidence of malnutrition.
B. Client's temperature is maintained within normal limits.
C. Dysreflexia will be prevented or recognized early and treated promptly.
D. Client has regular bowel movements.
E. Client has adequate patterns of urinary elimination.
F. Neuro checks are within normal limits.
G. Client maintains patent airway and has effective respiratory patterns.
H. Client remains free from injuries.
I. Client remains free from aspiration and complications of immobility.
J. Client's skin remains clear and intact.
K. Client communicates effectively, responds appropriately to others.
L. Client experiences satisfying sexual activity/expression.
M. No contractures or limitations in motor function have occurred or loss of mobility has been kept to a minimum.
N. Client attains independence in self-care activities; uses assistive devices as necessary.
O. Sensory dysfunction is corrected or compensated for.
P. Client is oriented to time, place, and person; memory is intact; able to evaluate reality.

DISORDERS OF THE NERVOUS SYSTEM

Headache

A. General information
  1. Diffuse pain in different parts of the head
  2. Types
    a. Functional
      1) Tension (muscle contraction): associated with tension or anxiety
      2) Migraine: recurrent throbbing headache
        a) Often starts in adolescence
        b) Affects women more than men
        c) Vascular origin: vasoconstriction or spasm of cerebral blood vessels (producing an aura) then vasodilation
      3) Cluster: similar to migraine (vascular origin); recur several times a day over a period of weeks followed by remission lasting for weeks or months
    b. Organic: secondary to intracranial or systemic disease (e.g., brain tumor, sinus disease)
B. Assessment findings
  1. Tension headache: pain usually bilateral, often occurring in the back of the neck and extending diffusely over top of head

2. Migraine headache: severe, throbbing pain, often in temporal or supraorbital area, lasting several hours to days; may be an aura (e.g., visual disturbance) preceding the pain; nausea and vomiting; pallor; sweating; irritability
3. Cluster headache: intense, throbbing pain, usually affecting only one side of face and head; abrupt onset, lasts 30–90 minutes; eye and nose water on side of pain; skin reddens
4. Diagnostic tests may be used to rule out organic causes.

C. Nursing interventions
1. Carefully assess details regarding the headache.
2. Provide quiet, dark environment.
3. Administer medications as ordered.
   a. Symptomatic during acute attack
      1) Nonnarcotic analgesics (aspirin, acetaminophen [Tylenol])
      2) Fiorinal (analgesic-sedative/tranquilizer combination)
      3) For migraines, ergotamine tartrate (Gynergen) or ergotamine with caffeine (Cafergot); vasoconstrictors given during aura may prevent the headache
      4) Midrin (vasoconstrictor and sedative)
      5) Sumatriptan (Imitrex) causes vasoconstriction in cerebral arteries; given via cutaneous injection.
   b. Prophylactic to prevent migraine attacks
      1) Methysergide maleate (Sansert): after 6 months' use, drug should be discontinued for a 2-month period before resuming
      2) Propranolol (Inderal) and amytriptyline (Elavil): have also been used in migraine prevention
4. Provide additional nursing interventions for pain.
5. Provide client teaching and discharge planning concerning:
   a. Identification of factors including diet that appear to precipitate attacks
   b. Examination of lifestyle, identification of stressors, and development of more positive coping behaviors
   c. Importance of daily exercise and relaxation periods
   d. Relaxation techniques
   e. Use and side effects of prescribed medications
   f. Alternative ways of handling the pain of headache: meditation, relaxation, self-hypnosis, yoga

Meningitis

A. General information
1. Inflammation of the meninges of the brain and spinal cord
2. Caused by bacteria, viruses, or other microorganisms
3. May reach CNS
   a. Via the blood, CSF, lymph
   b. By direct extension from adjacent cranial structures (nasal sinuses, mastoid bone, ear, skull fracture)
   c. By oral or nasopharyngeal route
4. Most common organisms: meningococcus, pneumococcus, *H. influenzae*, streptococcus

B. Assessment findings
1. Headache, photophobia, malaise, irritability
2. Chills and fever
3. Signs of meningeal irritation
   a. Nuchal rigidity: stiff neck
   b. Kernig's sign: contraction or pain in the hamstring muscle when attempting to extend the leg when the hip is flexed
   c. Opisthotonos: head and heels bent backward and body arched forward
   d. Brudzinski's sign: flexion at the hip and knee in response to forward flexion of the neck
4. Vomiting
5. Possible seizures and decreasing LOC
6. Diagnostic test: lumbar puncture (measurement and analysis of CSF shows increased pressure, elevated WBC and protein, decreased glucose and culture positive for specific microorganism)

C. Nursing interventions
1. Administer large doses of antibiotics IV as ordered.
2. Enforce respiratory isolation for 24 hours after initiation of antibiotic therapy for some types of meningitis (consult hospital's infection control manual for specific directions).
3. Provide nursing care for increased ICP, seizures, and hyperthermia if they occur.
4. Provide nursing care for delirious or unconscious client as needed.
5. Provide bed rest; keep room quiet and dark if client has headache or photophobia.
6. Administer analgesics for headache as ordered.
7. Maintain fluid and electrolyte balance.
8. Prevent complications of immobility.
9. Monitor vital signs and neuro checks frequently.
10. Provide client teaching and discharge planning concerning:
    a. Importance of good diet: high protein, high calorie with small, frequent feedings.
    b. Rehabilitation program for residual deficits.

Encephalitis

A. General information
1. Inflammation of the brain caused by a virus, e.g., herpes simplex (type I) or arbovirus (transmitted by mosquito or tick)

2. May occur as a sequela of other diseases such as measles, mumps, chickenpox.

B. Assessment findings
1. Headache
2. Fever, chills, vomiting
3. Signs of meningeal irritation
4. Possibly seizures
5. Alterations in LOC

C. Nursing interventions
1. Monitor vital signs and neuro checks frequently.
2. Provide nursing measures for increased ICP, seizures, hyperthermia if they occur.
3. Provide nursing care for confused or unconscious client as needed.
4. Provide client teaching and discharge planning: same as for meningitis.

Brain Abscess

A. General information
1. Collection of free or encapsulated pus within the brain tissue
2. Usually follows an infectious process elsewhere in the body (ear, sinuses, mastoid bone)

B. Assessment findings
1. Headache, malaise, anorexia
2. Vomiting
3. Signs of increased ICP
4. Focal neurologic deficits (hemiparesis, seizures)

C. Nursing interventions
1. Administer large doses of antibiotics as ordered.
2. Monitor vital signs and neuro checks.
3. Provide symptomatic and supportive care.
4. Prepare client for surgery if indicated (see Craniotomy).

Brain Tumors

A. General information
1. Tumor within the cranial cavity; may be benign or malignant
2. Types
a. Primary: originates in brain tissue (e.g., glioma, meningioma)
b. Secondary: metastasizes from tumor elsewhere in the body (e.g., lung, breast)

B. Medical management
1. Craniotomy: to remove the tumor when possible
2. Radiation therapy and chemotherapy: may follow surgery; also for inaccessible tumors and metastatic tumors
3. Drug therapy: hyperosmotic agents, corticosteroids, diuretics to manage increased ICP

C. Assessment findings
1. Headache: worse in the morning and with straining and stooping
2. Vomiting
3. Papilledema
4. Seizures (focal or generalized)
5. Changes in mental status
6. Focal neurologic deficits (e.g., aphasia, hemiparesis, sensory problems)
7. Diagnostic tests
a. Skull X-ray, CT scan, MRI, brain scan: reveal presence of tumor
b. Abnormal EEG
c. Brain biopsy

D. Nursing interventions
1. Monitor vital signs and neuro checks; observe for signs and symptoms of increased ICP.
2. Administer medications as ordered.
a. Drugs to decrease ICP, e.g., dextromethasone (Decadron)
b. Anticonvulsants, e.g., phenytoin (Dilantin)
c. Analgesics for headache, e.g., acetaminophen (Tylenol)
3. Provide supportive care for any neurologic deficit (see Cerebrovascular Accident).
4. Prepare client for surgery (see Craniotomy).
5. Provide care for effects of radiation therapy or chemotherapy (see Oncologic Nursing).
6. Provide psychologic support to client/significant others.
7. Provide client teaching and discharge planning concerning
a. Use and side effects of prescribed medications.
b. Rehabilitation program for residual deficits.

Cerebrovascular Accident (CVA)

A. General information
1. Destruction (infarction) of brain cells caused by a reduction in cerebral blood flow and oxygen
2. Affects men more than women; incidence increases with age
3. Caused by thrombosis, embolism, hemorrhage
4. Risk factors
a. Hypertension, diabetes mellitus, arteriosclerosis/atherosclerosis, cardiac disease (valvular disease/replacement, chronic atrial fibrillation, myocardial infarction)
b. Lifestyle: obesity, smoking, inactivity, stress, use of oral contraceptives
5. Pathophysiology
a. Interruption of cerebral blood flow for 5 minutes or more causes death of neurons in affected area with irreversible loss of function
b. Modifying factors
1) Cerebral edema: develops around affected area causing further impairment

2) Vasospasm: constriction of cerebral blood vessel may occur, causing further decrease in blood flow
3) Collateral circulation: may help to maintain cerebral blood flow when there is compromise of main blood supply

6. Stages of development
   a. Transient ischemic attack (TIA)
      1) Warning sign of impending CVA
      2) Brief period of neurologic deficit: visual loss, hemiparesis, slurred speech, aphasia, vertigo
      3) May last less than 30 seconds, but no more than 24 hours with complete resolution of symptoms
   b. Stroke in evolution: progressive development of stroke symptoms over a period of hours to days
   c. Completed stroke: neurologic deficit remains unchanged for a 2- to 3-day period.

B. Assessment findings
1. Headache
2. Generalized signs: vomiting, seizures, confusion, disorientation, decreased LOC, nuchal rigidity, fever, hypertension, slow bounding pulse, Cheyne-Stokes respirations
3. Focal signs (related to site of infarction): hemiplegia, sensory loss, aphasia, homonymous hemianopsia
4. Diagnostic tests
   a. CT and brain scan: reveal lesion
   b. EEG: abnormal changes
   c. Cerebral arteriography: may show occlusion or malformation of blood vessels

C. Nursing interventions: acute stage
1. Maintain patent airway and adequate ventilation.
2. Monitor vital signs and neuro checks and observe for signs of increased ICP, shock, hyperthermia, and seizures.
3. Provide complete bed rest as ordered.
4. Maintain fluid and electrolyte balance and ensure adequate nutrition.
   a. IV therapy for the first few days
   b. Nasogastric tube feedings if client unable to swallow
   c. Fluid restriction as ordered to decrease cerebral edema
5. Maintain proper positioning and body alignment.
   a. Head of bed may be elevated 30–45° to decrease ICP
   b. Turn and reposition every 2 hours (only 20 minutes on the affected side)
   c. Passive ROM exercises every 4 hours.
6. Promote optimum skin integrity: turn client and apply lotion every 2 hours.
7. Maintain adequate elimination.
   a. Offer bedpan or urinal every 2 hours, catheterize only if absolutely necessary.
   b. Administer stool softeners and suppositories as ordered to prevent constipation and fecal impaction.
8. Provide a quiet, restful environment.
9. Establish a means of communicating with the client.
10. Administer medications as ordered.
    a. Hyperosmotic agents, corticosteroids to decrease cerebral edema
    b. Anticonvulsants to prevent or treat seizures
    c. Thrombolytics given to dissolve clot (hemorrhage must be ruled out)
       1) Tissue plasminogen activator (tPA, Alteplase)
       2) Streptokinase, urokinase
       3) Must be given within 3 hours of episode
    d. Anticoagulants for stroke in evolution or embolic stroke (hemorrhage must be ruled out)
       1) Heparin
       2) Warfarin (Coumadin) for long-term therapy
       3) Aspirin and dipyridamole (Persantine) to inhibit platelet aggregation in treating TIAs
    e. Antihypertensives if indicated for elevated blood pressure

D. Nursing interventions: rehabilitation
1. Hemiplegia: results from injury to cells in the cerebral motor cortex or to corticospinal tracts (causes contralateral hemiplegia because tracts cross in medulla)
   a. Turn every 2 hours (20 minutes only on affected side).
   b. Use proper positioning and repositioning to prevent deformities (foot drop, external rotation of hip, flexion of fingers, wrist drop, abduction of shoulder and arm).
   c. Support paralyzed arm on pillow or use sling while out of bed to prevent subluxation of shoulder.
   d. Elevate extremities to prevent dependent edema.
   e. Provide active and passive ROM exercises every 4 hours.
2. Susceptibility to hazards
   a. Keep side rails up at all times.
   b. Institute safety measures.
   c. Inspect body parts frequently for signs of injury.
3. Dysphagia (difficulty swallowing)
   a. Check gag reflex before feeding client.
   b. Maintain a calm, unhurried approach.
   c. Place client in upright position.
   d. Place food in unaffected side of mouth.
   e. Offer soft foods.
   f. Give mouth care before and after meals.
4. Homonymous hemianopsia: loss of right or left half of each visual field

a. Approach client on unaffected side.
b. Place personal belongings, food, etc., on unaffected side.
c. Gradually teach client to compensate by scanning, i.e., turning the head to see things on affected side.

5. Emotional lability: mood swings, frustration
   a. Create a quiet, restful environment with a reduction in excessive sensory stimuli.
   b. Maintain a calm, nonthreatening manner.
   c. Explain to family that the client's behavior is not purposeful.
6. Aphasia: most common in right hemiplegics; may be receptive/expressive
   a. Receptive aphasia
      1) Give simple, slow directions.
      2) Give one command at a time; gradually shift topics.
      3) Use nonverbal techniques of communication (e.g., pantomime, demonstration).
   b. Expressive aphasia
      1) Listen and watch very carefully when the client attempts to speak.
      2) Anticipate client's needs to decrease frustration and feelings of helplessness.
      3) Allow sufficient time for client to answer.
7. Sensory/perceptual deficits: more common in left hemiplegics; characterized by impulsiveness, unawareness of disabilities, visual neglect (neglect of affected side and visual space on affected side)
   a. Assist with self-care.
   b. Provide safety measures.
   c. Initially arrange objects in environment on unaffected side.
   d. Gradually teach client to take care of the affected side and to turn frequently and look at affected side.
8. Apraxia: loss of ability to perform purposeful, skilled acts
   a. Guide client through intended movement (e.g., take object such as washcloth and guide client through movement of washing).
   b. Keep repeating the movement.
9. Generalizations about clients with left hemiplegia versus right hemiplegia and nursing care
   a. Left hemiplegia
      1) Perceptual, sensory deficits; quick and impulsive behavior
      2) Use safety measures, verbal cues, simplicity in all areas of care
   b. Right hemiplegia
      1) Speech-language deficits; slow and cautious behavior
      2) Use pantomime and demonstration

Cerebral Aneurysm

A. General information
   1. Dilation of the walls of a cerebral artery, resulting in a sac-like outpouching of vessel
   2. Caused by congenital weakness in the vessel, trauma, arteriosclerosis, hypertension
   3. Pathophysiology
      a. Aneurysm compresses nearby cranial nerves or brain substance, producing dysfunction.
      b. Aneurysm may rupture, causing subarachnoid hemorrhage or intracerebral hemorrhage.
      c. Initially a clot forms at the site of rupture, but fibrinolysis (dissolution of the clot) tends to occur within 7–10 days and may cause rebleeding.

B. Assessment findings
   1. Severe headache and pain in the eyes
   2. Diplopia, tinnitus, dizziness
   3. Nuchal rigidity, ptosis, decreasing LOC, hemiparesis, seizures

C. Nursing interventions
   1. Maintain a patent airway and adequate ventilation.
      a. Instruct client to take deep breaths but to avoid coughing.
      b. Suction only with a specific order.
   2. Monitor vital signs and neuro checks and observe for signs of vasospasm, increased ICP, hypertension, seizures, and hyperthermia.
   3. Enforce strict bed rest and provide complete care.
   4. Keep head of bed flat or elevated to 20–30° as ordered.
   5. Maintain a quiet, darkened environment.
   6. Avoid taking temperature rectally and instruct client to avoid sneezing, coughing, and straining at stool.
   7. Enforce fluid restriction as ordered; maintain accurate I&O.
   8. Administer medications as ordered.
      a. Antihypertensive agents to maintain normotensive levels
      b. Corticosteroids to prevent increased ICP
      c. Anticonvulsants to prevent seizures
      d. Stool softeners to prevent straining
      e. Aminocaproic acid (Amicar) to decrease fibrinolysis of the clot (administered IV)
   9. Prevent complications of immobility.
   10. Institute seizure precautions.
   11. Provide nursing care for the unconscious client if needed.
   12. Prepare the client for surgery if indicated (see Craniotomy).

Parkinson's Disease

A. General information
   1. A progressive disorder with degeneration of the nerve cells in the basal ganglia resulting in

generalized decline in muscular function; disorder of the extrapyramidal system
2. Usually occurs in the older population
3. Cause unknown; predominantly idiopathic, but sometimes disorder is postencephalitic, toxic, arteriosclerotic, traumatic, or drug induced (reserpine, methyldopa [Aldomet], haloperidol [Haldol], phenothiazines)
4. Pathophysiology
   a. Disorder causes degeneration of the dopamine-producing neurons in the substantia nigra in the midbrain.
   b. Dopamine influences purposeful movement.
   c. Depletion of dopamine results in degeneration of the basal ganglia.

B. Assessment findings
1. Tremor: mainly of the upper limbs, "pill-rolling," resting tremor; most common initial symptom
2. Rigidity: cogwheel type
3. Bradykinesia: slowness of movement
4. Fatigue
5. Stooped posture; shuffling, propulsive gait (see Figure 4-4)
6. Difficulty rising from sitting position
7. Masklike face with decreased blinking of eyes
8. Quiet, monotone speech
9. Emotional lability, depression
10. Increased salivation, drooling
11. Cramped, small handwriting
12. Autonomic symptoms: excessive sweating, seborrhea, lacrimation, constipation; decreased sexual capacity

C. Nursing interventions
1. Administer medications as ordered
   a. Levodopa (L-dopa)
      1) Increases level of dopamine in the brain; relieves tremor, rigidity, and bradykinesia.
      2) Side effects: anorexia; nausea and vomiting; postural hypotension; mental changes such as confusion, agitation, and hallucinations; cardiac arrhythmias; dyskinesias.
      3) Contraindications: narrow-angle glaucoma; clients taking MAO inhibitors, reserpine, guanethidine, methyldopa, antipsychotics; acute psychoses.
      4) Avoid multiple vitamin preparations containing vitamin B_6 (pyridoxine) and foods high in vitamin B_6.
      5) Be aware of any worsening of symptoms with prolonged high-dose therapy: "on-off" syndrome.
      6) Administer with food or snack to decrease GI irritation.
      7) Inform client that urine and sweat may be darkened.
   b. Carbidopa-levodopa (Sinemet): prevents breakdown of dopamine in the periphery and causes fewer side effects.
   c. Amantadine (Symmetrel): used in mild cases or in combination with L-dopa to reduce rigidity, tremor, and bradykinesia.

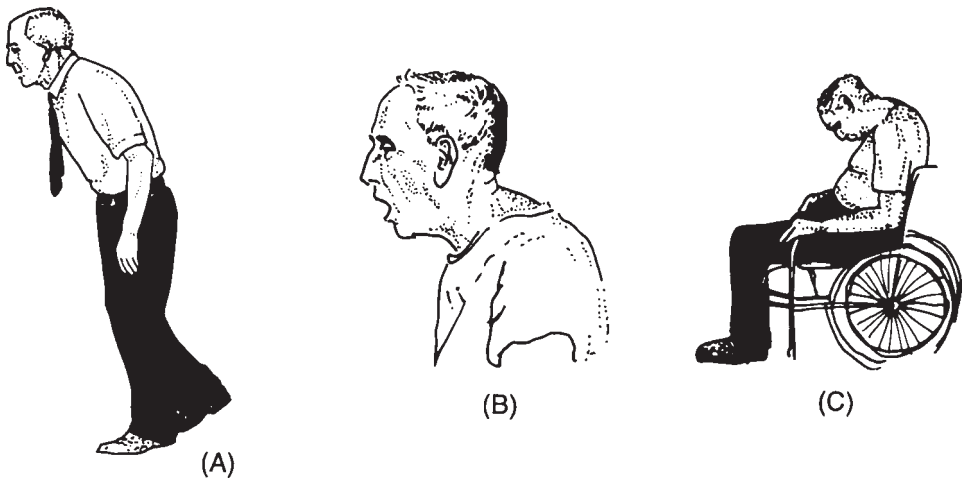


Figure 4–4 The shuffling gait and early postural changes of Parkinson's disease shown in (A). (B) and (C) show an advanced stage of the disease with head held forward, mouth open, and inability to stand.

d. Anticholinergic drugs: benztropine mesylate (Cogentin), procyclidine (Kemadrin), trihexyphenidyl (Artane)
1) Inhibit action of acetylcholine
2) Used in mild cases or in combination with L-dopa
3) Relieve tremor and rigidity
4) Side effects: dry mouth, blurred vision, constipation, urinary retention, confusion, hallucinations, tachycardia

e. Antihistamines: diphenhydramine (Benadryl)
1) Decrease tremor and anxiety
2) Side effect: drowsiness

f. Bromocriptine (Parlodel)
1) Stimulates release of dopamine in the substantia nigra.
2) Often employed when L-dopa loses effectiveness.

g. Eldepryl (Selegilene) a MAO inhibitor inhibits dopamine breakdown and slows progression of disease

h. Tricyclic antidepressants given to treat depression commonly seen in Parkinson's disease

2. Provide a safe environment.
a. Side rails on bed; rails and handlebars in toilet, bathtub, and hallways; no scatter rugs
b. Hard-back or spring-loaded chair to make getting up easier

3. Provide measures to increase mobility.
a. Physical therapy: active and passive ROM exercises; stretching exercises; warm baths
b. Assistive devices
c. If client "freezes," suggest thinking of something to walk over.

4. Encourage independence in self-care activities: alter clothing for ease in dressing; use assistive devices; do not rush client.

5. Improve communication abilities: instruct client to practice reading aloud, to listen to own voice, and enunciate each syllable clearly.

6. Refer for speech therapy when indicated.

7. Maintain adequate nutrition.
a. Cut food into bite-sized pieces.
b. Provide small, frequent feedings.
c. Allow sufficient time for meals, use warming tray.

8. Avoid constipation and maintain adequate bowel elimination.

9. Provide psychologic support to client/significant others; depression is common due to changes in body image and self-concept.

10. Provide client teaching and discharge planning concerning
a. Nature of the disease
b. Use of prescribed medications and side effects
c. Importance of daily exercise: walking, swimming, gardening as tolerated; balanced activity and rest
d. Activities/methods to limit postural deformities: firm mattress with a small pillow; keep head and neck as erect as possible; use broad-based gait; raise feet while walking
e. Promotion of active participation in self-care activities

Multiple Sclerosis (MS)

A. General information
1. Chronic, intermittently progressive disease of the CNS, characterized by scattered patches of demyelination within the brain and spinal cord
2. Incidence
a. Affects women more than men
b. Usually occurs from 20–40 years of age
c. More frequent in cool or temperate climates
3. Cause unknown; may be a slow-growing virus or possibly of autoimmune origin
4. Signs and symptoms are varied and multiple, reflecting the location of demyelination within the CNS
5. Characterized by remissions and exacerbations

B. Assessment findings
1. Visual disturbances: blurred vision, scotomas (blind spots), diplopia
2. Impaired sensation: touch, pain, temperature, or position sense; paresthesias such as numbness, tingling
3. Euphoria or mood swings
4. Impaired motor function: weakness, paralysis, spasticity
5. Impaired cerebellar function: scanning speech, ataxic gait, nystagmus, dysarthria, intention tremor
6. Bladder: retention or incontinence
7. Constipation
8. Sexual impotence in the male
9. Diagnostic tests:
a. CSF studies: increased protein and IgG (immunoglobulin)
b. Visual evoked response (VER) determined by EEG: may be delayed
c. CT scan: increased density of white matter
d. MRI: shows areas of demyelination

C. Nursing interventions
1. Assess the client for specific deficits related to location of demyelinization.
2. Promote optimum mobility.
a. Muscle-stretching and strengthening exercises
b. Walking exercises to improve gait: use wide-based gait
c. Assistive devices: canes, walker, rails, wheelchair as necessary

3. Administer medications as ordered.
   a. For acute exacerbations: corticosteroids (ACTH [IV], prednisone) to reduce edema at sites of demyelinization
   b. For spasticity: baclofen (Lioresal), dantrolene (Dantrium), diazepam (Valium)
   c. Beta interferon (Betaseron) to alter immune response
4. Encourage independence in self-care activities.
5. Prevent complications of immobility.
6. Institute bowel program.
7. Maintain urinary elimination.
   a. Urinary retention
      1) Administer bethanecol chloride (Urecholine) as ordered.
      2) Perform intermittent catheterization as ordered.
   b. Urinary incontinence
      1) Establish voiding schedule.
      2) Administer propantheline bromide (Pro-Banthine) if ordered.
   c. Force fluids to 3000 mL/day.
   d. Promote use of acid-ash foods like cranberry or grape juice.
8. Prevent injury related to sensory problems.
   a. Test bath water with thermometer.
   b. Avoid heating pads, hot-water bottles.
   c. Inspect body parts frequently for injury.
   d. Make frequent position changes.
9. Prepare client for plasma exchange (to remove antibodies) if indicated.
10. Provide psychologic support to client/significant others.
    a. Encourage positive attitude and assist client in setting realistic goals.
    b. Provide compassion in helping client adapt to changes in body image and self-concept.
    c. Do not encourage false hopes during remission.
    d. Refer to multiple sclerosis societies and community agencies.
11. Provide client teaching and discharge planning concerning
    a. General measures to ensure optimum health
       1) Balance between activity and rest
       2) Regular exercise such as walking, swimming, biking in mild cases
       3) Use of energy conservation techniques
       4) Well-balanced diet
       5) Fresh air and sunshine
       6) Avoiding fatigue, overheating or chilling, stress, infection
    b. Use of medications and side effects
    c. Alternative methods for sexual gratification; refer for sexual counseling if indicated.

Myasthenia Gravis

A. General information
   1. A neuromuscular disorder in which there is a disturbance in the transmission of impulses from nerve to muscle cells at the neuromuscular junction, causing extreme muscle weakness
   2. Incidence
      a. Highest between ages 15 and 35 for women, over 40 for men.
      b. Affects women more than men
   3. Cause: thought to be autoimmune disorder whereby antibodies destroy acetylcholine receptor sites on the postsynaptic membrane of the neuromuscular junction.
   4. Voluntary muscles are affected, especially those muscles innervated by the cranial nerves.
B. Medical management
   1. Drug therapy
      a. Anticholinesterase drugs: ambenonium (Mytelase), neostigmine (Prostigmin), pyridostigmine (Mestinon)
         1) Block action of cholinesterase and increase levels of acetylcholine at the neuromuscular junction
         2) Side effects: excessive salivation and sweating, abdominal cramps, nausea and vomiting, diarrhea, fasciculations (muscle twitching)
      b. Corticosteroids: prednisone
         1) Used if other drugs are not effective
         2) Suppress autoimmune response
   2. Surgery (thymectomy)
      a. Surgical removal of the thymus gland (thought to be involved in the production of acetylcholine receptor antibodies)
      b. May cause remission in some clients especially if performed early in the disease
   3. Plasma exchange
      a. Removes circulating acetylcholine receptor antibodies
      b. Use in clients who do not respond to other types of therapy
C. Assessment findings
   1. Diplopia, dysphagia
   2. Extreme muscle weakness, increased with activity and reduced with rest
   3. Ptosis, masklike facial expression
   4. Weak voice, hoarseness
   5. Diagnostic tests
      a. Tensilon test: IV injection of Tensilon provides spontaneous relief of symptoms (lasts 5–10 minutes)
      b. Electromyography (EMG): amplitude of evoked potentials decreases rapidly
      c. Presence of antiacetylcholine receptor antibodies in the serum

D. Nursing interventions
- **1.** Administer anticholinesterase drugs as ordered.
  - **a.** Give medication exactly on time.
  - **b.** Give with milk and crackers to decrease GI upset.
  - **c.** Monitor effectiveness of drugs: assess muscle strength and vital capacity before and after medication.
  - **d.** Avoid use of the following drugs: morphine and strong sedatives (respiratory depressant effect), quinine, curare, procainamide, neomycin, streptomycin, kanamycin and other aminoglycosides (skeletal muscle blocking effects).
  - **e.** Observe for side effects.
- **2.** Promote optimal nutrition.
  - **a.** Mealtimes should coincide with the peak effects of the drugs: give medications 30 minutes before meals.
  - **b.** Check gag reflex and swallowing ability before feeding.
  - **c.** Provide a mechanical soft diet.
  - **d.** If the client has difficulty chewing and swallowing, do not leave alone at mealtimes; keep emergency airway and suction equipment nearby.
- **3.** Monitor respiratory status frequently: rate, depth; vital capacity; ability to deep breathe and cough.
- **4.** Assess muscle strength frequently; plan activity to take advantage of energy peaks and provide frequent rest periods.
- **5.** Observe for signs of myasthenic or cholinergic crisis.
  - **a.** Myasthenic crisis
    - **1)** Abrupt onset of severe, generalized muscle weakness with inability to swallow, speak, or maintain respirations
    - **2)** Caused by undermedication, physical or emotional stress, infection
    - **3)** Symptoms will improve temporarily with Tensilon test
  - **b.** Cholinergic crisis
    - **1)** Symptoms similar to myasthenic crisis and, in addition, the side effects of anticholinesterase drugs (e.g., excessive salivation and sweating, abdominal cramps, nausea and vomiting, diarrhea, fasciculations)
    - **2)** Caused by overmedication with the cholinergic (anticholinesterase) drugs
    - **3)** Symptoms worsen with Tensilon test; keep atropine sulfate and emergency equipment on hand
  - **c.** Nursing care in crisis
    - **1)** Maintain tracheostomy or endotracheal tube with mechanical ventilation as indicated (see Mechanical Ventilation).
    - **2)** Monitor arterial blood gases and vital capacities.
    - **3)** Administer medications as ordered.
      - **a)** Myasthenic crisis: increase doses of anticholinesterase drugs as ordered.
      - **b)** Cholinergic crisis: discontinue anticholinesterase drugs as ordered until the client recovers.
    - **4)** Establish a method of communication.
    - **5)** Provide support and reassurance.
- **6.** Provide nursing care for the client with a thymectomy.
- **7.** Provide client teaching and discharge planning concerning
  - **a.** Nature of the disease
  - **b.** Use of prescribed medications, their side effects and signs of toxicity
  - **c.** Importance of checking with physician before taking any new medications including OTC drugs
  - **d.** Importance of planning activities to take advantage of energy peaks and of scheduling frequent rest periods
  - **e.** Need to avoid fatigue, stress, people with upper-respiratory infections
  - **f.** Use of eye patch for diplopia (alternate eyes)
  - **g.** Need to wear Medic-Alert bracelet
  - **h.** Myasthenia Gravis Foundation and other community agencies

Epilepsy

See Unit 5.

Head Injury

A. General information
- **1.** Usually caused by car accidents, falls, assaults
- **2.** Types
  - **a.** Concussion: severe blow to the head jostles brain, causing it to strike the skull; results in temporary neural dysfunction
  - **b.** Contusion: results from more severe blow that bruises the brain and disrupts neural function
  - **c.** Hemorrhage
    - **1)** Epidural hematoma: accumulation of blood between the dura mater and skull; commonly results from laceration of middle meningeal artery during skull fracture; blood accumulates rapidly
    - **2)** Subdural hematoma: accumulation of blood between the dura and arachnoid; venous bleeding that forms slowly; may be acute, subacute, or chronic
    - **3)** Subarachnoid hematoma: bleeding in subarachnoid space

4) Intracerebral hematoma: accumulation of blood within the cerebrum

d. Fractures: linear, depressed, comminuted, compound

B. Assessment findings (depend on type of injury)

1. Concussion: headache, transient loss of consciousness, retrograde or posttraumatic amnesia, nausea, dizziness, irritability

2. Contusion: neurologic deficits depend on the site and extent of damage; include decreased LOC, aphasia, hemiplegia, sensory deficits

3. Hemorrhages

a. Epidural hematoma: brief loss of consciousness followed by lucid interval; progresses to severe headache, vomiting, rapidly deteriorating LOC, possible seizures, ipsilateral pupillary dilation

b. Subdural hematoma: alterations in LOC, headache, focal neurologic deficits, personality changes, ipsilateral pupillary dilation

c. Intracerebral hematoma: headache, decreased LOC, hemiplegia, ipsilateral pupillary dilation

4. Fractures

a. Headache, pain over fracture site

b. Compound fractures: rhinorrhea (leakage of CSF from nose); otorrhea (leakage of CSF from ear)

5. Diagnostic tests

a. Skull X-ray: reveals skull fracture or intracranial shift

b. CT scan: reveals hemorrhage

C. Nursing interventions (see also Care of the Unconscious Client and Care of the Client with Increased ICP)

1. Maintain a patent airway and adequate ventilation.

2. Monitor vital signs and neuro checks; observe for changes in neurologic status, signs of increased ICP, shock, seizures, and hyperthermia.

3. Observe for CSF leakage.

a. Check discharge for positive Testape or Dextrostix reaction for glucose; bloody spot encircled by watery, pale ring "halo" on pillowcase or sheet.

b. Never attempt to clean the ears or nose of a head-injured client or use nasal suction unless cleared by physician.

4. If a CSF leak is present:

a. Instruct client not to blow nose.

b. Elevate head of bed 30° as ordered.

c. Observe for signs of meningitis and administer antibiotics to prevent meningitis as ordered.

d. Place a cotton ball in the ear to absorb otorrhea; replace frequently.

e. Gently place a sterile gauze pad at the bottom of the nose for rhinorrhea; replace frequently.

5. Prevent complications of immobility.

6. Prepare the client for surgery if indicated.

a. Depressed skull fracture: surgical removal or elevation of splintered bone; debridement and cleansing of area; repair of dural tear if present; cranioplasty (if necessitated for large cranial defect)

b. Epidural or subdural hematoma: evacuation of the hematoma

7. Provide psychologic support to client/significant others.

8. Observe for hemiplegia, aphasia, and sensory problems, and plan care accordingly (see Cerebrovascular Accident).

9. Provide client teaching and discharge planning concerning rehabilitation for neurologic deficits; note availability of community agencies.

Intracranial Surgery

A. Types

1. Craniotomy: surgical opening of skull to gain access to intracranial structures; used to remove a tumor, evacuate blood clot, control hemorrhage, relieve increased ICP

2. Craniectomy: excision of a portion of the skull; sometimes used for decompression

3. Cranioplasty: repair of a cranial defect with a metal or plastic plate

B. Nursing interventions: preoperative

1. Routine pre-op care (see Perioperative Nursing).

2. Provide emotional support; explain post-op procedures and that client's head will be shaved, there will be a large bandage on head, possibly temporary swelling and discoloration around the eye on the affected side, and possible headache.

3. Shampoo the scalp and check for signs of infection.

4. Shave hair.

5. Evaluate and record baseline vital signs and neuro checks.

6. Avoid enemas unless directed (straining increases ICP).

7. Give pre-op steroids as ordered to decrease brain swelling.

8. Insert Foley catheter as ordered.

C. Nursing interventions: postoperative

1. Provide nursing care for the unconscious client.

2. Maintain a patent airway and adequate ventilation.

a. Supratentorial incision: elevate head of bed 15–45° as ordered; position on back (if intubated or conscious) or on unaffected side; turn every 2 hours to facilitate breathing and venous return.

b. Infratentorial incision: keep head of bed flat or elevate 20–30° as ordered; do not flex head on chest; turn side to side every

2 hours using a turning sheet; check respirations closely and report any signs of respiratory distress.
   c. Instruct the conscious client to breathe deeply but not to cough; avoid vigorous suctioning.
3. Check vital signs and neuro checks frequently; observe for decreasing LOC, increased ICP, seizures, hyperthermia.
4. Monitor fluid and electrolyte status.
   a. Maintain accurate I&O.
   b. Restrict fluids to 1500 mL/day or as ordered to decrease cerebral edema.
   c. Avoid overly rapid infusions.
   d. Watch for signs of diabetes insipidus (severe thirst, polyuria, dehydration) and inappropriate ADH secretion (decreased urine output, hunger, thirst, irritability, decreased LOC, muscle weakness).
   e. For infratentorial surgery: may be NPO for 24 hours due to possible impaired swallowing and gag reflexes.
5. Assess dressings frequently and report any abnormalities.
   a. Reinforce as needed with sterile dressings.
   b. Check dressings for excessive drainage, CSF, infection, displacement and report to physician.
   c. If surgical drain is in place, note color, amount, and odor of drainage.
6. Administer medications as ordered.
   a. Corticosteroids: to decrease cerebral edema
   b. Anticonvulsants: to prevent seizures
   c. Stool softeners: to prevent straining
   d. Mild analgesics
7. Apply ice to swollen eyelids; lubricate lids and areas around eyes with petrolatum jelly.
8. Refer client for rehabilitation for residual deficits.

Spinal Cord Injuries

A. General information
   1. Occurs most commonly in young adult males between ages 15 and 25
   2. Common traumatic causes: motor vehicle accidents, diving in shallow water, falls, industrial accidents, sports injuries, gunshot or stab wounds
   3. Nontraumatic causes: tumors, hematomas, aneurysms, congenital defects (spina bifida)
   4. Classified by extent, level, and mechanism of injury
      a. Extent of injury
         1) May affect the vertebral column: fracture, fracture/dislocation
         2) May affect anterior or posterior ligaments, causing compression of spinal cord
         3) May be to the spinal cord and its roots: concussion, contusion, compression or laceration by fracture/dislocation or penetrating missiles
      b. Level of injury: cervical, thoracic, lumbar
      c. Mechanisms of injury
         1) Hyperflexion
         2) Hyperextension
         3) Axial loading (force exerted straight up or down spinal column as in a diving accident)
         4) Penetrating wounds
   5. Pathophysiology: hemorrhage and edema cause ischemia, leading to necrosis and destruction of the cord

B. Medical management: immobilization and maintenance of normal spinal alignment to promote fracture healing
   1. Horizontal turning frames (Stryker frame)
   2. Skeletal traction: to immobilize the fracture and maintain alignment of the cervical spine
      a. Cervical tongs (Crutchfield, Gardner-Wells, Vinke): inserted through burr holes; traction is provided by a rope extended from the center of tongs over a pulley with weights attached at the end.
      b. Halo traction
         1) Stainless steel halo ring fits around the head and is attached to the skull with four pins; halo is attached to plastic body cast or plastic vest
         2) Permits early mobilization, decreased period of hospitalization and reduces complications of immobility
   3. Surgery: decompression laminectomy, spinal fusion
      a. Depends on type of injury and the preference of the surgeon
      b. Indications: unstable fracture, cord compression, progression of neurologic deficits

C. Assessment findings
   1. Spinal shock
      a. Occurs immediately after the injury as a result of the insult to the CNS
      b. Temporary condition lasting from several days to 3 months
      c. Characterized by absence of reflexes below the level of the lesion, flaccid paralysis, lack of temperature control in affected parts, hypotension with bradycardia, retention of urine and feces
   2. Symptoms depend on the level and the extent of the injury.
      a. Level of injury
         1) Quadriplegia: cervical injuries (C_1–C_8) cause paralysis of all four extremities; respiratory paralysis occurs in lesions above C_6 due to lack of innervation to

the diaphragm; (phrenic nerves at the C_4–C_5 level).

2) Paraplegia: thoraco/lumbar injuries (T_1–L_4) cause paralysis of the lower half of the body involving both legs

b. Extent of injury

1) Complete cord transection

a) Loss of all voluntary movement and sensation below the level of the injury; reflex activity below the level of the lesion may return after spinal shock resolves.

b) Lesions in the conus medullaris or cauda equina result in permanent flaccid paralysis and areflexia.

2) Incomplete lesions: varying degrees of motor or sensory loss below the level of the lesion depending on which neurologic tracts are damaged and which are spared.

3. Diagnostic test: spinal X-rays may reveal fracture.

D. Nursing interventions: emergency care

1. Assess airway, breathing, circulation

a. Do not move the client during assessment.

b. If airway obstruction or inadequate ventilation exists: do not hyperextend neck to open airway, use jaw thrust instead.

2. Perform a quick head-to-toe assessment: check for LOC, signs of trauma to the head or neck, leakage of clear fluid from ears or nose, signs of motor or sensory impairment.

3. Immobilize the client in the position found until help arrives.

4. Once emergency help arrives, assist in immobilizing the head and neck with a cervical collar and place the client on a spinal board; avoid any movement during transfer, especially flexion of the spinal column.

5. Have suction available to clear the airway and prevent aspiration if the client vomits; client may be turned slightly to the side if secured to a board.

6. Evaluate respiration and observe for weak or labored respirations.

E. Nursing interventions: acute care

1. Maintain optimum respiratory function.

a. Observe for weak or labored respirations; monitor arterial blood gases.

b. Prevent pneumonia and atelectasis: turn every 2 hours; cough and deep breathe every hour; use incentive spirometry every 2 hours.

c. Tracheostomy and mechanical ventilation may be necessary if respiratory insufficiency occurs.

2. Maintain optimal cardiovascular function.

a. Monitor vital signs; observe for bradycardia, arrhythmias, hypotension.

b. Apply thigh-high elastic stockings or Ace bandages.

c. Change position slowly and gradually elevate the head of the bed to prevent postural hypotension.

d. Observe for signs of deep-vein thrombosis.

3. Maintain fluid and electrolyte balance and nutrition.

a. Nasogastric tube may be inserted until bowel sounds return.

b. Maintain IV therapy as ordered; avoid overhydration (can aggravate cord edema).

c. Check bowel sounds before feeding client (paralytic ileus is common).

d. Progress slowly from clear liquid to regular diet.

e. Provide diet high in protein, carbohydrates, calories.

4. Maintain immobilization and spinal alignment always.

a. Turn every hour on turning frame.

b. Maintain cervical traction at all times if indicated.

5. Prevent complications of immobility; use footboard/high-topped sneakers to prevent footdrop; provide splint for quadriplegic client to prevent wrist drop.

6. Maintain urinary elimination.

a. Provide intermittent catheterization or maintain indwelling catheter as ordered.

b. Increase fluids to 3000 mL/day.

c. Provide acid-ash foods/fluids to acidify urine and prevent infection.

7. Maintain bowel elimination: administer stool softeners and suppositories to prevent impaction as ordered.

8. Monitor temperature control.

a. Check temperature every 4 hours.

b. Regulate environment closely.

c. Avoid excessive covering or exposure.

9. Observe for and prevent infection.

a. Observe tongs or pin site for redness, drainage.

b. Provide tong- or pin-site care. Cleanse with antiseptic solution according to agency policy.

c. Observe for signs of respiratory or urinary infection.

10. Observe for and prevent stress ulcers.

a. Assess for epigastic or shoulder pain.

b. If corticosteroids are ordered, give with food or antacids; administer H_2 blocker as ordered.

c. Check nasogastric tube contents and stools for blood.

F. Nursing interventions: chronic care

1. Neurogenic bladder

a. Reflex or upper motor neuron bladder; reflex activity of the bladder may occur after spinal shock resolves; the bladder is unable to store urine very long and empties involuntarily

b. Nonreflexive or lower motor neuron bladder: reflex arc is disrupted and no reflex activity of the bladder occurs, resulting in urine retention with overflow
c. Management of reflex bladder
1) Intermittent catheterization every 4 hours and gradually progress to every 6 hours.
2) Regulate fluid intake to 1800–2000 mL/day.
3) Bladder taps or stimulating trigger points to cause reflex emptying of the bladder.
d. Management of nonreflexive bladder
1) Intermittent catheterization every 6 hours.
2) Credé maneuver or rectal stretch.
3) Regulate intake to 1800–2000 mL/day to prevent overdistention of bladder.
e. Management depends on lifestyle, age, sex, home care, and availability of caregiver.

2. Spasticity
a. Return of reflex activity may occur after spinal shock resolves; severe spasticity may be detrimental
b. Drug therapy: baclofen (Lioresal), dantrolene (Dantrium), diazepam (Valium)
c. Physical therapy: stretching exercises, warm tub baths, whirlpool
d. Surgery: chordotomy

3. Autonomic dysreflexia
a. Rise in blood pressure, sometimes to fatal levels
b. Occurs in clients with cord lesions above T_6 and most commonly in clients with cervical injuries
c. Reflex response to stimulation of the sympathetic nervous system
d. Stimulus may be overdistended bladder or bowel, decubitus ulcer, chilling, pressure from bedclothes
e. Symptoms: severe headache, hypertension, bradycardia, sweating, goose bumps, nasal congestion, blurred vision, convulsions
f. Interventions
1) Raise client to sitting position to decrease BP.
2) Check for source of stimulus (bladder, bowel, skin).
3) Remove offending stimulus (e.g., catheterize client, digitally remove impacted feces, reposition client).
4) Monitor blood pressure.
5) Administer antihypertensives (e.g., hydralazine HCl [Apresoline]) as ordered.

G. Nursing interventions: general rehabilitative care
1. Provide psychologic support to client/significant others.
a. Support during grieving process.
b. Assist client to adjust to effects of injury.
c. Encourage independence.
d. Involve the client in decision making.
2. Provide sexual counseling.
a. Work with the client and partner.
b. Explore alternative methods of sexual gratification.
3. Initiate rehabilitation program.
a. Physical therapy
b. Vocational rehabilitation
c. Psychologic counseling
d. Use of braces, electronic wheelchair, and other assistance devices to maximize independence

Specific Disorders of the Peripheral Nervous System

Trigeminal Neuralgia (Tic Douloureux)

A. General information
1. Disorder of cranial nerve V causing disabling and recurring attacks of severe pain along the sensory distribution of one or more branches of the trigeminal nerve
2. Incidence increased in elderly women
3. Cause unknown

B. Medical management
1. Anticonvulsant drugs: carbamazepine (Tegretol), phenytoin (Dilantin)
2. Nerve block: injection of alcohol or phenol into one or more branches of the trigeminal nerve; temporary effect, lasts 6–18 months
3. Surgery
a. Peripheral: avulsion of peripheral branches of trigeminal nerve
b. Intracranial
1) Retrogasserian rhizotomy: total severance of the sensory root of the trigeminal nerve intracranially; results in permanent anesthesia, numbness, heaviness, and stiffness in affected part; loss of corneal reflex
2) Microsurgery: uses more precise cutting and may preserve facial sensation and corneal reflex
3) Percutaneous radio-frequency trigeminal gangliolysis: current surgical procedure of choice; thermally destroys the trigeminal nerve in the area of the ganglion; provides permanent pain relief with preservation of sense of touch, proprioception, and corneal reflex; done under local anesthesia
4) Microvascular decompression of trigeminal nerve: decompresses the trigeminal nerve; craniotomy

necessary; provides permanent pain relief while preserving facial sensation

C. Assessment findings
- **1.** Sudden paroxysms of extremely severe shooting pain in one side of the face
- **2.** Attacks may be triggered by a cold breeze, foods/fluids of extreme temperature, toothbrushing, chewing, talking, or touching the face
- **3.** During attack: twitching, grimacing, and frequent blinking/tearing of the eye
- **4.** Poor eating and hygiene habits
- **5.** Withdrawal from interactions with others
- **6.** Diagnostic tests: X-rays of the skull, teeth, and sinuses may identify dental or sinus infection as an aggravating factor.

D. Nursing interventions
- **1.** Assess characteristics of the pain including triggering factors, trigger points, and pain management techniques.
- **2.** Administer medications as ordered; monitor response.
- **3.** Maintain room at an even, moderate temperature, free from drafts.
- **4.** Provide small, frequent feedings of lukewarm, semiliquid, or soft foods that are easily chewed.
- **5.** Provide the client with a soft washcloth and lukewarm water and perform hygiene during periods when pain is decreased.
- **6.** Prepare the client for surgery if indicated.
- **7.** Provide client teaching and discharge planning concerning
  - **a.** Need to avoid outdoor activities during cold, windy, or rainy weather
  - **b.** Importance of good nutrition and hygiene
  - **c.** Use of medications, side effects, and signs of toxicity
  - **d.** Specific instructions following surgery for residual effects of anesthesia and loss of corneal reflex
    - **1)** Protective eye care
    - **2)** Chew on unaffected side only
    - **3)** Avoid hot fluids/foods
    - **4)** Mouth care after meals to remove particles
    - **5)** Good oral hygiene; visit dentist every 6 months
    - **6)** Protect the face during extremes of temperature

Bell's Palsy

A. General information
- **1.** Disorder of cranial nerve VII resulting in the loss of ability to move the muscles on one side of the face
- **2.** Cause unknown; may be viral or autoimmune
- **3.** Complete recovery in 3–5 weeks in majority of clients

B. Assessment findings
- **1.** Loss of taste over anterior two-thirds of tongue on affected side
- **2.** Complete paralysis of one side of face
- **3.** Loss of expression, displacement of mouth toward unaffected side, and inability to close eyelid (all on affected side)
- **4.** Pain behind the ear

C. Nursing interventions
- **1.** Assess facial nerve function regularly (see Table 4-16).
- **2.** Administer medications as ordered.
  - **a.** Corticosteroids: to decrease edema and pain
  - **b.** Mild analgesics as necessary
- **3.** Provide soft diet with supplementary feedings as indicated.
- **4.** Instruct to chew on unaffected side, avoid hot fluids/foods, and perform mouth care after each meal.
- **5.** Provide special eye care to protect the cornea.
  - **a.** Dark glasses (cosmetic and protective reasons) or eyeshield
  - **b.** Artificial tears to prevent drying of the cornea
  - **c.** Ointment and eye patch at night to keep eyelid closed
- **6.** Provide support and reassurance.

Guillain-Barré Syndrome

A. General information
- **1.** Symmetrical, bilateral, peripheral polyneuritis characterized by ascending paralysis
- **2.** Can occur at any age; affects women and men equally
- **3.** Cause unknown; may be an autoimmune process
- **4.** Precipitating factors: antecedent viral infection, immunization
- **5.** Progression of disease is highly individual; 90% of clients stop progression in 4 weeks; recovery is usually from 3–6 months; may have residual deficits

B. Medical management
- **1.** Mechanical ventilation if respiratory problems present
- **2.** Plasmapheresis to reduce circulating antibodies
- **3.** Continuous ECG monitoring to detect alteration in heart rate and rhythm
- **4.** Propranolol to prevent tachycardia
- **5.** Atropine may be given to prevent episodes of bradycardia during endotracheal suctioning and physical therapy

C. Assessment findings
- **1.** Mild sensory changes; in some clients severe misinterpretation of sensory stimuli resulting in extreme discomfort
- **2.** Clumsiness: usually first symptom

3. Progressive motor weakness in more than one limb (classically is ascending and symmetrical)
4. Cranial nerve involvement (dysphagia)
5. Ventilatory insufficiency if paralysis ascends to respiratory muscles
6. Absence of deep tendon reflexes
7. Autonomic dysfunction
8. Diagnostic tests
   a. CSF studies: increased protein
   b. EMG: slowed nerve conduction

D. Nursing interventions
1. Maintain adequate ventilation.
   a. Monitor rate and depth of respirations; serial vital capacities.
   b. Observe for ventilatory insufficiency.
   c. Maintain mechanical ventilation as needed; keep airway free of secretions and prevent pneumonia.
2. Check individual muscle groups every 2 hours in acute phase to check for progression of muscle weakness.
3. Assess cranial nerve function: check gag reflex and swallowing ability; ability to handle secretions; voice.
4. Monitor vital signs and observe for signs of autonomic dysfunction such as acute periods of hypertension fluctuating with hypotension, tachycardia, arrhythmias.
5. Administer corticosteroids to suppress immune reaction as ordered.
6. Administer antiarrhythmic agents as ordered.
7. Prevent complications of immobility.
8. Promote comfort (especially in clients with sensory changes): foot cradle, sheepskin, guided imagery, relaxation techniques.
9. Promote optimum nutrition.
   a. Check gag reflex before feeding.
   b. Start with pureed foods.
   c. Assess need for nasogastric tube feedings if unable to swallow.
10. Provide psychologic support and encouragement to client/significant others.
11. Refer for rehabilitation to regain strength and to treat any residual deficits.

Amyotrophic Lateral Sclerosis (Lou Gehrig's Disease)

A. General information
1. Progressive motor neuron disease, which usually leads to death in 2–6 years
2. Onset usually between ages 40 and 70; affects men more than women
3. Cause unknown
4. There is no cure or specific treatment; death usually occurs as a result of respiratory infection secondary to respiratory insufficiency

B. Assessment findings
1. Progressive weakness and atrophy of the muscles of the arms, trunk, or legs
2. Dysarthria, dysphagia
3. Fasciculations
4. Respiratory insufficiency
5. Diagnostic tests: EMG and muscle biopsy can rule out other diseases

C. Nursing interventions
1. Provide nursing measures for muscle weakness and dysphagia.
2. Promote adequate ventilatory function.
3. Prevent complications of immobility.
4. Encourage diversional activities; spend time with the client.
5. Provide compassion and intensive support to client/significant others.
6. Provide or refer for physical therapy as indicated.
7. Promote independence for as long as possible.

DISORDERS OF THE EYE

Cataracts

A. General information
1. Opacity of the ocular lens
2. Incidence increases with age
3. May be caused by changes associated with aging ("senile" cataract); may be congenital; or may develop secondary to trauma, radiation, infection, certain drugs (corticosteroids)

B. Assessment findings
1. Blurred vision
2. Progressive decrease in vision
3. Glare in bright lights
4. Pupil may develop milky-white appearance
5. Diagnostic test: ophthalmoscopic exam confirms presence of cataract

C. Nursing interventions: prepare client for cataract surgery.

Cataract Surgery

A. General information
1. Performed when client can no longer remain independent because of reduced vision
2. Surgery performed on one eye at a time; usually in a same-day surgery unit
3. Local anesthesia and intravenous sedation usually used
4. Types
   a. Extracapsular extraction: lens capsule is excised and the lens is expressed; posterior capsule is left in place (may be used to support new artificial lens implant).
   b. Phacoemulsification: a type of extracapsular extraction; a hollow needle capable of ultrasonic vibration is inserted into lens, vibrations emulsify the lens, which is then aspirated.
   c. Intracapsular extraction: lens is totally removed within its capsule, may be

delivered from eye by cryoextraction (lens is frozen with a metal probe and removed).

5. Peripheral iridectomy may be performed at the time of surgery; small hole cut in iris to prevent development of secondary glaucoma
6. Intraocular lens implant often performed at the time of surgery.

B. Nursing interventions: preoperative (see also Perioperative Nursing)

1. Assess vision in the unaffected eye since the affected eye will be patched post-op.
2. Provide pre-op teaching regarding measures to prevent increased intraocular pressure post-op.
3. Administer medications as ordered.
   a. Topical mydriatics and cycloplegics to dilate the pupil
   b. Topical antibiotics to prevent infection
   c. Acetazolamide (Diamox) and osmotic agents (oral glycerin or IV mannitol) to decrease intraocular pressure to provide a soft eyeball for surgery

C. Nursing interventions: postoperative

1. Reorient the client to surroundings.
2. Provide safety measures: elevate side rails, provide call bell, assist with ambulation when fully recovered from anesthesia.
3. Prevent increased intraocular pressure and stress on the suture line.
   a. Elevate head of bed 30–40°.
   b. Have client lie on back or unaffected side.
   c. Avoid having client cough, sneeze, bend over, or move head too rapidly.
   d. Treat nausea with antiemetics as ordered to prevent vomiting.
   e. Give stool softeners as ordered to prevent straining.
   f. Observe for and report signs of increased intraocular pressure: severe eye pain, restlessness, increased pulse.
4. Protect eye from injury.
   a. Dressings are usually removed the day after surgery.
   b. Eyeglasses or eye shield used during the day.
   c. Always use eye shield during the night.
5. Administer medications as ordered.
   a. Topical mydriatics and cycloplegics to decrease spasm of ciliary body and relieve pain
   b. Topical antibiotics and corticosteroids
   c. Mild analgesics as needed
6. Provide client teaching and discharge planning concerning
   a. Technique of eyedrop administration
   b. Use of eye shield at night
   c. No bending, stooping, or lifting
   d. Report signs or symptoms of complications immediately to physician: severe eye pain, decreased vision, excessive drainage, swelling of eyelid.
   e. Cataract glasses/contact lenses
      1) If a lens implant has not been performed, the client will need glasses or contact lenses.
      2) Temporary glasses are worn for 1–4 weeks, then permanent glasses fitted.
      3) Cataract glasses magnify objects by ⅓ and distort peripheral vision; have client practice manual coordination with assistance until new spatial relationships become familiar; have client practice walking, using stairs, reaching for articles.
      4) Contact lenses cause less distortion of vision; prescribed at 1 month.

Glaucoma

A. General information

1. Characterized by increased intraocular pressure resulting in progressive loss of vision; may cause blindness if not recognized and treated
2. Risk factors: age over 40, diabetes, hypertension, heredity; history of previous eye surgery, trauma, or inflammation
3. Types
   a. Chronic (open-angle) glaucoma: most common form, due to obstruction of the outflow of aqueous humor, in trabecular meshwork or canal of Schlemm
   b. Acute (closed-angle) glaucoma: due to forward displacement of the iris against the cornea, obstructing the outflow of the aqueous humor; occurs suddenly and is an emergency situation; if untreated, blindness will result
   c. Chronic (closed-angle) glaucoma: similar to acute (closed-angle) glaucoma, with the potential for an acute attack
4. Early detection is very important; regular eye exams including tonometry for persons over age 40 is recommended.

B. Medical management

1. Chronic (open-angle) glaucoma
   a. Drug therapy: one or a combination of the following
      1) Miotic eyedrops (pilocarpine) to increase outflow of aqueous humor
      2) Epinephrine eyedrops to decrease aqueous humor production and increase outflow
      3) Acetazolamide (Diamox): carbonic anhydrase inhibitor to decrease aqueous humor production
      4) Timolol maleate (Timoptic): topical beta-adrenergic blocker to decrease intraocular pressure
   b. Surgery (if no improvement with drugs)

1) Filtering procedure (trabeculectomy, trephining) to create artificial openings for the outflow of aqueous humor
2) Laser trabeculoplasty: noninvasive procedure performed with argon laser that can be done on an outclient basis; produces similar results as trabeculectomy

2. Acute (closed-angle) glaucoma
   a. Drug therapy (before surgery)
      1) Miotic eyedrops (e.g., pilocarpine) to cause pupil to contract and draw iris away from cornea
      2) Osmotic agents (e.g., glycerin [oral], mannitol [IV]) to decrease intraocular pressure
      3) Narcotic analgesics for pain
   b. Surgery
      1) Peripheral iridectomy: portion of the iris is excised to facilitate outflow of aqueous humor
      2) Argon laser beam surgery: noninvasive procedure using laser that produces same effect as iridectomy; done on an outclient basis
      3) Iridectomy usually performed on second eye later because a large number of clients have an acute attack in the other eye
3. Chronic (closed-angle) glaucoma
   a. Drug therapy: miotics (pilocarpine)
   b. Surgery: bilateral peripheral iridectomy to prevent acute attacks

C. Assessment findings
1. Chronic (open-angle) glaucoma: symptoms develop slowly; impaired peripheral vision (tunnel vision); loss of central vision if unarrested; mild discomfort in the eyes; halos around lights
2. Acute (closed-angle) glaucoma: severe eye pain; blurred, cloudy vision; halos around lights; nausea and vomiting; steamy cornea; moderate pupillary dilation
3. Chronic (closed-angle) glaucoma: transient blurred vision; slight eye pain; halos around lights
4. Diagnostic tests
   a. Visual acuity: reduced
   b. Tonometry: reading of 24–32 mm Hg suggests glaucoma; may be 50 mm Hg or more in acute (closed-angle) glaucoma
   c. Ophthalmoscopic exam: reveals narrowing of small vessels of optic disk, cupping of optic disk
   d. Perimetry: reveals defects in visual fields
   e. Gonioscopy: examine angle of anterior chamber

D. Nursing interventions
1. Administer medications as ordered.
2. Provide quiet, dark environment.
3. Maintain accurate I&O with the use of osmotic agents.
4. Prepare the client for surgery if indicated.
5. Provide post-op care (see Cataract Surgery).
6. Provide client teaching and discharge planning concerning
   a. Self-administration of eyedrops
   b. Need to avoid stooping, heavy lifting, or pushing, emotional upsets, excessive fluid intake, constrictive clothing around the neck
   c. Need to avoid the use of antihistamines or sympathomimetic drugs (found in cold preparations) in closed-angle glaucoma because they may cause mydriasis
   d. Importance of follow-up care
   e. Need to wear Medic-Alert tag

Detached Retina

A. General information
1. Detachment of the sensory retina from the pigment epithelium of the retina
2. Caused by trauma, aging process, severe myopia, postcataract extraction, severe diabetic retinopathy
3. Pathophysiology: tear in the retina allows vitreous humor to seep behind the sensory retina and separate it from the pigment epithelium

B. Medical management
1. Bed rest with eyes patched and detached areas dependent to prevent further detachment
2. Surgery: necessary to repair detachment
   a. Photocoagulation: light beam (argon laser) through dilated pupil creates an inflammatory reaction and scarring to heal the area
   b. Cryosurgery or diathermy: application of extreme cold or heat to the external globe; inflammatory reaction causes scarring and healing of area
   c. Scleral buckling: shortening of sclera to force pigment epithelium close to retina

C. Assessment findings
1. Flashes of light, floaters
2. Visual field loss, veil-like curtain coming across field of vision
3. Diagnostic test: ophthalmoscopic examination confirms diagnosis

D. Nursing interventions: preoperative
1. Maintain bed rest as ordered with head of bed flat and detached area in a dependent position.
2. Use bilateral eye patches as ordered; elevate side rails to prevent injury.
3. Identify yourself when entering the room.
4. Orient the client frequently to time, date, and surroundings; explain procedures.
5. Provide diversional activities to provide sensory stimulation.

E. Nursing interventions: postoperative (see also Cataract Surgery)
  1. Check orders for positioning and activity level.
    a. May be on bed rest for 1–2 days.
    b. May need to position client so that detached area is in dependent position.
  2. Administer medications as ordered: topical mydriatics, analgesics as needed.
  3. Provide client teaching and discharge planning concerning
    a. Technique of eyedrop administration
    b. Use of eye shield at night
    c. No bending from waist; no heavy work or lifting for 6 weeks
    d. Restriction of reading for 3 weeks or more
    e. May watch television
    f. Need to check with physician regarding combing and shampooing hair and shaving
    g. Need to report complications such as recurrence of detachment

Eye Injuries/Emergency Care

A. Removal of loose foreign body from conjunctiva
  1. Foreign bodies, e.g., sand, dust, may cause pain and lacrimation.
  2. Instruct client to look upward.
  3. Evert lower lid to expose the conjunctival sac.
  4. Gently remove the particle with a cotton applicator dipped in sterile normal saline using a twisting motion.
  5. If particle is not found, examine the upper lid.
  6. Place cotton applicator stick or tongue blade horizontally on outer surface of upper lid; grasp under eyelashes with fingers of other hand and pull the upper lid outward and upward over the applicator stick.
  7. Gently remove the particle as previously described.

B. Penetrating injuries to the eye
  1. Examples: darts, scissors, flying metal.
  2. Do not attempt to remove object.
  3. Do not allow client to apply pressure to the eye.
  4. Cover eye lightly with sterile eye patch for embedded objects, e.g., metal; apply protective shield, e.g., paper cup, for impaled objects such as darts.
  5. Cover uninjured eye to prevent excessive movement of injured eye.
  6. Refer the client to an emergency room immediately.

C. Chemical burns
  1. Flush eye immediately with copious amounts of water for 15–20 minutes.
    a. Have client hold head under faucet to let water run over eye to thoroughly wash it out; may need to forcibly separate eyelids during flush
    b. If available, flush eye with syringe
  2. After flushing, refer client to an emergency room immediately.

DISORDERS OF THE EAR

Otosclerosis

A. General information
  1. Formation of new spongy bone in the labyrinth of the ear causing fixation of the stapes in the oval window; this prevents transmission of auditory vibration to the inner ear
  2. Found more often in females
  3. Cause unknown, but there is a familial tendency

B. Medical management: stapedectomy is the procedure of choice.

C. Assessment findings
  1. Progressive loss of hearing
  2. Tinnitus
  3. Diagnostic tests
    a. Audiometry: reveals conductive hearing loss
    b. Weber's and Rinne's tests: show bone conduction is greater than air conduction

D. Nursing interventions: see Stapedectomy.

Stapedectomy

A. General information
  1. Removal of diseased portion of stapes and replacement with a prosthesis to conduct vibrations from the middle ear to inner ear; usually performed under local anesthesia
  2. Used to treat otosclerosis

B. Nursing interventions: preoperative
  1. Provide general pre-op nursing care, including an explanation of post-op expectations.
  2. Explain to the client that hearing may improve during surgery and then decrease due to edema and packing.

C. Nursing interventions: postoperative
  1. Position the client according to the surgeon's orders (possibly with operative ear uppermost to prevent displacement of the graft).
  2. Have client deep breathe every 2 hours while in bed, but no coughing.
  3. Elevate side rails; assist the client with ambulation and move slowly (may have some vertigo).
  4. Administer medications as ordered: analgesics, antibiotics, antiemetics, anti-motion-sickness drugs.
  5. Check dressings frequently for excessive drainage or bleeding.
  6. Assess facial nerve function, i.e., ask client to wrinkle forehead, close eyelids, puff out cheeks, smile and show teeth; check for any asymmetry.
  7. Question client about pain, headache, vertigo, and unusual sensations in the ear; report existence to physician.

8. Provide client teaching and discharge planning concerning
   a. Warnings against blowing nose or coughing; sneeze with the mouth open
   b. Need to keep ear dry in the shower; no shampooing until allowed
   c. No flying for 6 months, especially if an upper respiratory tract infection is present
   d. Placement of cotton ball in auditory meatus after packing is removed; change twice a day

Ménière's Disease

A. General information
   1. Disease of the inner ear resulting from dilation of the endolymphatic system and increased volume of endolymph; characterized by recurrent and usually progressive triad of symptoms: vertigo, tinnitus, and hearing loss
   2. Incidence highest between ages 30 and 60
   3. Cause unknown; theories include allergy, toxicity, localized ischemia, hemorrhage, viral infection, or edema
B. Medical management
   1. Acute: atropine (decreases autonomic nervous system activity), diazepam (Valium), fentanyl, and droperidol (Innovar)
   2. Chronic
      a. Drug therapy: vasodilators (nicotinic acid), diuretics, mild sedatives or tranquilizers (diazepam [Valium]), antihistamines (diphenhydramine [Benadryl], meclizine [Antivert])
      b. Low-sodium diet, restricted fluid intake, restrict caffeine and nicotine.
   3. Surgery
      a. Surgical destruction of labyrinth causing loss of vestibular and cochlear function (if disease is unilateral)
      b. Intracranial division of vestibular portion of cranial nerve VIII
      c. Endolymphatic sac decompression or shunt to equalize pressure in endolymphatic space
C. Assessment findings
   1. Sudden attacks of vertigo lasting hours or days; attacks occur several times a year
   2. Nausea, tinnitus, progressive hearing loss
   3. Vomiting, nystagmus
   4. Diagnostic tests
      a. Audiometry: reveals sensorineural hearing loss
      b. Vestibular tests: reveal decreased function
D. Nursing interventions
   1. Maintain bed rest in a quiet, darkened room in position of choice; elevate side rails as needed.
   2. Only move the client for essential care (bath may not be essential).
   3. Provide an emesis basin for vomiting.
   4. Monitor IV therapy; maintain accurate I&O.
   5. Assist with ambulation when the attack is over.
   6. Administer medications as ordered.
   7. Prepare the client for surgery as indicated (post-op care includes using above measures).
   8. Provide client teaching and discharge planning concerning
      a. Use of medication and side effects
      b. Low-sodium diet and decreased fluid intake
      c. Importance of eliminating smoking

Sample Questions

108. An adult has a medical diagnosis of increased intracranial pressure and is being cared for on the neurology unit. The nursing care plan includes elevating the head of the bed and positioning the client's head in proper alignment. What is the reason for these actions?
1. Makes it easier for the client to breathe.
2. Prevents a Valsalva maneuver.
3. Promotes venous drainage.
4. Reduces pain.

109. A client begins to have Cheyne-Stokes respirations. What is the correct explanation for this occurrence?
1. Completely irregular breathing pattern with random deep and shallow respirations.
2. Prolonged inspirations with inspiratory and/or expiratory pauses.
3. Rhythmic waxing and waning of both rate and depth of respiration with brief periods of interspersed apnea.
4. Sustained, regular, rapid respirations of increased depth.

110. Which of the following reduces cerebral edema by constricting cerebral veins?
1. Dexamethasone (Decadron).
2. Mechanical hyperventilation.
3. Mannitol (Osmitrol).
4. Ventriculostomy.

111. The nurse is caring for an adult client who was admitted unconscious. The initial assessment utilized the Glasgow Coma Scale. The nurse knows that of the following, which are included when assessing a client using the Glasgow Coma Scale? Select all that apply.
____ Eye opening.
____ Motor response.
____ Pupillary reaction
____ Verbal performance.

112. Utilizing the Glasgow Coma Scale, which score would be indicative of coma?

1. 0
2. 2
3. 6
4. 10

113. When the nurse tested an unconscious client for noxious stimuli, the client responded with decorticate rigidity or posturing. What is the best description for this action?

1. Flexion of the upper and lower extremities into a fetal-like position.
2. Rigid extension of the upper and lower extremities and plantar flexion.
3. Complete flaccidity of both upper and lower extremities and hyperextension of the neck.
4. Flexion of the upper extremities, extension of the lower extremities, and plantar flexion.

114. An adult male is receiving cryotherapy for repair of a detached retina. When taking a history from him, which symptom should the nurse expect him to have?

1. Diplopia.
2. Severe eye pain.
3. Sudden blindness.
4. Bright flashes of light.

115. An adult who has a detached retina asks the nurse what may have contributed to the development of his detached retina. What is a risk factor associated with this condition?

1. Hypertension.
2. Nearsightedness.
3. Cranial tumors.
4. Sinusitis.

116. The nurse is explaining cryotherapy to a client who has a detached retina. What would be a major purpose for the procedure?

1. Create a scar that promotes healing.
2. Disintegrate debris in the eye.
3. Freeze small blood vessels.
4. Halt secretions of the lacrimal duct.

117. An adult client has a stapedectomy. Which of the following is most important for the nurse to include in the post-op care plan?

1. Checking the gag reflex.
2. Encouraging independence.
3. Instructing the client not to blow the nose.
4. Positioning the client on the operative side.

118. The nurse is assessing reflexes on a client. Which of the following correctly describes this reflex?

1. Extension of the elbow and contraction of the triceps tendon.
2. Supination and flexion of the forearm.
3. Dorsiflexion of the great toe with fanning of the other toes.
4. Flexion of the arm at the antecubital fossa and contraction of the biceps.

119. The nurse is assessing the optic nerve of a client. Which of the following is a correct method to evaluate cranial nerve (CN) II, the optic nerve?

1. Inspect the pupils for reaction.
2. Test extraocular movements.
3. Use of a Snellen chart.
4. Test for a corneal reflex.

120. Which of the following tests or tools could the nurse use to assess CN VIII, the acoustic nerve?

1. Romberg.
2. Rosenbaum chart.
3. Inspection of pupils.
4. Audiometry.

121. A nurse is obtaining a Glasgow Coma Score on a client. The score is as follows:
Best eye opening 3
Best motor response 6
Best verbal response 4
How would the nurse interpret this score?

1. Opens eyes to speech, obeys verbal commands, and is confused.
2. Opens eyes to pain, decoricates to pain, and does not speak.
3. Opens eyes to pain, no motor response, and has inappropriate speech.
4. Opens eyes spontaneously, obeys verbal commands, and is oriented × 3.

122. A nurse is preparing a client for an MRI. Which factor would exclude the client from the test?

1. Wearing jewelry.
2. Cardiac pacemaker.
3. Claustrophobia.
4. Allergy to iodine.

123. A nurse is assessing a client who has returned from a cerebral arteriogram. The left carotid was the site punctured. Which of the following indicates complications?

1. Difficulty in swallowing.
2. Puncture site is dry and red.

3. BP 120/82, HR 86, RR 22.
4. No swelling or hematoma at the site.

124. A client with a closed head injury is confused, drowsy, and has unequal pupils. Which of the following nursing diagnosis is *most important* at this time?
1. Altered level of cognitive function.
2. High risk for injury.
3. Altered cerebral tissue perfusion.
4. Sensory perceptual alteration.

125. A client is admitted with a head injury. To monitor hypothalamic function, the nurse should monitor what parameters?
1. Temperature and urinary output.
2. Gastric aspirate and BP.
3. Heart rate and pupillary responses.
4. Respiratory rate and skin integrity.

126. Which of the following is the best way for the nurse to assist a blind client in ambulation?
1. Allow client to take nurse's arm with the nurse walking slightly ahead of the client.
2. Allow client to walk beside the nurse with the nurse's hand on the client's back.
3. Allow client to walk down the hall with his or her hand along the wall.
4. Push the client in a wheelchair.

127. Which of the following is the best way for the nurse to communicate with the hearing impaired client?
1. Talk directly into the impaired ear.
2. Speak directly and clearly facing the person.
3. Shout into the good ear.
4. Write out all communication.

128. A nurse is assessing a client who is unable to extend the legs without pain, has a temperature of 103°F, and on flexion of the neck also flexes the hip and knee. Based on this assessment, What condition does the nurse suspect?
1. Meningitis.
2. Brain abscess.
3. Brain tumor.
4. Epilepsy.

129. A client has a fever of 103°F, nuchal rigidity, pain on extension of the legs, and opisthotonos. What would be the priority nursing diagnosis?
1. Acute pain.
2. Ineffective tissue perfusion
3. Anxiety.
4. Risk for injury.

130. A client presents with symptoms of increased intracranial pressure, papilledema, and headache. No history of trauma is found. Vital signs are: BP 110/60, HR 80, T 98.9°F, RR 24. What condition does the nurse suspect?
1. Brain tumor.
2. Meningitis.
3. Skull fracture.
4. Encephalitis.

131. What should the nurse include in the plan of care for a newly admitted client with an infratentorial craniotomy for a brain tumor?
1. Keep the head of the bed elevated 30–45°; and a large pillow under the client's head and shoulder.
2. Keep the head of the bed flat with a small pillow under the nape of the neck.
3. Assess vital signs and pupils every four hours.
4. Flex neck every 2 hours to prevent stiffness.

132. The home health nurse observes an aide who is transferring a client with hemiplegia from a sitting position in the bed to the wheelchair. Which action by the aide requires correction?
1. Grasping the client's arms to pull the client to a standing position.
2. Reminding the client to lean forward before rising.
3. Moving the client toward the unaffected side.
4. Bracing the affected knee and foot to assist the client to stand.

133. When comparing a cerebrovascular accident (CVA) to a transient ischemic attack (TIA), what is unique about the TIA?
1. It has permanent long-term focal deficits.
2. It is intermittent with spontaneous resolution of the neurologic deficit.
3. It is intermittent with permanent motor and sensory deficits.
4. It has permanent long-term neurologic deficits.

134. The nurse is teaching a client with transient ischemic attacks about aspirin therapy. Which statement by the client indicates understanding of the reason for his aspirin therapy?
1. "I must take the aspirin regularly to prevent the headache that many people have with this disorder."
2. "If I take aspirin, I am less likely to develop bleeding in my brain."
3. "The aspirin will help to prevent me from having a stroke."
4. "Taking aspirin regularly will reduce my chances of having a heart attack."

135. A client with Parkinson's disease is receiving combination therapy with levodopa (L-dopa) and carbidopa (Sinemet). Which of the following manifestations indicates to the nurse that an adverse drug reaction is occurring?

1. Involuntary head movement.
2. Bradykinesia.
3. Shuffling gait.
4. Depression.

136. A nurse is teaching the family of a client with Parkinson's disease. Which of the following statements by the family reflects a need for more education?

1. "We can buy lots of soups for Dad."
2. "We are teaching Dad posture exercises."
3. "Dad is going to do his range of motion (ROM) exercises three times a day."
4. "The bath bars will be installed before Dad comes home."

137. A 36-year-old female reports double vision, visual loss, muscular weakness, numbness of the hands, fatigue, tremors, and incontinence. Based on this report, what does the nurse suspect?

1. Parkinson's disease.
2. Myasthenia gravis (MG).
3. Amyotrophic lateral sclerosis (ALS).
4. Multiple sclerosis (MS).

138. Which nursing diagnosis is of the *highest priority* when caring for a client with myasthenia gravis (MG)?

1. Pain.
2. Risk for injury.
3. Ineffective coping.
4. Ineffective airway clearance.

139. The nurse has explained the use of neostigmine methylsulfate (Prostigmin) to a client with myasthenia gravis. Which comment by the client indicates the need for further instruction?

1. "I need to take the medication regularly, even when I feel strong."
2. "I should take the medication once daily at bedtime."
3. "If I take too much medication, I can become weak and have breathing problems."
4. "I may have difficulty swallowing my saliva if I take too much medication."

140. A nurse is assessing a client with a head injury. The client has clear drainage from the nose and ears. How can the nurse determine if the drainage is cerebrospinal fluid (CSF)?

1. Measure the pH of the fluid.
2. Measure the specific gravity of the fluid.
3. Test for glucose.
4. Test for chloride.

141. The nurse is caring for a confused client who sustained a head injury resulting in a subdural hematoma. The client's blood pressure is 100/60 mm Hg and he is unresponsive. Select the most effective position for the client as the nurse transports him to the operating room.

1. Semi-Fowler's.
2. Trendelenburg.
3. High-Fowler's.
4. Supine.

142. A client who has been treated in the emergency room for a head injury is preparing for discharge. The nurse is teaching the family about the signs of complications that may occur within the first 24 hours and the appropriate action to take if a complication is suspected. Which statement by the client's spouse would require further teaching by the nurse?

1. "I'm not looking forward to checking on my husband all night long."
2. "If he can just get a long nap, I'm sure that my husband will be fine."
3. "I'll call the doctor immediately if my husband starts to vomit."
4. "If my husband has trouble talking, I'll bring him to the hospital."

143. A client is admitted postcraniotomy. Decadron 4 mg IV is ordered every 6 hours. What is the purpose for this medication?

1. Stabilize the blood sugar.
2. Decrease cerebral edema.
3. Prevent seizures.
4. Maintain the integrity of the gastric mucosa.

144. A client is admitted with a C_7 complete transection. What must the nurse plan for in the immediate post-injury period?

1. Bladder and bowel training.
2. Possible ventilatory support.
3. Complications of autonomic dysreflexia.
4. Diaphragmatic pacing.

145. A client fell backward over a stair rail to the floor below and is not breathing. After calling for assistance, how should the nurse proceed?

1. Initiate rescue breathing by performing a chin tilt maneuver and administering two breaths.

2. After determining absence of breathing, administer 15 chest compressions at the rate of 60 per minute.
3. Initiate rescue breathing by performing a jaw thrust maneuver and administering two breaths.
4. After determining pulselessness, administer five chest compressions at the rate of 60 per minute.

146. A client with a cervical spine injury was placed in Halo traction yesterday. When the client complains of discomfort around the pins, what action should the nurse take?
1. Carefully loosen the pins and notify the physician immediately.
2. Cleanse the skin around the pin sites and dry the area thoroughly.
3. Give the ordered analgesic and reassure the client that the pain is temporary.
4. Loosen the pins immediately and maintain the head in a neutral position.

147. A client with a C6 spinal cord injury 2 months ago now complains of a pounding headache. The pulse is 64 and the blood pressure is 220/110 mm Hg. Which of the following actions should the nurse take first?
1. Give the analgesic as ordered.
2. Check the client's output.
3. Elevate the client's head and lower the legs.
4. Notify the physician.

148. The nurse is evaluating the ability of a client with trigeminal neuralgia to implement the treatment that has been suggested. Which of the following behaviors by the client will be most effective in controlling manifestations?
1. Exercise the facial muscles at least twice daily.
2. Put the affected arm through full range of motion daily.
3. Avoid extremes in temperature of food and drink.
4. Use proper body mechanics in sitting and bending.

149. A client with Bell's palsy asks the nurse why artificial tears were ordered by the physician. Select the best reply by the nurse.
1. "When your affected eye fails to make tears, the eye can become irritated and ulcerated."
2. "Because your eye remains closed, foreign matter can be trapped beneath the lid."
3. "Artificial tears will remove the purulent drainage from your eye, which speeds healing."
4. "Because you cannot blink the affected eye, it can become dry and irritated."

150. A nurse is caring for a client with Guillain-Barré syndrome. Which of the following strategies is of the *most importance* in the plan of care?
1. Range of motion exercises three to four times per day.
2. Frequent measurement of vital capacity.
3. Use of artificial tears.
4. Starting an enteral feeding.

151. The nurse has presented information about amyotrophic lateral sclerosis (ALS) to a newly diagnosed client. Which question by the client indicates that he understands the nature of the disease?
1. "How can I avoid infecting my family with the virus?"
2. "How can I execute a living will?"
3. "How can I prevent an exacerbation of the disease?"
4. "How many people achieve remission with chemotherapy?"

152. A client reports gradual painless blurring of vision. On assessment, the nurse notes a cloudy opaque lens. What condition does the nurse suspect?
1. Glaucoma.
2. Cataracts.
3. Retinal detachment.
4. Diabetic retinopathy.

153. Which of the following risk factors would the nurse assess for in a client with glaucoma?
1. Family history, increased intraocular pressure, and age of 45–65.
2. History of diabetes and age greater than 50.
3. Female gender, cigarette smoking, age greater than 65.
4. Myopia, history of diabetes, and sudden severe physical exertion.

154. The nurse has been planning for home care with the family of a client who will undergo extracapsular lens extraction with an intraocular lens implant. Because the client and family speak very little English, the nurse takes extra care to evaluate their understanding. Which behavior by the client and/or family shows progress in understanding post-op home care instructions?
1. Using a chart showing various sleeping positions, the client points to a person lying on the affected side.

2. The family demonstrates that the eye should be cleaned with a washcloth, soap, and water.
3. The client demonstrates medication instillation by carefully dropping the solution on the cornea.
4. The family shows the nurse the sunglasses they have purchased for the client to wear post-op.

155. A nurse is admitting a client who reports vision loss. What additional information will be reported for the nurse to suspect glaucoma?
1. Seeing floating spots.
2. Eye pain.
3. Seeing flashing lights.
4. Sudden loss of vision.

156. Which of the following techniques should the nurse use to evaluate a client's understanding of self-care for chronic (primary) open-angle glaucoma?
1. The nurse asks for the client's weekly blood pressure readings.
2. The nurse asks if the client avoids watching television.
3. The nurse observes the client's technique for monitoring blood glucose.
4. The nurse observes the client's administration of eye drops.

157. A client is admitted with a detached retina of the left eye. The nurse patches both eyes. What is the rationale for patching both eyes?
1. To prevent eye infections.
2. To decrease eye movement.
3. To prevent photophobia.
4. To prevent nystagmus.

158. A neighbor splashes chlorine bleach in her eyes and calls the nurse for immediate help. What should be the nurse's first action?
1. Lift the upper lid over the lower lid of each eye.
2. Close and patch both eyes with a loose bandage.
3. Continuously flush the eyes with tap water for 20 minutes.
4. Instill an over-the-counter anti-irritant solution, such as Visine.

159. A client reports bilateral hearing loss. On assessment of the ear, the nurse observes chalky white plaques on the eardrum and the eardrum appears pinkish orange in color. The Rinne test favors bone conduction. What condition does the nurse suspect?
1. Cholesteatoma.
2. Actinic keratosis.
3. External otitis.
4. Otosclerosis.

160. The nurse is teaching a post-op stapedectomy client. What should be included in the teaching?
1. Work can be resumed the next day.
2. Gently sneeze or cough with the mouth closed.
3. Avoid airline flight for 6 months.
4. Resume exercise in 1 week.

161. A client reports very loud, overpowering ringing in the ears, fluctuating hearing loss on the right side with severe vertigo accompanied by nausea and vomiting, What condition does the nurse suspect?
1. Ménière's disease.
2. Acoustic neuroma.
3. Otosclerosis.
4. Cholesteatoma.

162. What is the *priority* nursing diagnosis for a client with very loud overpowering ringing in his ears, fluctuating hearing loss on the right side with severe vertigo accompanied by nausea and vomiting and a feeling of fullness in the right ear?
1. Knowledge deficit related to the disease process.
2. Anxiety.
3. Impaired physical mobility.
4. Pain.

Answers and Rationales

108. 3. It has been demonstrated that positioning the client with the head elevated to 30° decreases ICP by promoting venous drainage from the head by gravity. Pronounced angulation of the head can obstruct venous return and increase ICP.

109. 3. Cheynes-Stokes respirations are a pattern of breathing in which phases of hyperapnea regularly alternate with apnea. The pattern waxes (crescendo) and wanes (decrescendo).

110. 2. Mechanical hyperventilation to reduce CO_2 levels to 25 mm Hg produces cerebral vasoconstriction and thereby decreases ICP.

111. *Eye opening* should be selected. The Glasgow Coma Scale is a practical scale that independently evaluates three features: eye opening, motor response in the upper limb, and verbal performance.
Motor response should be selected. The Glasgow Coma Scale is a practical scale that independently evaluates three features: eye opening, motor response in the upper limb, and verbal performance.
Verbal performance should be selected. The Glasgow Coma Scale is a practical scale that independently evaluates three features: eye opening, motor response in the upper limb, and verbal performance.

112. **3.** A score of 7 or less defines coma. The lowest achievable score is 3, which indicates deep coma. Fifteen is a perfect score.

113. **4.** Decorticate rigidity or posturing is best described as an abnormal flexor response in the arm with extension and plantar flexion in the lower extremities.

114. **4.** Momentary bright flashes of light are a common symptom of retinal detachment.

115. **2.** Myopia or nearsightedness is a predisposing factor in the development of a retinal tear.

116. **1.** Cryotherapy is used to produce a chorioretinal adhesion or scar that allows the retina to return to its normal position.

117. **3.** The client should be taught to avoid blowing the nose because this action could increase the pressure in the eustachian tube and dislodge the surgical graft.

118. **3.** The response describes the Babinski reflex. It is abnormal in an adult, signifying an upper motor neuron lesion.

119. **3.** To correctly test cranial nerve II, the optic nerve, use a Snellen chart to assess visual acuity.

120. **4.** An audiometry test tests different pitches and sounds.

121. **1.** Three points are given for opening eyes to speech, 6 points are given for obeying verbal commands related to motor response, and 4 points are given for best verbal response when client is confused.

122. **2.** Pacemakers and cerebral aneurysm clips are the exclusions for an MRI.

123. **1.** Difficulty swallowing occurs from a hematoma developing and pushing on the trachea.

124. **3.** The client is manifesting symptoms of increased intracranial pressure.

125. **1.** Increased intracranial pressure causes hypothalamic dysfunction creating hypo/hyperthermia, SIADH, and diabetes insipidus. The hypothalamus regulates body temperature, osmolality of body fluids, hunger, and satiety.

126. **1.** This method allows the client to have a feeling of control.

127. **2.** Facing the person and speaking clearly is the best way to communicate with the hearing impaired.

128. **1.** These are some of the symptoms of meningitis.

129. **2.** The ineffective tissue perfusion is related to the increased intracranial pressure and inflammatory process.

130. **1.** These findings are consistent with a brain tumor.

131. **2.** This is the correct position for an infratentorial approach.

132. **1.** Pulling the client's paralyzed arm can result in shoulder subluxation and pain. The client's unaffected hand must be free to reach for the arm of the wheelchair.

133. **2.** A TIA is a temporary loss of function due to cerebral ischemia.

134. **3.** Platelet-inhibiting drugs such as aspirin are taken prophylactically to prevent cerebral infarction secondary to embolism and thrombosis.

135. **4.** Depression, confusion, and hallucinations are adverse effects that can occur after prolonged use of L-dopa. A "drug holiday" under medical supervision may restore drug effectiveness.

136. **1.** The client should have semisolid, thickened food. Soup is thin in texture and could be aspirated by the client.

137. 4. These are the symptoms of MS, which is more common in women ages 20–40.

138. 4. Clients with MG have respiratory muscle failure.

139. 2. The client is confused about the timing of medication administration. The anticholinesterase medication should be taken 30 minutes prior to meals to enhance the muscle strength needed for chewing and swallowing.

140. 3. Cerebrospinal fluid is positive for glucose.

141. 1. The client's head should be elevated about 30° to lower the intracranial pressure, which may be dangerously elevated in a subdural hematoma. The venous blood pressure begins to decline as intracranial pressure rises.

142. 2. The wife may not understand that she must interrupt the client's sleep to detect early signs of increased intracranial pressure caused by contusion or hematoma development.

143. 2. Cerebral edema is common after surgery. Decadron (a corticosteroid) is given to decrease the edema.

144. 2. Edema above the area of the lesion can cause respiratory depression and arrest.

145. 3. When initiating rescue breathing for a client with a suspected spinal injury, the jaw thrust maneuver is used with rescue breathing at the rate of 12 breaths per minute.

146. 3. Discomfort at the pin sites is expected for several days after application of the Halo device. The pain can be controlled with mild analgesic medication. The client can benefit from the reassurance that the pain will not continue for the weeks that the traction will be in place.

147. 3. The client is showing signs of autonomic dysreflexia. Placing the client in a sitting position will allow blood to pool in the legs, which should lower the blood pressure and prevent possible hypertensive hemorrhage.

148. 3. Extremes of temperature of food or drink can trigger paroxysms of severe facial pain along the pathways of the trigeminal nerve. Meals are better tolerated if served at room temperature.

149. 4. Bell's palsy may cause paralysis of the eyelid and loss of the blink reflex on the affected side. The eye may not close completely. These problems render the eye susceptible to drying and irritation from dust or other debris.

150. 2. Clients with Guillain-Barré have respiratory muscle weakness and respiratory failure.

151. 2. Clients with ALS often experience respiratory failure as the disease progresses and need to communicate their wishes regarding ventilator support. The nurse should explore the client's wishes and facilitate discussion within the family. Arranging for the client to sign a living will, if the client wishes to do so, is also a nursing responsibility.

152. 2. These are the assessment findings of cataracts.

153. 1. These are common risk factors for glaucoma.

154. 4. Sunglasses should be worn post-op for comfort and protection when outdoors.

155. 2. Eye pain is present with open- and narrow-angle glaucoma, but not with a detached retina.

156. 4. Glaucoma is usually treated with eye drops, such as betaxolol (Timoptic), a beta-adrenergic antagonist. The eye can be damaged when eye drops are used incorrectly.

157. 2. Eye movements can increase the amount of detachment.

158. 3. Immediate irrigation with copious amounts of water or normal saline solution may reduce alkaline burns of the cornea and conjunctiva. Any delay in initiating the irrigation can result in serious damage to eye structures.

159. 4. These are classic signs of otosclerosis.

160. 3. The client should avoid flying to prevent pressure changes in the ear at higher altitudes.

161. 1. These are classic signs of Ménière's disease.

162. 1. This client most likely has Ménière's disease. In Ménière's disease, client education is paramount. The client needs to be taught that with the increased volume of hydrolymph, excessive fluid intake increases the volume even more and exacerbates the disease. They should also be taught not to ambulate or make extreme movements during the acute attacks.

The Cardiovascular System

OVERVIEW OF ANATOMY AND PHYSIOLOGY

The cardiovascular system consists of the heart, arteries, veins, and capillaries. The major functions are circulation of blood, delivery of oxygen and other nutrients to the tissues of the body, and removal of carbon dioxide and other products of cellular metabolism.

Heart

The heart is a muscular pump that propels blood into the arterial system and receives blood from the venous system.

Heart Wall

A. Pericardium: composed of fibrous (outermost layer) and serous pericardium (parietal and visceral); a sac that functions to protect the heart from friction.
B. Epicardium: covers surface of heart, becomes continuous with visceral layer of serous pericardium.
C. Myocardium: middle, muscular layer.
D. Endocardium: thin, inner membranous layer lining the chambers of the heart.
E. Papillary muscles: arise from the endocardial and myocardial surface of the ventricles and attach to the chordae tendinae.
F. Chordae tendinae: attach to the tricuspid and mitral valves and prevent eversion during systole.

Chambers

A. Atria: two chambers, function as receiving chambers, lie above the ventricles
  1. Right atrium: receives systemic venous blood through the superior vena cava, inferior vena cava, and coronary sinus.
  2. Left atrium: receives oxygenated blood returning to the heart from the lungs through the pulmonary veins.
B. Ventricles: two thick-walled chambers; major responsibility for forcing blood out of the heart; lie below the atria.
  1. Right ventricle: contracts and propels deoxygenated blood into the pulmonary circulation via the pulmonary artery.
  2. Left ventricle: propels blood into the systemic circulation via the aorta during ventricular systole.

Valves

See Figure 4-5.
A. Atrioventricular (AV) valves
  1. Mitral valve: located between the left atrium and left ventricle; contains two leaflets attached to the chordae tendinae.
  2. Tricuspid valve: located between the right atrium and right ventricle; contains three leaflets attached to the chordae tendinae.
  3. Functions
    a. Permit unidirectional flow of blood from specific atrium to specific ventricle during ventricular diastole.
    b. Prevent reflux flow during ventricular systole.
    c. Valve leaflets open during ventricular diastole and close during ventricular systole; valve closure produces first heart sound (S_1).
B. Semilunar valves
  1. Pulmonary valve: located between right ventricle and pulmonary artery
  2. Aortic valve: located between left ventricle and aorta
  3. Functions
    a. Permit unidirectional flow of blood from specific ventricle to arterial vessel during ventricular systole.

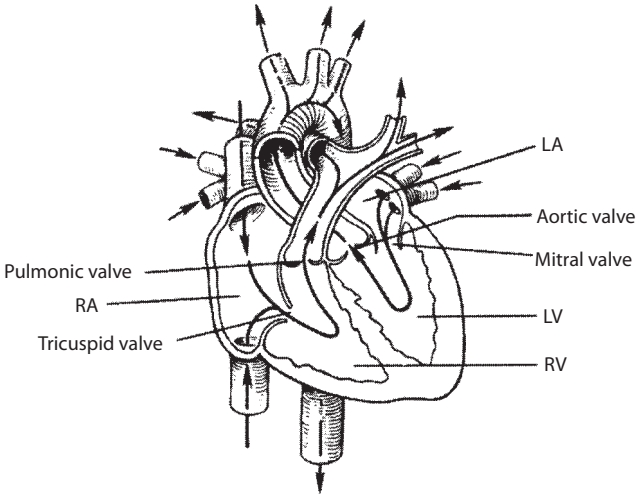


Figure 4–5 The valves of the heart; arrows indicate the direction of blood flow.

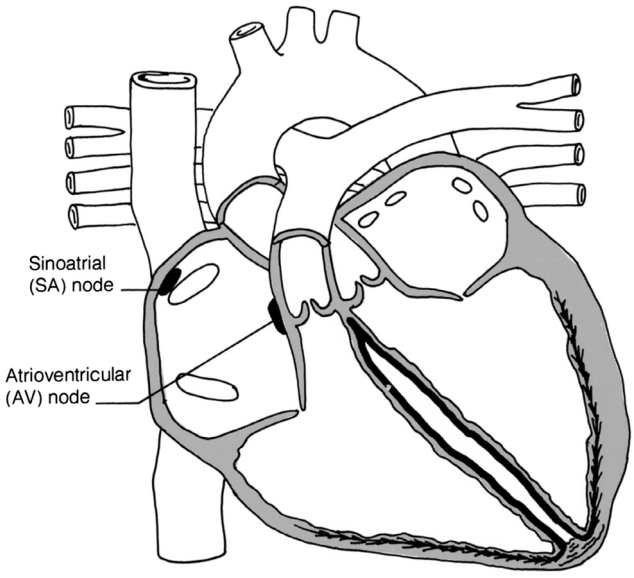


Figure 4–6 Conduction system of the heart

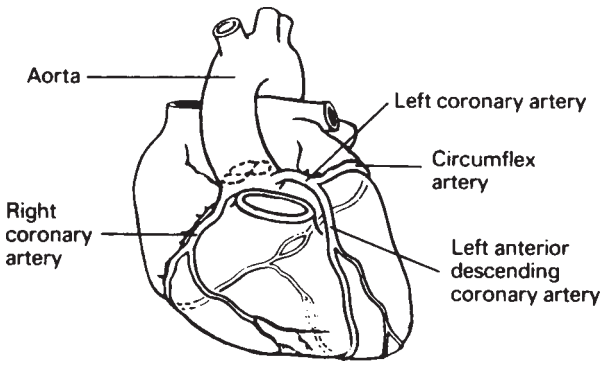


Figure 4–7 Coronary circulation

b. Prevent reflux blood flow during ventricular diastole.
c. Valves open when ventricles contract and close during ventricular diastole; valve closure produces second heart sound (S_2).

Conduction System

See Figure 4-6.

A. Sinoatrial (SA) node: the pacemaker of the heart; initiates the cardiac impulse, which spreads across the atria and into AV node.
B. Atrioventricular (AV) node: delays the impulse from the atria while the ventricles fill.
C. Bundle of His: arises from the AV node and conducts impulse to the bundle branch system.
  1. Right bundle branch: divided into anterior, lateral, and posterior; transmits impulses down the right side of the interventricular septum toward the right ventricular myocardium
  2. Left bundle branch: divided into anterior and posterior
    a. Anterior portion transmits impulses to the anterior endocardial surface of the left ventricle.
    b. Posterior portion transmits impulses over the posterior and inferior endocardial surfaces of the left ventricle.
D. Purkinje fibers: transmit impulses to the ventricles and provide for depolarization after ventricular contraction.
E. Electrical activity of heart can be visualized by attaching electrodes to the skin and recording activity by electrocardiograph.

Coronary Circulation

See Figure 4-7.

A. Coronary arteries: branch off at the base of the aorta and supply blood to the myocardium and the conduction system; two main coronary arteries are right and left.
B. Coronary veins: return blood from the myocardium back to the right atrium via the coronary sinus.

Vascular System

The major function of the blood vessels is to supply the tissues with blood, remove wastes, and carry unoxygenated blood back to the heart.

Types of Blood Vessels

A. Arteries: elastic-walled vessels that can stretch during systole and recoil during diastole; they carry blood away from the heart and distribute oxygenated blood throughout the body.
B. Arterioles: small arteries that distribute blood to the capillaries and function in controlling systemic vascular resistance and, therefore, arterial pressure.
C. Capillaries: the following exchanges occur in the capillaries
  1. Oxygen and carbon dioxide
  2. Solutes between the blood and tissues
  3. Fluid volume transfer between the plasma and interstitial spaces
D. Venules: small veins that receive blood from the capillaries and function as collecting channels between the capillaries and veins.
E. Veins: low-pressure vessels with thin walls and less muscle than arteries; most contain valves that prevent retrograde blood flow; they carry deoxygenated blood back to the heart. When skeletal muscles surrounding veins contract, the veins are compressed, promoting movement of blood back to the heart.

ASSESSMENT

Health History

A. Presenting problem
  1. Nonspecific symptoms may include fatigue, shortness of breath, cough, dizziness, syncope, headache, palpitations, weight loss/gain, anorexia, difficulty sleeping.
  2. Specific signs and symptoms
    a. Chest pain: note character, quality, location, radiation, frequency, and whether it is associated with precipitating factors (exertion, eating, excitement).
    b. Dyspnea (shortness of breath): note kind and extent of precipitating activities.
    c. Orthopnea (form of dyspnea that develops when client lies down): determine how many pillows are used when sleeping; note any paroxysmal nocturnal dyspnea (PND) (client awakens suddenly in the night, breathing with difficulty).
    d. Palpitations (awareness of heartbeat, fluttering feeling): assess precipitating factors (anxiety, caffeine, nicotine, stress); ask client to tap out the rhythm.
    e. Edema (abnormal accumulation of fluid in tissues): note whether unilateral/bilateral, location, time of day when most apparent.
    f. Cyanosis (dusky, bluish coloration to the skin): note whether peripheral or central.

B. Lifestyle: occupation, hobbies, financial status, stressors, unusual life patterns, relaxation time, exercise, living conditions, smoking, sleep habits

C. Use of medications: OTC drugs, cardiac drugs, oral contraceptives, or estrogen replacement therapy

D. Personality profile: Type A, manic-depressive, anxieties

E. Nutrition: dietary habits; calorie, cholesterol, salt intake; alcohol consumption

F. Past medical history
  1. Heart murmurs, rheumatic fever, sexually transmitted diseases, angina, myocardial infarction (MI), hypertension, CVA, alcoholism, obesity, hyperlipidemia, varicose veins, claudication
  2. Pregnancies, contraceptive use

G. Family history: heart disease (congenital, acute, chronic); risk factors (diabetes, hypertension, obesity)

Physical Examination

A. Skin and mucous membranes: note color/texture, temperature, hair distribution on extremities, atrophy or edema, venous pattern, petechiae, lesions, ulcerations or gangrene; examine nails.

B. Peripheral pulses: palpate and rate all arterial pulses (temporal, carotid, brachial, radial, femoral, popliteal, dorsalis pedis, and posterior tibial) on scale of: 0 = absent, 1 = palpable, 2 = normal, 3 = full, 4 = full and bounding.

C. Assess for arterial insufficiency and venous impairment.

D. Measure and record blood pressure.

E. Inspect and palpate the neck vessels.
  1. Jugular veins: note location, characteristics; measure jugular venous pressure.
  2. Carotid arteries: note location, characteristics

F. Precordium
  1. Inspect and palpate sternoclavicular, aortic, pulmonic, Erb's point, tricuspid, apical, epigastric sites.
  2. Note point of maximum impulse (PMI), pulsations, thrills.

G. Auscultate aortic, pulmonic, Erb's point, tricuspid, mitral or apical, xiphoid areas; note heart rate and rhythm (see Figure 4-8).
  1. Normal heart sounds (S_1 and S_2): note location, intensity, splitting
  2. Abnormal heart sounds (S_3, S_4): note location, occurrence in cardiac cycle
  3. Murmurs: note location, occurrence in cardiac cycle
  4. Friction rubs

Laboratory/Diagnostic Tests

A. Blood chemistry and electrolyte analysis
  1. Serial cardiac enzymes (protein assays) will be evaluated with symptoms of acute coronary

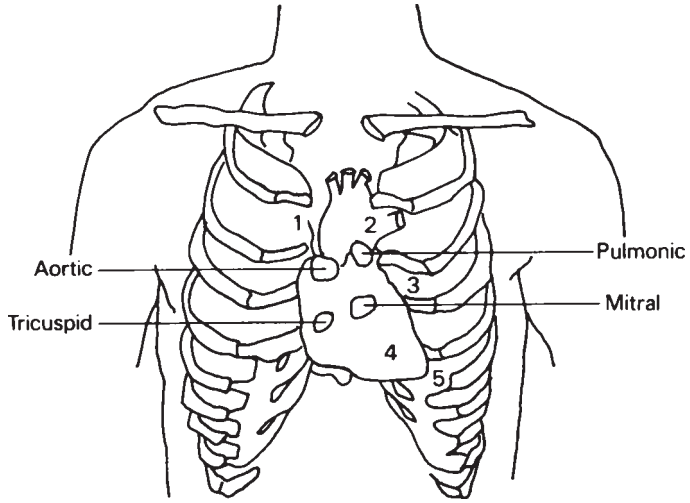


Figure 4–8 Heart valves and areas of auscultation: (1) aortic area; (2) pulmonic area; (3) Erb's point; (4) tricuspid area; (5) mitral area

syndrome, chest pain/ischemia with and without infection, congestive heart failure, post cardiac surgical intervention, and post chest trauma.

a. Nonspecific enzymes, elevated in myocardial injury and with other systems:
- **1)** Creatine kinase (CK); normally 50–325 million units/mL
- **2)** Myoglobin
- **3)** LDH
- **4)** AST (SGOT); normally 7–40 units/mL

b. Specific cardiac isoenzymes, elevated in myocardial injury:
- **1)** Creatine kinase-MB (CKMB); normally 0%
- **2)** LDH1 and LDH2
- **3)** Troponin I or cardiac troponin T (currently used in place of LDH isoenzymes)

c. Specific enzymes, elevations correlated with vascular inflammation, irritability of atherosclerotic plaque, and future coronary risk:
- **1)** Ischemic modified albumin (IMA)
- **2)** Serum lipids (HDLs, LDLs, VDRLs)
- **3)** C-reactive protein (CRP)
- **4)** Lipoprotein phospholipase A2 (PLAQ test)

d. Specific cardiac proteins, elevated in congestive heart failure:
- **1)** B-type natriuretic peptide and N-terminal proB-type natriuretic peptide (BNP)

B. Hematologic studies
1. CBC (see Hematologic system for values)
2. Coagulation time: 5–15 min.; increased levels indicate bleeding tendency, used to monitor heparin therapy
3. Prothrombin time (PT) 9.5–12 sec.; INR 1.0, increased levels indicate bleeding tendency, used to monitor warfarin therapy
4. Activated partial thromboplastin time (APTT) 20–45 sec., increased levels indicate bleeding tendency, used to monitor heparin therapy
5. Erythrocyte sedimentation rate (ESR) < 20 mm/hr; increased level indicate inflammatory process

C. Urine studies: routine urinalysis

D. Electrocardiogram (ECG or EKG)
1. Noninvasive test that produces a graphic record of the electrical activity of the heart. In addition to determining cardiac rhythm, pattern variations may reveal pathologic processes (MI and ischemia, electrolyte and acid-base imbalance, chamber enlargement, block of the right or left bundle branch); see also Cardiac Monitoring.
2. Portable recorder (Holter monitor) provides continuous recording of ECG for up to 24 hours; client keeps a diary noting presence of symptoms or any unusual activities.

E. Stress tests may show heart disease when resting ECG does not. Stress test types:
1. Exercise: treadmill or bicycle
2. Chemical: Persantine, Dobutamine, Adenosine

F. Cardiac nuclear scan: Radionucleotide imaging to identify ischemic/infracted tissue.

G. Phonocardiogram: noninvasive device to amplify and record heart sounds and murmurs.

H. Echocardiogram: noninvasive recording of the cardiac structures using ultrasound.

I. Cardiac catheterization: invasive, but often definitive test for diagnosis of cardiac disease.
1. A catheter is inserted into the right or left side of the heart to obtain information.
   - **a**. Right-sided catheterization: the catheter is inserted into an antecubital vein and advanced into the vena cava, right atrium, and right ventricle with further insertion into the pulmonary artery.
   - **b**. Left-sided catheterization: performed by inserting the catheter into a brachial or femoral artery; the catheter is passed retrograde up the aorta and into the left ventricle.
2. Purpose: to measure intracardiac pressures and oxygen levels in various parts of the heart; with injection of a dye, it allows visualization of the heart chambers, blood vessels, and course of blood flow (angiography).
3. Nursing care: pretest
   - **a**. Confirm that informed consent has been signed.
   - **b**. Ask about allergies, particularly to iodine, if dye being used.
   - **c**. Keep client NPO for 8–12 hours prior to test.
   - **d.** Temporarily suspend metformin for dye and surgical procedures; do not restart until oral intake has resumed and renal function is normal.
   - **e.** Record height and weight, take baseline vital signs, and monitor peripheral pulses.
   - **f**. Inform client that a feeling of warmth and fluttering sensation as catheter is passed is common.
4. Nursing care: posttest
   - **a**. Assess circulation to the extremity used for catheter insertion.
   - **b**. Check peripheral pulses, color, sensation of affected extremity every 15 minutes for 4 hours.
   - **c**. If protocol requires, keep affected extremity straight for approximately 8 hours.
   - **d**. Observe catheter insertion site for swelling and bleeding; a sandbag or pressure dressing may be placed over insertion site.
   - **e**. Assess vital signs and report significant changes from baseline.

J. Aortography
   1. Injection of radiopaque contrast medium into the aorta to visualize the aorta, valve leaflets, and major vessels on a movie film.
   2. Purpose: to determine and diagnose aortic valve incompetence, aneurysms of the ascending aorta, abnormalities of major branches of the aorta.
   3. Nursing care: pretest
      a. Confirm that informed consent has been signed.
      b. Inform client that a dye will be injected and to report any dyspnea, numbness, or tingling.
   4. Nursing care: posttest
      a. Assess the puncture site frequently for bleeding or inflammation.
      b. Assess peripheral pulses distal to the injection site every hour for 4–8 hours posttest.

K. Coronary arteriography
   1. Visualization of coronary arteries by injection of radiopaque contrast dye and recording on a movie film.
   2. Purpose: evaluation of heart disease and angina, location of areas of infarction and extent of lesions, ruling out coronary artery disease in clients with myocardial disease.
   3. Nursing care: same as for Aortography.

ANALYSIS

Nursing diagnoses for the client with a cardiovascular dysfunction may include:

A. Excess fluid volume
B. Decreased cardiac output
C. Ineffective tissue perfusion
D. Impairment of skin integrity
E. Activity intolerance
F. Pain
G. Ineffective individual coping
H. Fear
I. Anxiety

PLANNING AND IMPLEMENTATION

Goals

A. Fluid imbalance will be resolved, edema minimized.
B. Cardiac output will be improved.
C. Cardiopulmonary and peripheral tissue perfusion will be improved.
D. Adequate skin integrity will be maintained.
E. Activity tolerance will progressively increase.
F. Pain in the chest or in the affected extremity will be diminished.
G. Client will use effective coping techniques.
H. Client's level of fear and anxiety will be decreased.

Interventions

Cardiac Monitoring

A. The cardiac monitor provides continuous information regarding the cardiac rhythm and rate (ECG). Constant surveillance and understanding of the basic electrocardiographic system is imperative to avoid/treat arrhythmias (see Figure 4-9).
   1. ECG strip: each small square represents 0.04 second, each large square 0.2 second.
   2. P wave: produced by atrial depolarization; indicates SA node function.
   3. P-R interval
      a. Indicates atrioventricular conduction time or the time it takes an impulse to travel from the atria down and through the AV node
      b. Measured from beginning of P wave to beginning of QRS complex
      c. Normal: 0.12–0.20 second.
   4. QRS complex
      a. Indicates ventricular depolarization
      b. Measured from onset of Q wave to end of S wave
      c. Normal: 0.06–0.10 seconds
   5. ST segment
      a. Indicates time interval between complete depolarization of ventricles and repolarization of ventricles
      b. Measured after QRS complex to beginning of T wave
   6. T wave
      a. Represents ventricular repolarization
      b. Follows ST segment

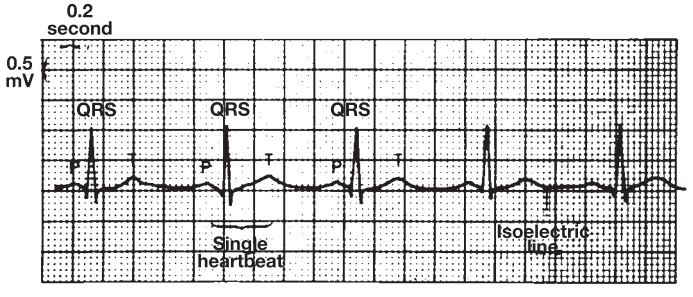


Figure 4-9 A typical ECG; all beats appear as a similar pattern, equally spaced, and have three major units: P wave, QRS complex, and T wave

Hemodynamic Monitoring (Swan-Ganz Catheter)

A. A pulmonary artery (PA) catheter with a balloon tip that is advanced through the superior vena cava into the right atrium, right ventricle, and pulmonary artery. When it is wedged it is in the distal arterial branch of the pulmonary artery.

B. Purposes
- **1.** Proximal port: measures right atrial pressure
- **2.** Distal port
  - **a.** Measures pulmonary artery (PA) pressure (reflects left and right heart pressures) and pulmonary capillary wedge pressure (PCWP) (reflects left atrial and left ventricular end diastolic pressure)
  - **b.** Normal values: PA systolic 15–30 mm Hg and diastolic 4–12 mm Hg; PCWP 6–12 mm Hg
- **3.** Balloon port: inflated with 1–1.5 cc air to obtain PCWP
- **4.** Thermistor lumen: used to measure cardiac output if ordered.

C. Nursing care
- **1.** A sterile dry dressing should be applied to site and changed every 24 hours; inspect site daily and report signs of infection.
- **2.** If catheter is inserted via an extremity, immobilize extremity to prevent catheter dislodgment or trauma.
- **3.** Observe catheter site for leakage.
- **4.** Ensure that balloon is deflated with a syringe attached, except when PCWP is read.
- **5.** Continuously monitor PA systolic and diastolic pressures and report significant variations.
- **6.** Maintain client in same position for each reading.
- **7.** Maintain pressure bag at 300 mm Hg.
- **8.** Record PA systolic and diastolic readings at least every hour and PCWP as ordered, noting position of client.

Central Venous Pressure (CVP)

A. Obtained by inserting a catheter into the external jugular, antecubital, or femoral vein and threading it into the vena cava. The catheter is attached to an IV infusion and H_2O manometer by a three-way stopcock or electronic transducer.

B. Purposes
- **1.** Reveals right atrial pressure, reflecting alterations in the right ventricular pressure
- **2.** Provides information concerning blood volume and adequacy of central venous return
- **3.** Provides an IV route for drawing blood samples, administering fluids or medication, and possibly inserting a pacing catheter

C. Normal range is 4–10 cm H_2O or 2–6 mm Hg; elevation indicates hypervolemia, decreased level indicates hypovolemia.

D. Nursing care
- **1.** Ensure client is relaxed.
- **2.** Maintain zero point of manometer always at level of right atrium (midaxillary line).
- **3.** Determine patency of catheter by opening IV infusion line.
- **4.** Turn stopcock to allow IV solution to run into manometer to a level of 10–20 cm above expected pressure reading.
- **5.** Turn stopcock to allow IV solution to flow from manometer into catheter; fluid level in manometer fluctuates with respiration.
- **6.** Stop ventilatory assistance during measurement of CVP.
- **7.** After CVP reading, return stopcock to IV infusion position.
- **8.** Record CVP reading and position of client.
- **9.** Electronic transducer
  - **a.** Ensure client is relaxed.
  - **b.** Make sure transducer is zeroed and calibrated.
  - **c.** If CVP line is in use, turn stopcock to allow pressure measurement from transducer, which will temporarily stop infusion.
  - **d.** Ensure that infusion is reinitiated upon completion of reading.
  - **e**. Record CVP.

EVALUATION

A. Resolution of peripheral edema and neck vein distention; weight stable; lungs clear.

B. Capillary refill is less than 3 seconds; balanced I&O with urine output at least 30 mL/hour; hemodynamic measurements within normal range; usual mental status.

C. Stable vital signs; skin warm and dry; peripheral pulses present, equal, and strong; absence of edema; increased tolerance to activity; usual mentation; absence of pain.

D. Client's skin warm and dry, shows absence of redness and irritation; healing of lesions.

E. Progressive increase in tolerance for activity with heart rate and blood pressure stable; absence of pain.

F. Client expresses relief from pain; relaxed facial expression; stable vital signs; progressive increase in activity tolerance.

G. Demonstrates the use of effective coping skills and problem-solving techniques.

H. Verbalizes awareness of feelings of fear and anxiety. Client reports fear/anxiety as reduced/controlled.

DISORDERS OF THE CARDIOVASCULAR SYSTEM

The Heart

Coronary Artery Disease (CAD)

A. General information
- **1.** CAD refers to a variety of pathologic conditions that cause narrowing or obstruction of the coronary arteries, resulting in decreased blood supply to the myocardium.
- **2.** Atherosclerosis (deposits of cholesterol and lipids within the walls of the artery) is the major causative factor.
- **3.** Occurs most often between ages 30 and 50; men affected more often than women; nonwhites have higher mortality rates.
- **4.** May manifest as angina pectoris or MI.
- **5.** Risk factors: family history of CAD, elevated serum lipoproteins, cigarette smoking, diabetes mellitus, hypertension, obesity, sedentary and/or stressful/competitive lifestyle, elevated serum uric acid levels.

B. Medical management, assessment findings, and nursing interventions: see Angina Pectoris and Myocardial Infarction.

Angina Pectoris

A. General information
- **1.** Transient, paroxysmal chest pain produced by insufficient blood flow to the myocardium resulting in myocardial ischemia
- **2.** Risk factors: CAD, atherosclerosis, hypertension, diabetes mellitus, thromboangiitis obliterans, severe anemia, aortic insufficiency
- **3.** Precipitating factors: physical exertion, consumption of a heavy meal, extremely cold weather, strong emotions, cigarette smoking, sexual activity
- **4.** Two main types:
  - **a.** Stable angina: chest pain occurs with increased oxygen demand; relieved when precipitating factor is removed or with nitroglycerin.
  - **b.** Unstable angina chest pain increases in frequency, duration, and intensity at low levels of activity or at rest; often a precursor to MI.

B. Medical management
- **1.** Drug therapy: nitrates, beta-adrenergic blocking agents, and/or calcium-blocking agents, lipid reducing drugs if cholesterol elevated
- **2.** Modification of diet and other risk factors
- **3.** Surgery: coronary artery bypass surgery
- **4.** Percutaneous transluminal coronary angioplasty (PTCA)

C. Assessment findings
- **1.** Pain: substernal with possible radiation to the neck, jaw, back, and arms; may be relieved by rest
- **2.** Palpitations, tachycardia
- **3.** Dyspnea
- **4.** Diaphoresis
- **5.** Increased serum lipid levels
- **6**. Diagnostic tests
  - **a.** ECG may reveal ST segment depression and T-wave inversion during chest pain.
  - **b.** Stress test may reveal an abnormal ECG during exercise.

D. Nursing interventions
- **1.** Administer oxygen.
- **2.** Give prompt pain relief with nitrates or narcotic analgesics as ordered.
- **3.** Monitor vital signs, status of cardiopulmonary function.
- **4.** Monitor ECG.
- **5.** Place client in semi- to high-Fowler's position.
- **6.** Provide emotional support.
- **7.** Provide client teaching and discharge planning concerning
  - **a.** Proper use of nitrates
    - **1)** Nitroglycerin tablets (sublingual)
      - **a)** Allow tablet to dissolve.
      - **b)** Relax for 15 minutes after taking tablet to prevent dizziness.
      - **c)** If no relief with 1 tablet, take additional tablets at 5-minute intervals, but no more than 3 tablets within a 15-minute period, reassess blood pressure after each tablet dissolved.
      - **d)** Know that transient headache is a frequent side effect.
      - **e)** Keep pills in original bottle, tightly capped and prevent exposure to air, light, and heat.
      - **f)** Ensure tablets are within reach at all times.
      - **g)** Check shelf life, expiration date of tablets.
    - **2)** Nitroglycerin ointment (topical)
      - **a)** Rotate sites to prevent dermal inflammation.
      - **b)** Remove previously applied ointment.
      - **c)** Avoid massaging/rubbing as this increases absorption and interferes with the drug's sustained action.
  - **b.** Ways to minimize precipitating events
    - **1)** Reduce stress and anxiety (relaxation techniques, guided imagery)
    - **2)** Avoid overexertion and smoking
    - **3)** Maintain low-cholesterol, low-saturated fat diet and eat small, frequent meals
    - **4)** Avoid extremes of temperature
    - **5)** Dress warmly in cold weather

c. Gradual increase in activities and exercise
   1) Participate in regular exercise program
   2) Space exercise periods and allow for rest periods
8. Instruct client to notify physician immediately if pain occurs and persists, despite rest and medication administration.

Dysrhythmias

A dysrhythmia, often called an arrhythmia, is a disruption in the normal events of the cardiac cycle. It may take a variety of forms. Treatment varies depending on the type of dysrhythmia; commonly used drugs are summarized in Table 2-14.

Sinus Tachycardia

A. General information
   1. A heart rate of over 100 beats/minute, originating in the SA node
   2. May be caused by fever, apprehension, physical activity, anemia, hyperthyroidism, drugs (epinephrine, theophylline), myocardial ischemia, caffeine
B. Assessment findings
   1. Rate: 100–160 beats/minute
   2. Rhythm: regular
   3. P wave: precedes each QRS complex with normal contour
   4. P-R interval: normal (0.08 second)
   5. QRS complex: normal (0.06 second)
C. Treatment: correction of underlying cause, elimination of stimulants; sedatives, propranolol (Inderal).

Premature Atrial Complex (PAC)

A. General information
   1. Physical appearance: single ECG complex that occurs early
   2. Causes: nicotine, alcohol, anxiety, low potassium level, hypovolemia, myocardial ischemia
B. Assessment findings
   1. Ventricular and atrial rate dependent on underlying rhythm
   2. Rhythm; irregular due to premature complexes
   3. QRS shape; usually normal
   4. P wave: morphology may be the same, different, or absent
   5. P-R interval: may be shorter but within limits (0.12–0.20 second)
   6. P-QRS: 1:1

Sinus Bradycardia

A. General information
   1. A slowed heart rate initiated by SA node
   2. Caused by excessive vagal or decreased sympathetic tone, MI, intracranial tumors, meningitis, myxedema, cardiac fibrosis; a normal variation of the heart rate in well-trained athletes
B. Assessment findings
   1. Rate: less than 60 beats/minute
   2. Rhythm: regular
   3. P wave: precedes each QRS with a normal contour
   4. P-R interval: normal
   5. QRS complex: normal
C. Treatment: usually not needed; if cardiac output is inadequate, atropine and isoproterenol (Isuprel) are usually prescribed; if drugs are not effective, a pacemaker may need to be inserted.

Atrial Tachycardia

A. General information
   1. A heart rate above 160–250, originates in the SA node
   2. May be drug induced (including substance abuse), caused by fever, severe blood loss, thyroid storm, electrolyte imbalances, severe hypoxia
B. Assessment findings
   1. Rate: 160–250 beats/minute
   2. Rhythm: regular
   3. P Wave: precedes each QRS complex with normal contour
   4. P-R interval: normal (0.08 second)
   5. QRS complex: normal (0.06 second)
C. Treatment: correction of underlying problem, beta-blockers, calcium channel blocker, amniodarone

Atrial Flutter

A. General information
   1. Atrial rate between 250 and 400, ventricular rate between 75 and 150
   2. May be idiopathic, associated with advanced age, valvular disease, HTN, cardiomyopathy, pulmonary disease, hyperthyroidism, moderate-to-heavy alcohol consumption
B. Assessment findings
   1. Rate: 250–400 beats/minute
   2. Rhythm: irregular
   3. P Wave: varies to QRS
   4. P-R interval: difficult to distinguish due to rate
   5. QRS complex: normal or abnormal
C. Treatment: correction of underlying problem, beta-blockers, calcium channel blocker, amniodarone, digitalis

Atrial Fibrillation

A. General information
   1. An arrhythmia in which ectopic foci in the atria cause rapid, irregular contractions of the heart
   2. Commonly seen in clients with rheumatic mitral stenosis, thyrotoxicosis,

cardiomyopathy, hypertensive heart disease, pericarditis, and coronary heart disease

B. Assessment findings
  1. Rate
    a. Atrial: 350–600 beats/minute
    b. Ventricular: varies between 100–160 beats/minute
  2. Rhythm: atrial and ventricular regularly irregular
  3. P wave: no definite P wave; rapid undulations called fibrillatory (f) waves
  4. P-R interval: not measurable
  5. QRS complex: generally normal

C. Treatment: digitalis preparations, propranolol, verapamil in conjunction with digitalis; direct-current cardioversion

Premature Ventricular Contractions (PVCs)

A. General information
  1. Irritable impulses originate in the ventricles
  2. Caused by electrolyte imbalance (hypokalemia); digitalis drug therapy; myocardial disease; stimulants (caffeine, epinephrine, isoproterenol); hypoxia; congestive heart failure

B. Assessment findings
  1. Rate: varies according to number of PVCs
  2. Rhythm: irregular because of PVCs
  3. P wave: normal; however, often lost in QRS complex
  4. P-R interval: often not measurable
  5. QRS complex: wide and distorted in shape, greater than 0.12 second

C. Treatment
  1. IV push of lidocaine (50–100 mg) followed by IV drip of lidocaine at rate of 1–4 mg/minute
  2. Procainamide (Pronestyl), quinidine
  3. Treatment of underlying cause

Ventricular Tachycardia

A. General information
  1. A run of three or more consecutive PVCs; occurs from repetitive firing of an ectopic focus in the ventricles
  2. Caused by acute MI, CAD, digitalis intoxication, hypokalemia

B. Assessment findings
  1. Rate
    a. Atrial: 60–100 beats/minute
    b. Ventricular: 110–250 beats/minute
  2. Rhythm: atrial (regular), ventricular (occasionally irregular)
  3. P wave: often lost in QRS complex
  4. P-R interval: usually not measurable
  5. QRS complex: greater than 0.12 second, wide

C. Treatment
  1. IV push of lidocaine (1 mg/kg for a dose of 50–100 mg), then IV drip of lidocaine 1–4 mg/minute
  2. Procainamide via IV infusion of 2–6 mg/minute
  3. Direct-current cardioversion
  4. Bretylium, propranolol (Inderal)

Ventricular Fibrillation

A. General information
  1. Rapid and disorganized rhythm caused by quivering of the ventricles
  2. No atrial activity is seen
  3. May be caused by idiopathic sudden death, electrical shock

B. Assessment findings
  1. Ventricular rate: greater than 300
  2. Ventricular rhythm irregular, without specific pattern
  3. QRS shape and duration: irregular, undulating waves without recognizable QRS pattern

C. Treatment: counter-shock (defibrillation)

Myocardial Infarction (MI)

A. General information
  1. The death of myocardial cells from inadequate oxygenation, often caused by a sudden complete blockage of a coronary artery; characterized by localized formation of necrosis (tissue destruction) with subsequent healing by scar formation and fibrosis.
  2. Risk factors: atherosclerotic CAD, thrombus formation, hypertension, diabetes mellitus, hyperlipidemia, and genetic predisposition

B. Assessment findings (see also Angina Pectoris)
  1. Pain usually substernal with radiation to the neck, arm, jaw, or back; severe, crushing, viselike with sudden onset; *unrelieved by rest or nitrates*
  2. Nausea and vomiting
  3. Dyspnea
  4. Skin: cool, clammy, ashen
  5. Elevated temperature
  6. Initial increase in blood pressure and pulse, with gradual drop in blood pressure
  7. Restlessness
  8. Occasional findings: rales or crackles; presence of S_4; pericardial friction rub; split S_1, S_2
  9. Diagnostic tests
    a. Elevated WBC
    b. Elevated CPK and CPK-MB
    c. Elevated SGOT or AST
    d. Elevated LDH, LDH_1, and LDH_2
    e. Elevated troponin levels
    f. ECG changes (specific changes dependent on location of myocardial damage and phase of the MI; inverted T wave and ST segment changes seen with myocardial ischemia
    g. Increased ESR, elevated serum cholesterol

C. Nursing interventions
1. Establish a patent IV line
2. Provide pain relief; morphine sulfate IV (given IV because after an infarction there is poor peripheral perfusion and because serum enzymes would be affected by IM injections) as ordered.
3. Administer oxygen as ordered to relieve dyspnea and prevent arrhythmias.
4. Provide bed rest with semi-Fowler's position to decrease cardiac workload.
5. Monitor ECG and hemodynamic procedures.
6. Administer antiarrhythmias as ordered.
7. Perform complete lung/cardiovascular assessment.
8. Monitor urinary output and report output of less than 30 mL/hour; indicates decreased cardiac output.
9. Maintain full liquid diet with gradual increase to soft; low sodium.
10. Maintain quiet environment.
11. Administer stool softeners as ordered to facilitate bowel evacuation and prevent straining.
12. Relieve anxiety associated with coronary care unit (CCU) environment.
13. Administer anticoagulants, as ordered.
14. Administer thrombolytics (tissue-type plasminogen activator or t-pa and streptokinase) and monitor for side effects (bleeding).
15. Provide client teaching and discharge planning concerning
    a. Effects of MI, healing process, and treatment regimen
    b. Medication regimen including name, purpose, schedule, dosage, side effects
    c. Risk factors, with necessary lifestyle modifications
    d. Dietary restrictions: low sodium, low cholesterol, avoidance of caffeine
    e. Importance of participation in a progressive activity program
    f. Resumption of sexual activity according to physician's orders (usually 4–6 weeks)
    g. Need to report the following symptoms: increased persistent chest pain, dyspnea, weakness, fatigue, persistent palpitations, light-headedness
    h. Enrollment of client in a cardiac rehabilitation program

Percutaneous Transluminal Coronary Angioplasty

A. General information
1. Percutaneous transluminal coronary angioplasty (PTCA), with or without placement of a stent, can be performed as an alternative to coronary artery bypass graft surgery (CABG).
2. The aim of PTCA is to revascularize the myocardium, decrease angina, and increase survival.
3. PTCA is performed in the cardiac catheterization lab and is accomplished by insertion of a balloon-tipped catheter into the stenotic, diseased coronary artery. The balloon is inflated with a controlled pressure and thereby decreases the stenosis of the vessel.

B. Nursing interventions: preoperative and postoperative care is similar to the care of the client undergoing cardiac catheterization.

Coronary Artery Bypass Surgery (CABG)

A. General information
1. A coronary artery bypass graft is the surgery of choice for clients with severe CAD.
2. New supply of blood brought to diseased/occluded coronary artery by bypassing the obstruction with a graft that is attached to the aorta proximally and to the coronary artery distally.
3. Several bypasses can be performed depending on the location and extent of the blockage.
4. Procedure frequently requires use of extracorporeal circulation (heart-lung machine, cardiopulmonary bypass). Some clients may be candidates for off pump coronary artery bypass (OPCAB).

B. Nursing interventions: preoperative
1. Explain anatomy of the heart, function of coronary arteries, effects of CAD.
2. Explain events of the day of surgery: length of time in surgery, length of time until able to see family.
3. Orient to the critical and coronary care units and introduce to staff.
4. Explain equipment to be used (monitors, hemodynamic procedures, ventilator, endotracheal tube, drainage tubes).
5. Demonstrate activity and exercises (turning from side to side, dangling, sitting in a chair, ROM exercises for arms and legs, effective deep breathing, and coughing).
6. Reassure client that pain medication is available.

C. Nursing interventions: postoperative
1. Maintain patent airway.
2. Promote lung reexpansion.
    a. Monitor drainage from chest/mediastinal tubes, and check patency of chest drainage system.
    b. Assist client with turning, coughing, and deep breathing.
3. Monitor cardiac status.
    a. Monitor vital signs and cardiac rhythm and report significant changes, particularly temperature elevation.
    b. Perform peripheral pulse checks.

c. Carry out hemodynamic monitoring.
d. Administer anticoagulants as ordered and monitor hematologic test results carefully.

4. Maintain fluid and electrolyte balance.
a. Maintain accurate I&O with hourly outputs; report if less than 30 mL/hour urine.
b. Assess color, character, and specific gravity of urine.
c. Daily weights.
d. Assess lab values, particularly BUN, creatinine, sodium, and potassium levels.

5. Maintain adequate cerebral circulation: frequent neuro checks.

6. Provide pain relief.
a. Administer narcotics cautiously and monitor effects.
b. Assist with positioning for maximum comfort.
c. Teach relaxation techniques.

7. Prevent abdominal distension.
a. Monitor nasogastric drainage and maintain patency of system.
b. Assess for bowel sounds every 2–4 hours.
c. Measure abdominal girths if necessary.

8. Monitor for and prevent the following complications.
a. Thrombophlebitis/pulmonary embolism
b. Cardiac tamponade
c. Arrhythmias
1) Maintain continuous ECG monitoring and report changes.
2) Assess electrolyte levels daily and report significant changes, particularly potassium.
3) Administer antiarrhythmics as ordered.
d. Heart failure

9. Provide client teaching and discharge planning concerning
a. Limitation with progressive increase in activities
1) Encourage daily walking with gradual increase in distance weekly
2) Avoid heavy lifting and activities that require continuous arm movements (vacuuming, playing golf, bowling)
3) Avoid driving a car until physician permits
b. Sexual intercourse: can usually be resumed by third or fourth week post-op; avoid sexual positions in which the client would be supporting weight
c. Medical regimen: ensure client/family are aware of drugs, dosages, proper times of administration, and side effects
d. Meal planning with prescribed modifications (decreased sodium, cholesterol, and possibly carbohydrates)
e. Wound cleansing daily with mild soap and H_2O and report signs of infection
f. Symptoms to be reported: fever, dyspnea, chest pain with minimal exertion

Heart Failure (HF)

A. General information: inability of the heart to pump an adequate supply of blood to meet the metabolic needs of the body.

B. Types
1. Left-sided heart failure
a. Left ventricular damage causes blood to back up through the left atrium and into the pulmonary veins. Increased pressure causes transudation into the interstitial tissues of the lungs with resultant pulmonary congestion.
b. Caused by left ventricular damage (usually due to an MI), hypertension, ischemic heart disease, aortic valve disease, mitral stenosis
c. Assessment findings
1) Dyspnea, orthopnea, PND, tiredness, muscle weakness, cough
2) Tachycardia, PMI displaced laterally, possible S_3, bronchial wheezing, rales or crackles, cyanosis, pallor
3) Decreased pO_2, increased pCO_2
4) Diagnostic tests
a) Chest X-ray: shows cardiac hypertrophy
b) PAP and PCWP usually increased; however, this is dependent on the degree of heart failure
5) Echocardiography: shows increased size of cardiac chambers

2. Right-sided heart failure
a. Weakened right ventricle is unable to pump blood into the pulmonary system; systemic venous congestion occurs as pressure builds up.
b. Caused by left-sided heart failure, right ventricular infarction, atherosclerotic heart disease, COPD, pulmonic stenosis, pulmonary embolism.
c. Assessment findings
1) Anorexia, nausea, weight gain
2) Dependent pitting edema, jugular venous distension, bounding pulses, hepatomegaly, cool extremities, oliguria
3) Elevated CVP, decreased pO_2, increased ALT (SGPT)
4) Diagnostic tests
a) Chest X-ray: reveals cardiac hypertrophy
b) Echocardiography: indicates increased size of cardiac chambers

3. High-output failure
   a. Cardiac output is adequate but exceeded by the metabolic needs of the tissues; the exorbitant demands made on the heart eventually cause ventricular failure.
   b. Caused by hyperthyroidism, anemia, AV fistula, pregnancy

C. Medical management (all types)
1. Determination and elimination/control of underlying cause
2. Drug therapy: digitalis preparations, diuretics, vasodilators
3. Sodium-restricted diet to decrease fluid retention
4. If medical therapies unsuccessful, mechanical assist devices (intra-aortic balloon pump), cardiac transplantation, or mechanical hearts may be employed.

D. Nursing interventions
1. Monitor respiratory status and provide adequate ventilation (when HF progresses to pulmonary edema).
   a. Administer oxygen therapy.
   b. Maintain client in semi- or high-Fowler's position.
   c. Monitor ABGs.
   d. Assess for breath sounds, noting any changes.
2. Provide physical and emotional rest.
   a. Constantly assess level of anxiety.
   b. Maintain bed rest with limited activity.
   c. Maintain quiet, relaxed environment.
   d. Organize nursing care around rest periods.
3. Increase cardiac output.
   a. Administer digitalis as ordered and monitor effects.
   b. Monitor ECG and hemodynamic monitoring.
   c. Administer vasodilators as ordered.
   d. Monitor vital signs.
4. Reduce/eliminate edema.
   a. Administer diuretics as ordered.
   b. Daily weights.
   c. Maintain accurate I&O.
   d. Assess for peripheral edema.
   e. Measure abdominal girths daily.
   f. Monitor electrolyte levels.
   g. Monitor CVP and Swan-Ganz readings.
   h. Provide sodium-restricted diet as ordered.
   i. Provide meticulous skin care.
5. Provide client teaching and discharge planning concerning
   a. Need to monitor self daily for signs and symptoms of HF (pedal edema, weight gain of 1–2 kg in a 2-day period, dyspnea, loss of appetite, cough)
   b. Medication regimen including name, purpose, dosage, frequency, and side effects (digitalis, diuretics)
   c. Prescribed dietary plan (low sodium; small, frequent meals)
   d. Need to avoid fatigue and plan for rest periods

Pulmonary Edema

A. General information
1. A medical emergency that occurs when the capillary pressure within the lungs becomes so great that fluid moves from the intravascular space into the alveoli, bronchi, and bronchioles. Death occurs by suffocation if this condition is untreated.
2. Caused by left-sided heart failure, rapid administration of IV fluids.

B. Medical management
1. Oxygen therapy
2. Endotracheal/nasotracheal intubation (possible)
3. Drug therapy
   a. Morphine sulfate to induce vasodilation and decrease anxiety; 5 mg IV, administer slowly
   b. Digitalis to improve cardiac output
   c. Diuretics (furosemide [Lasix] is drug of choice) to relieve fluid retention
   d. Aminophylline to relieve bronchospasm and increase cardiac output; 250–500 mg IV, administer slowly
   e. Vasodilators (nitroglycerin, isosorbide dinitrate) to dilate the vessels, thereby reducing amount of blood returned to the heart
4. Rotating tourniquets or phlebotomy

C. Assessment findings
1. Dyspnea
2. Cough with large amounts of blood-tinged sputum
3. Tachycardia, pallor, wheezing, rales or crackles, diaphoresis
4. Restlessness, fear/anxiety
5. Jugular vein distension
6. Decreased pO_2, increased pCO_2, elevated CVP

D. Nursing interventions
1. Assist with intubation (if necessary) and monitor mechanical ventilation.
2. Administer oxygen by mask in high concentrations (40–60%) if not intubated.
3. Place client in semi-Fowler's position or over bedside table to ease dyspnea.
4. Administer medications as ordered.
5. Assist with phlebotomy (removal of 300–500 mL of blood from a peripheral vein) if performed.
6. CVP/hemodynamic monitoring.
7. Provide client teaching and discharge planning concerning
   a. Prescribed medications, including name, purpose, schedule, dosage, and side effects

b. Dietary restrictions: low sodium, low cholesterol
c. Importance of adhering to planned rest periods with gradual progressive increase in activities
d. Daily weights
e. Need to report the following symptoms to physician immediately: dyspnea, persistent productive cough, pedal edema, restlessness

Pacemakers

A. General information
1. A pacemaker is an electronic device that provides repetitive electrical stimulation to the cardiac musculature to control the heart rate.
2. Artificial pacing system consists of a battery-powered generator and a pacing wire that delivers the stimulus to the heart.

B. Indications for use
1. Adams-Stokes attack
2. Acute MI with Mobitz II AV block
3. Third-degree AV block with slow ventricular rate
4. Right bundle branch block
5. New left bundle branch block
6. Symptomatic sinus bradycardia
7. Sick sinus syndrome
8. Arrhythmias (during or after cardiac surgery)
9. Drug-resistant tachyarrhythmia

C. Modes of pacing
1. Fixed rate: pacemaker fires electrical stimuli at preset rate, regardless of the client's rate and rhythm.
2. Demand: pacemaker produces electrical stimuli only when the client's own heart rate drops below the preset rate per minute on the generator.

D. Types of pacemakers
1. Temporary
   a. Used in emergency situations and performed via an endocardial (transvenous) or transthoracic approach to the myocardium.
   b. Performed at bedside or using fluoroscopy.
2. Permanent
   a. Endocardial or transvenous procedure involves passing endocardial lead into right ventricle with subcutaneous implantation of pulse generator into right or left subclavian areas. Usually done under local anesthesia.
   b. Epicardial or myocardial method involves passing the electrode transthoracically to the myocardium where it is sutured in place. The pulse generator is implanted into the abdominal wall.

E. Nursing interventions
1. Assess pacemaker function
   a. Monitor heart rate, noting deviations from the preset rate.
   b. Observe the presence of pacemaker spikes on ECG tracing or cardiac monitor; spike before P wave with atrial pacemaker; spike before QRS complex with ventricular pacemaker
   c. Assess for signs of pacemaker malfunction, such as weakness, fainting, dizziness, or hypotension.
2. Maintain the integrity of the system
   a. Ensure that catheter terminals are attached securely to the pulse generator (temporary pacemaker)
   b. Attach pulse generator to client securely to prevent accidental dislodgment (temporary pacemaker)
3. Provide safety and comfort
   a. Provide safe environment by properly grounding all equipment in the room.
   b. Monitor electrolyte level periodically, particularly potassium.
4. Prevent infection
   a. Assess vital signs, particularly temperature changes.
   b. Assess catheter insertion site daily for signs of infection.
   c. Maintain sterile dressing over catheter insertion site.

F. Provide client teaching and discharge planning concerning
1. Fundamental concepts of cardiac physiology
2. Daily pulse check for 1 minute
3. Need to report immediately any sudden slowing or increase in pulse rate
4. Importance of adhering to weekly monitoring schedule during first month after implantation and when battery depletion is anticipated (depending on type of battery)
5. Wear loose-fitting clothing around the area of the pacemaker for comfort
6. Notify physician of any pain or redness over incision site
7. Avoid trauma to area of pulse generator
8. Avoid heavy contact sports
9. Carry an identification card/bracelet that indicates physician's name, type and model number of pacemaker, manufacturer's name, pacemaker rate
10. Display identification card and request scanning by hand scanner when going through weapons detector at airport
11. Remember that periodic hospitalization is necessary for battery changes/pacemaker unit replacement

Cardiac Arrest

A. General information: sudden, unexpected cessation of breathing and adequate circulation of blood by the heart

B. Medical management
1. Cardiopulmonary resuscitation (CPR)

2. Drug therapy
    a. Lidocaine, procainamide, verapamil for ventricular tachycardia
    b. Dopamine (Intropin), isoproterenol (Isuprel), norepinephrine (Levophed): see also Drugs Used to Treat Shock, Table 4-9
    c. Epinephrine to enhance myocardial automaticity, excitability, conductivity, and contractility
    d. Atropine sulfate to reduce vagus nerve's control over the heart, thus increasing the heart rate
    e. Sodium bicarbonate to correct respiratory and metabolic acidosis
    f. Calcium chloride: calcium ions help the heart beat more effectively by enhancing the myocardium's contractile force
3. Defibrillation (electrical countershock)

C. Assessment findings: unresponsiveness, cessation of respiration, pallor, cyanosis, absence of heart sounds/blood pressure/palpable pulses, dilation of pupils, ventricular fibrillation or asystole (if client on a monitor)

D. Nursing interventions: monitored arrest caused by ventricular fibrillation
1. CPR until defibrillation possible.
2. If defibrillation unsuccessful, continue CPR and assist with administration of and monitor effects of additional emergency drugs.
3. If defibrillation successful, monitor client status.

Cardiopulmonary Resuscitation (CPR)

A. General information: process of externally supporting the circulation and respiration of a person who has had a cardiac arrest

B. Nursing interventions: unwitnessed cardiac arrest
1. Assess LOC.
    a. Shake victim's shoulder and shout.
    b. If no response, summon help.
2. Position victim supine on a firm surface.
3. Open airway.
    a. Use head tilt, chin lift maneuver.
    b. Place ear over nose and mouth.
        1) Look to see if chest is moving.
        2) Listen for escape of air.
        3) Feel for movement of air against face.
    c. If no respiration, proceed to #4.
4. Ventilate twice, allowing for deflation between breaths.
5. Assess circulation: in adults palpate for carotid pulse; if not present, proceed to #6.
6. Initiate external cardiac compressions
    a. Proper placement of hands: lower half of the sternum
    b. Depth of compressions: 1½–2 inches for adults
    c. 30 compressions (at rate of 80–100 per minute) with 2 ventilations
7. According to the American Heart Association in March 2008, new guidelines were issued that stressed the importance of chest compressions, especially if the bystander was not trained to perform rescue breathing.

Endocarditis

A. General information
1. Inflammation of the endocardium; platelets and fibrin deposit on the mitral and/or aortic valves causing deformity, insufficiency, or stenosis.
2. Caused by bacterial infection: commonly *S. aureus, S. viridans*, B-hemolytic streptococcus, gonococcus
3. Precipitating factors: rheumatic heart disease, open-heart surgery procedures, GU/Ob-Gyn instrumentation/surgery, dental extractions, invasive monitoring, septic thrombophlebitis

B. Medical management
1. Drug therapy
    a. Antibiotics specific to sensitivity of organism cultured
    b. Penicillin G and streptomycin if organism not known
    c. Antipyretics
2. Cardiac surgery to replace affected valve

C. Assessment findings
1. Fever, malaise, fatigue, dyspnea and cough (if extensive valvular damage), acute upper quadrant pain (if splenic involvement), joint pain
2. Petechiae, murmurs, edema (if extensive valvular damage), splenomegaly, hemiplegia and confusion (if cerebral infarction), hematuria (if renal infarction)
3. Elevated WBC and ESR, decreased Hgb and Hct
4. Diagnostic tests: positive blood culture for causative organism

D. Nursing interventions
1. Administer antibiotics as ordered to control the infectious process.
2. Control temperature elevation by administration of antipyretics.
3. Assess for vascular complications (see Thrombophlebitis and Pulmonary Embolism).
4. Provide client teaching and discharge planning concerning
    a. Types of procedures/treatments (e.g., tooth extractions, GU instrumentation) that increase the chances of recurrences
    b. Antibiotic therapy, including name, purpose, dose, frequency, side effects
    c. Signs and symptoms of recurrent endocarditis (persistent fever, fatigue, chills, anorexia, joint pain)
    d. Avoidance of individuals with known infections

Pericarditis

A. General information
  1. An inflammation of the visceral and parietal pericardium
  2. Caused by a bacterial, viral, or fungal infection; collagen diseases; trauma; acute MI; neoplasms; uremia; radiation therapy; drugs (procainamide, hydralazine, doxorubicin HCl [Adriamycin])

B. Medical management
  1. Determination and elimination/control of underlying cause
  2. Drug therapy
    a. Medication for pain relief
    b. Corticosteroids, salicylates (aspirin), and indomethacin (Indocin) to reduce inflammation
    c. Specific antibiotic therapy against the causative organism may be indicated.

C. Assessment findings
  1. Chest pain with deep inspiration (relieved by sitting up), cough, hemoptysis, malaise
  2. Tachycardia, fever, pleural friction rub, cyanosis or pallor, accentuated component of S_2, pulsus paradoxus, jugular vein distension
  3. Elevated WBC and ESR, normal or elevated AST (SGOT)
  4. Diagnostic tests
    a. Chest X-ray may show increased heart size if effusion occurs
    b. ECG changes: ST elevation (precordial leads and 2- or 3-limb heads), T wave inversion

D. Nursing interventions
  1. Ensure comfort: bed rest with semi- or high-Fowler's position.
  2. Monitor hemodynamic parameters carefully.
  3. Administer medications as ordered and monitor effects.
  4. Provide client teaching and discharge planning concerning:
    a. Signs and symptoms of pericarditis indicative of a recurrence (chest pain that is intensified by inspiration and position changes, fever, cough)
    b. Medication regimen including name, purpose, dosage, frequency, side effects

Cardiac Tamponade

A. General information
  1. An accumulation of fluid/blood in the pericardium that prevents adequate ventricular filling; without emergency treatment client will die.
  2. Caused by blunt or penetrating chest trauma, malignant pericardial effusion; can be a complication of cardiac surgery.

B. Medical management: emergency treatment of choice is pericardiocentesis (insertion of a needle into the pericardial sac to aspirate fluid/blood and relieve the pressure on the heart)

C. Assessment findings
  1. Chest pain
  2. Hypotension, distended neck veins, tachycardia, muffled or distant heart sounds, paradoxical pulse, pericardial friction rub
  3. Elevated CVP, decreased Hgb and Hct if massive hemorrhage
  4. Diagnostic test: chest X-ray reveals enlarged heart and widened mediastinum.

D. Nursing interventions
  1. Administer oxygen therapy
  2. Monitor CVP/IVs closely
  3. Assist with pericardiocentesis
    a. Monitor ECG, blood pressure, and pulse.
    b. Assess aspirated fluid for color, consistency.
    c. Send specimen to lab immediately.

Cardiogenic Shock

See Table 4-9.

The Blood Vessels

Hypertension

A. General information
  1. According to the World Health Organization, hypertension is a persistent elevation of the systolic blood pressure above 140 mm Hg and of the diastolic above 90 mm Hg.
  2. Types
    a. Essential (primary, idiopathic): marked by loss of elastic tissue and arteriosclerotic changes in the aorta and larger vessels coupled with decreased caliber of the arterioles
    b. Benign: a moderate rise in blood pressure marked by a gradual onset and prolonged course
    c. Malignant: characterized by a rapid onset and short dramatic course with a diastolic blood pressure of more than 150 mm Hg
    d. Secondary: elevation of the blood pressure as a result of another disease such as renal parenchymal disease, Cushing's disease, pheochromocytoma, primary aldosteronism, coarctation of the aorta
  3. Essential hypertension usually occurs between ages 30 and 50; more common in men over 35, women over 45; African-Americans affected twice as often as white Americans
  4. Risk factors for essential hypertension include positive family history, obesity, stress, cigarette smoking, hypercholesteremia, increased sodium intake

B. Medical management
  1. Diet and weight reduction (restricted sodium, kcal, cholesterol)

2. Lifestyle changes: alcohol moderation, exercise regimen, cessation of smoking
3. Antihypertensive drug therapy (see Table 2-17)

C. Assessment findings
1. Pain similar to anginal pain; pain in calves of legs after ambulation or exercise (intermittent claudication); severe occipital headaches, particularly in the morning; polyuria; nocturia; fatigue; dizziness; epistaxis; dyspnea on exertion
2. Blood pressure consistently above 140/90, retinal hemorrhages and exudates, edema of extremities (indicative of right-sided heart failure)
3. Rise in systolic blood pressure from supine to standing position (indicative of essential hypertension)
4. Diagnostic tests; elevated serum uric acid, sodium, cholesterol levels

D. Nursing interventions
1. Record baseline blood pressure in three positions (lying, sitting, standing: also known as "orthostatics") and in both arms.
2. Continuously assess blood pressure and report any variables that relate to changes in blood pressure (positioning, restlessness).
3. Administer antihypertensive agents as ordered; monitor closely and assess for side effects.
4. Monitor intake and hourly outputs.
5. Provide client teaching and discharge planning concerning
   a. Risk factor identification and development/implementation of methods to modify them
   b. Restricted sodium, kcal, cholesterol diet; include family in teaching
   c. Antihypertensive drug regimen (include family); see Table 2-17
      1) Names, actions, dosages, and side effects of prescribed medications
      2) Take drugs at regular times and avoid omission of any doses
      3) Never abruptly discontinue the drug therapy
      4) Supplement diet with potassium-rich foods if taking potassium-wasting diuretics
      5) Avoid hot baths, alcohol, or strenuous exercise within 3 hours of taking medications that cause vasodilation
   d. Development of a graduated exercise program
   e. Importance of routine follow-up care

Arteriosclerosis Obliterans

A. General information
1. A chronic occlusive arterial disease that may affect the abdominal aorta or the lower extremities. The obstruction to blood flow with resultant ischemia usually affects the femoral, popliteal, aortal, and iliac arteries.
2. Occurs most often in men ages 50–60
3. Caused by atherosclerosis
4. Risk factors: cigarette smoking, hyperlipidemia, hypertension, diabetes mellitus

B. Medical management
1. Drug therapy
   a. Vasodilators: papaverine, isoxsuprine HCl (Vasodilan), nylidrin HCl (Arlidin), nicotinyl alcohol (Roniacol), cyclandelate (Cyclospasmol), tolazoline HCl (Priscoline) to improve arterial circulation; effectiveness questionable
   b. Analgesics to relieve ischemic pain
   c. Anticoagulants to prevent thrombus formation
   d. Lipid-reducing drug: cholestyramine (Questran), colestipol HCl (Cholestid), dextrothyroxine sodium (Choloxin), clofibrate (Atromid-S), gemfibrozil (Lopid), niacin, lovastatin (Mevacor) (see Unit 2)
2. Surgery: bypass grafting, endarterectomy, balloon catheter dilation; lumbar sympathectomy (to increase blood flow), amputation may be necessary

C. Assessment findings
1. Pain, both intermittent claudication and rest pain, numbness or tingling of the toes
2. Pallor after 1–2 minutes of elevating feet, and dependent hyperemia/rubor; diminished or absent dorsalis pedis, posterior tibial and femoral pulses; trophic changes; shiny, taut skin with hair loss on lower legs
3. Diagnostic tests
   a. Oscillometry may reveal decrease in pulse volume
   b. Doppler ultrasound reveals decreased blood flow through affected vessels
   c. Angiography reveals location and extent of obstructive process
4. Elevated serum triglycerides; sodium

D. Nursing interventions
1. Encourage slow, progressive physical activity (out of bed at least 3–4 times per day, walking 2 times per day).
2. Administer medications as ordered.
3. Assist with Buerger-Allen exercises 4 times a day.
   a. Client lies with legs elevated above heart for 2–3 minutes
   b. Client sits on edge of bed with legs and feet dependent and exercises feet and toes—upward and downward, inward and outward—for 3 minutes
   c. Client lies flat with legs at heart level for 5 minutes
4. Assess for sensory function and trophic changes.
5. Protect client from injury.

6. Provide client teaching and discharge planning concerning:
   a. Restricted kcal, low-saturated-fat diet; include family
   b. Importance of continuing with established exercise program
   c. Measures to reduce stress (relaxation techniques, biofeedback)
   d. Importance of avoiding smoking, constrictive clothing, standing in any position for a long time, injury
   e. Importance of foot care, immediately taking care of cuts, wounds, injuries
7. Prepare client for surgery if necessary.

Thromboangiitis Obliterans (Buerger's Disease)

A. General information
1. Acute, inflammatory disorder affecting medium/smaller arteries and veins of the lower extremities. Occurs as focal, obstructive process; results in occlusion of a vessel with subsequent development of collateral circulation.
2. Most often affects men ages 25–40.
3. Disease is idiopathic; high incidence among smokers.

B. Medical management: see Arteriosclerosis Obliterans, only really effective treatment is cessation of smoking.

C. Assessment findings
1. Intermittent claudication, sensitivity to cold (skin of extremity may at first be white, changing to blue, then red)
2. Decreased or absent peripheral pulses (posterior tibial and dorsalis pedis), trophic changes, ulceration and gangrene (advanced)
3. Diagnostic tests: same as in Arteriosclerosis Obliterans except no elevation in serum triglycerides

D. Nursing interventions
1. Prepare client for surgery.
2. Provide client teaching and discharge planning concerning:
   a. Drug regimen (vasodilators, anticoagulants, analgesics) to include names, dosages, frequency, and side effects
   b. Need to avoid trauma to the affected extremity
   c. Need to maintain warmth, especially in cold weather
   d. Importance of stopping smoking.

Raynaud's Phenomenon

A. General information
1. Intermittent episode of arterial spasms, most frequently involving the fingers
2. Most often affects women between the teenage years and age 40
3. Cause unknown
4. Predisposing factors: collagen diseases (systemic lupus erythematosus, rheumatoid arthritis), trauma (e.g., from typing, piano playing, operating a chain saw)

B. Medical management: vasodilators, catecholamine-depleting antihypertensive drugs (reserpine, guanethidine monosulfate [Ismelin])

C. Assessment findings
1. Coldness, numbness, tingling in one or more digits; pain (usually precipitated by exposure to cold, emotional upsets, tobacco use)
2. Intermittent color changes (pallor, cyanosis, rubor); small ulcerations and gangrene at tips of digits (advanced)

D. Nursing interventions
1. Provide client teaching concerning:
   a. Importance of stopping smoking
   b. Need to maintain warmth, especially in cold weather
   c. Need to use gloves when handling cold objects/opening freezer or refrigerator door
   d. Drug regimen

Aneurysms

An aneurysm is a sac formed by dilation of an artery secondary to weakness and stretching of the arterial wall. The dilation may involve one or all layers of the arterial wall.

Classification

A. Fusiform: uniform spindle shape involving the entire circumference of the artery

B. Saccular: outpouching on one side only, affecting only part of the arterial circumference

C. Dissecting: separation of the arterial wall layers to form a cavity that fills with blood

D. False: the vessel wall is disrupted, blood escapes into surrounding area but is held in place by surrounding tissue

Thoracic Aortic Aneurysm

A. General information
1. An aneurysm, usually fusiform or dissecting, in the descending, ascending, or transverse section of the thoracic aorta
2. Usually occurs in men ages 50–70
3. Caused by arteriosclerosis, infection, syphilis, hypertension

B. Medical management
1. Control of underlying hypertension
2. Surgery: resection of the aneurysm and replacement with a Teflon/Dacron graft; clients will need extracorporeal circulation (heart-lung machine).

C. Assessment findings
1. Often asymptomatic
2. Deep, diffuse chest pain; hoarseness; dysphagia; dyspnea

3. Pallor, diaphoresis, distended neck veins, edema of head and arms
4. Diagnostic tests
   a. Aortography shows exact location of the aneurysm
   b. X-rays: chest film reveals abnormal widening of aorta; abdominal film may show calcification within walls of aneurysm

D. Nursing interventions: see Cardiac Surgery.

Abdominal Aortic Aneurysm

A. General information
1. Most aneurysms of this type are saccular or dissecting and develop just below the renal arteries but above the iliac bifurcation
2. Occur most often in men over age 60
3. Caused by atherosclerosis, hypertension, trauma, syphilis, other types of infectious processes

B. Medical management: surgical resection of the lesion and replacement with a graft (extracorporeal circulation not needed)

C. Assessment findings
1. Severe mid- to low-abdominal pain, low-back pain
2. Mass in the periumbilical area or slightly to the left of the midline with bruits heard over the mass
3. Pulsating abdominal mass
4. Diminished femoral pulses
5. Diagnostic tests: same as for thoracic aneurysms

D. Nursing interventions: preoperative
1. Prepare client for surgery: routine pre-op care.
2. Assess rate, rhythm, character of the peripheral pulses and mark all distal pulses.

E. Nursing interventions: postoperative
1. Provide routine post-op care.
2. Monitor the following parameters:
   a. Hourly circulation checks noting rate, rhythm, character of all pulses distal to the graft
   b. CVP/PAP/PCWP
   c. Hourly outputs through Foley catheter (report less than 30 mL/hour)
   d. Daily BUN/creatinine/electrolyte levels
   e. Presence of back pain (may indicate retroperitoneal hemorrhage)
   f. IV fluids
   g. Neuro status including LOC, pupil size and response to light, hand grasp, movement of extremities
   h. Heart rate and rhythm via monitor
3. Maintain client flat in bed without sharp flexion of hip/knee (avoid pressure on femoral/popliteal arteries).
4. Auscultate lungs and encourage turning, coughing, and deep breathing.
5. Assess for signs and symptoms of paralytic ileus.
6. Prevent thrombophlebitis.
   a. Encourage client to dorsiflex foot while in bed.
   b. Use elastic stockings or sequential compression devices as ordered.
   c. Assess for signs and symptoms (see Thrombophlebitis).
7. Provide client teaching and discharge planning concerning
   a. Importance of changes in color/temperature of extremities
   b. Avoidance of prolonged sitting, standing, and smoking
   c. Need for a gradual progressive activity regimen
   d. Adherence to low-cholesterol, low-saturated fat diet
   e. Adherence to activity restrictions and avoid lifting heavy objects (limit 15 to 20 pounds).

Femoral-Popliteal Bypass Surgery

A. General information
1. Most common type of surgery to correct arterial obstructions of the lower extremities
2. Procedure involves bypassing the occluded vessel with a graft, such as Teflon, Dacron, or an autogenous artery or vein (saphenous).

B. Nursing interventions: preoperative
1. Provide routine pre-op care.
2. Monitor and correct potassium imbalances to prevent cardiac arrhythmias.
3. Assess for focus of infection (infected tooth) or infectious processes (urinary tract infections).
4. Mark distal peripheral pulses.

C. Nursing interventions: postoperative
1. Provide routine post-op care.
2. Assess the following
   a. Circulation, noting rate, rhythm, and quality of peripheral pulses distal to the graft; color; temperature; and sensation
   b. Signs and symptoms of thrombophlebitis
   c. Neuro checks
   d. Hourly outputs
   e. CVP
   f. Wound drainage, noting amount, color, and characteristics
3. Elevate legs above the level of the heart.
4. Encourage turning, coughing, and deep breathing while splinting incision.

Venous Stasis Ulcers

A. General information
1. Usually a complication of thrombophlebitis and varicose veins.
2. Ulcers result from incompetent valves in the veins, causing high pressure with rupture of small skin veins and venules.

B. Medical management
  1. Antibiotic therapy (specific to organism cultured); topical bacteriocidal solutions
  2. Skin grafting
  3. Enzymatic or surgical debridement

C. Assessment findings
  1. Pain in the limb in dependent position or during ambulation
  2. Skin of leathery texture, brownish pigment around ankles; positive pulses but edema makes palpation difficult.

D. Nursing interventions
  1. Provide bed rest, elevating extremity.
  2. Provide a balanced diet with added protein and vitamin supplements.
  3. Administer antibiotics as ordered to control infection.
  4. Promote healing by cleansing ulcer with prescribed agents.
  5. Provide client teaching and discharge planning concerning
    a. Importance of avoiding trauma to affected limb
    b. Skin care regimen
    c. Use of elastic support stockings (after ulcer is healed)
    d. Need for planned rest periods with elevation of the extremities
  6. Adherence to balanced diet with vitamin supplements.

Thrombophlebitis

A. General information
  1. Inflammation of the vessel wall with formation of a clot (thrombus); may affect superficial or deep veins.
  2. Most frequent veins affected are the saphenous, femoral, and popliteal.
  3. Can result in damage to the surrounding tissues, ischemia, and necrosis.
  4. Risk factors: obesity, HF, prolonged immobility, MI, pregnancy, oral contraceptives, trauma, sepsis, cigarette smoking, dehydration, severe anemias, venous cannulation, complication of surgery.

B. Medical management
  1. Anticoagulant therapy
    a. Heparin
      1) Blocks conversion of prothrombin to thrombin and reduces formation or extension of thrombus
      2) Side effects: spontaneous bleeding, injection site reactions, ecchymoses, tissue irritation and sloughing, reversible transient alopecia, cyanosis, pain in arms or legs, thrombocytopenia
    b. Warfarin (Coumadin)
      1) Blocks prothrombin synthesis by interfering with vitamin K synthesis
      2) Side effects
        a) GI: anorexia, nausea and vomiting, diarrhea, stomatitis
        b) Hypersensitivity: dermatitis, urticaria, pruritus, fever
        c) Other: transient hair loss, burning sensation of feet, bleeding complications
  2. Surgery
    a. Vein ligation and stripping
    b. Venous thrombectomy: removal of a clot in the iliofemoral region
    c. Plication of the inferior vena cava: insertion of an umbrella-like prosthesis into the lumen of the vena cava to filter incoming clots. (See Figure 4-10).

C. Assessment findings
  1. Pain in the affected extremity
  2. Superficial vein: tenderness, redness, induration along course of the vein
  3. Deep vein: swelling, venous distension of limb, tenderness over involved vein, positive Homan's sign, cyanosis

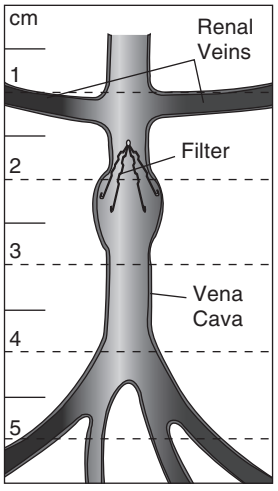


Figure 4-10 Vena caval filters to prevent embolus from traveling to the lungs, heart, or brain. (A) Greenfield; (B) Umbrella

4. Elevated WBC and ESR
5. Diagnostic tests
   a. Venography (phlebography): increased uptake of radioactive material
   b. Doppler ultrasonography: impairment of blood flow ahead of thrombus
   c. Venous pressure measurements: high in affected limb until collateral circulation is developed

D. Nursing interventions
1. Provide bed rest, elevating involved extremity to increase venous return and decrease edema.
2. Apply continuous warm, moist soaks to decrease lymphatic congestion.
3. Administer anticoagulants as ordered
   a. Heparin
      1) Monitor PTT; dosage should be adjusted to keep PTT between 1.5–2.5 times normal control level.
      2) Use infusion pump to administer IV heparin.
      3) Ensure proper injection technique.
         a) Use 26- or 27-gauge syringe with ½–⅝-inch needle, inject into fatty layer of abdomen above iliac crest.
         b) Avoid injecting within 2 inches of umbilicus.
         c) Insert needle at 45–90° to skin.
         d) Do not withdraw plunger to assess blood return.
         e) Apply gentle pressure after removal of needle, avoid massage.
      4) Assess for increased bleeding tendencies (hematuria; hematemesis; bleeding gums; petechiae of soft palate, conjunctiva, retina; ecchymoses, epistaxis, bloody sputum, melena) and instruct client to observe for and report these.
      5) Have antidote (protamine sulfate) available.
      6) Instruct client to avoid aspirin, antihistamines, and cough preparations containing glyceryl guaiacolate, and to obtain physician's permission before using other OTC drugs.
   b. Warfarin (Coumadin)
      1) Assess PT daily; dosage should be adjusted to maintain PT at 1.5–2.5 times normal control level; INR of 2.
      2) Obtain careful medication history (there are many drug-drug interactions).
      3) Advise client to withhold dose and notify physician immediately if bleeding or signs of bleeding occur (see Heparin).
      4) Instruct client to use a soft toothbrush and to floss gently.
      5) Have antidote (vitamin K) available.
      6) Alert client to factors that may affect the anticoagulant response (high-fat diet or sudden increases in vitamin K-rich foods).
      7) Instruct client to wear Medic-Alert bracelet.
4. Assess vital signs every 4 hours.
5. Monitor for chest pain or shortness of breath (possible pulmonary embolism).
6. Measure thighs, calves, ankles, and instep every morning.
7. Provide client teaching and discharge planning concerning:
   a. Need to avoid standing, sitting for long periods; constrictive clothing; crossing legs at the knees; smoking; oral contraceptives
   b. Importance of adequate hydration to prevent hypercoagulability
   c. Use of elastic stockings when ambulatory
   d. Importance of planned rest periods with elevation of the feet
   e. Drug regimen
   f. Plan for exercise/activity
      1) Begin with dorsiflexion of the feet while sitting or lying down
      2) Swim several times weekly
      3) Gradually increase walking distance
   g. Importance of weight reduction if obese

Pulmonary Embolism

A. General information
1. Most pulmonary emboli arise as detached portions of venous thrombi formed in the deep veins of the legs, right side of the heart, or pelvic area.
2. Distribution of emboli is related to blood flow; emboli involve the lower lobes of the lung because of higher blood flow.
3. Embolic obstruction to blood flow increases venous pressure in the pulmonary artery and pulmonary hypertension.
4. Risk factors: venous thrombosis, immobility, pre- and post-op states, trauma, pregnancy, HF, use of oral contraceptives, obesity

B. Medical management
1. Drug therapy
   a. Anticoagulants (see Thrombophlebitis)
   b. Thrombolytics: streptokinase or urokinase
   c. Dextran 70 to decrease blood viscosity and aggregation of blood cells
   d. Narcotics for pain relief
   e. Vasopressors (in the presence of shock)
2. Surgery: embolectomy (surgical removal of an embolus from the pulmonary arteries)

C. Assessment findings
1. Chest pain (pleuritic), severe dyspnea, feeling of impending doom

2. Tachypnea, tachycardia, anxiety, hemoptysis, shock symptoms (if massive)
3. Decreased pCO_2; increased pH (due to hyperventilation)
4. Increased temperature
5. Intensified pulmonic S_2; rales or crackles
6. Diagnostic tests
   a. Pulmonary angiography: reveals location/extent of embolism
   b. Lung scan reveals adequacy/inadequacy of pulmonary circulation

D. Nursing interventions
1. Administer medications as ordered; monitor effects and side effects.
2. Administer oxygen therapy to correct hypoxemia.
3. Assist with turning, coughing, deep breathing, and passive ROM exercises.
4. Provide adequate hydration to prevent hypercoagulability.
5. Offer support/reassurance to client/family.
6. Elevate head of bed to relieve dyspnea.
7. Provide client teaching and discharge planning: same as for thrombophlebitis.

Varicose Veins

A. General information
1. Dilated veins that occur most often in the lower extremities and trunk. As the vessel dilates, the valves become stretched and incompetent with resultant venous pooling/edema
2. Most common between ages 30 and 50
3. Predisposing factor: congenital weakness of the veins, thrombophlebitis, pregnancy, obesity, heart disease

B. Medical management: vein ligation (involves ligating the saphenous vein where it joins the femoral vein and stripping the saphenous vein system from groin to ankle)

C. Assessment findings
1. Pain after prolonged standing (relieved by elevation)
2. Swollen, dilated, tortuous skin veins
3. Diagnostic tests
   a. Trendelenburg test: varicose veins distend very quickly (less than 35 seconds)
   b. Doppler ultrasound: decreased or no blood flow heard after calf or thigh compression

D. Nursing interventions
1. Elevate legs above heart level.
2. Measure circumference of ankle and calf daily.
3. Apply knee-length elastic stockings.
4. Provide adequate rest.
5. Prepare client for vein ligation, if necessary.
   a. Provide routine pre-op care; usually outpatient surgery.
   b. In addition to routine post-op care:
      1) Keep affected extremity elevated above the level of the heart to prevent edema.
      2) Apply elastic bandages and stockings, which should be removed every 8 hours for short periods and reapplied.
      3) Assist out of bed within 24 hours, ensuring that elastic stockings are applied.
      4) Assess for increased bleeding, particularly in the groin area.
6. Provide client teaching and discharge planning: same as for Thrombophlebitis.

Amputation

A. General information
1. Surgical procedure done for peripheral vascular disease if medical management is ineffective and the symptoms become worse.
2. The level of amputation is determined by the extent of the disease process.
   a. Above knee (AKA): performed between the lower third to the middle of the thigh
   b. Below knee (BKA): usually done in middle third of leg, leaving a stump of 12.5–17.5 cm

B. Nursing interventions: preoperative
1. Provide routine pre-op care.
2. Offer support/encouragement and accept client's response of anger/grief.
3. Discuss
   a. Rehabilitation program and use of prosthesis
   b. Upper extremity exercises such as push-ups in bed
   c. Crutch walking
   d. Amputation dressings/cast
   e. Phantom limb sensation as a normal occurrence

C. Nursing interventions: postoperative
1. Provide routine post-op care.
2. Prevent hip/knee contractures.
3. Avoid letting client sit in chair with hips flexed for long periods of time.
4. Have client assume prone position several times a day and position hip in extension (unless otherwise ordered).
5. Avoid elevation of the stump after 12–24 hours.
6. Observe stump dressing for signs of hemorrhage and mark outside of dressing so rate of bleeding can be assessed.
7. Administer pain medication as ordered.
8. Ensure that stump bandages fit tightly and are applied properly to enhance prosthesis fitting.
9. Initiate active ROM exercises of all joints (when medically advised), crutch walking, and arm/shoulder exercises.
10. Provide stump care.
    a. Inspect daily for signs of skin irritation.
    b. Wash thoroughly daily with warm water and bacteriostatic soap; rinse and dry thoroughly.
    c. Avoid use of irritating substances such as lotions, alcohol, powders.

Sample Questions

163. An adult is admitted to the coronary care unit to rule out a myocardial infarction. The client states, "I am not sure if it is just angina, and I cannot understand the difference between angina and heart attack pain." Which response is most appropriate for the nurse to make?

1. Anginal pain usually stops after resting.
2. Anginal pain produces clenching of the fists over the chest while acute MI pain does not.
3. Anginal pain requires morphine for relief.
4. Anginal pain radiates to the left arm while acute MI pain does not.

164. An adult woman is admitted to the cardiac care unit with a myocardial infarction. The morning after admission she and her husband tell the nurse that she must be home tonight to care for the children when her husband goes to work. What nursing diagnosis describes this problem?

1. Anxiety related to physical limitations.
2. Alteration in cardiac output.
3. Knowledge deficit related to disease process.
4. Impaired home maintenance.

165. The nurse is caring for an adult admitted to the coronary care unit with a myocardial infarction. During the second night in the CCU, the client develops heart failure. What is the basis for insertion of a pulmonary artery catheter?

1. It provides information about pulmonary resistance.
2. It measures myocardial oxygen consumption.
3. It increases renal blood flow.
4. It controls afterload.

166. The nurse is planning care for a client who is in heart failure. Which of the following goals are appropriate? Select all that apply.

____ An increase in cardiac output.
____ An elevation in renal blood flow.
____ A reduction in the heart's workload.
____ A decrease in myocardial contractility.

167. The nurse is caring for an adult who is being treated for a myocardial infarction. Oxygen is ordered. Administering oxygen to this client is related to which of the following client problems?

1. Anxiety.
2. Chest pains.
3. Ineffective myocardial perfusion.
4. Alteration in heart rate, rhythm, or conduction.

168. The nurse reading an ECG rhythm strip notes that there are 8 QRS complexes in a 6-second strip. What would be the heart rate?

1. 48.
2. 64.
3. 80.
4. 120.

169. A 57-year-old is being treated in the clinic for hypertension. His blood pressure is 170/92 and he is complaining of fatigue and lassitude. He has been taking propranolol (Inderal) 80 mg bid. What action by the client will assure the nurse that teaching has been successful?

1. Checks his pulse for bradycardia.
2. Makes an appointment as soon as he notices fatigue.
3. Stops the drug when he experiences chest pain.
4. Takes the drug with breakfast and dinner.

170. A 56-year-old obese man is recovering from a bowel resection for cancer of the colon. On his third post-op day he complains that the area around the calf of his leg is warm and tender. What assessment will the nurse observe that will suggest the client has a deep vein thrombosis?

1. Absence of a pulse distal to the clot.
2. Cyanosis distal to the clot.
3. Pain on dorsiflexion.
4. Reddened area around the clot.

171. A client with a history of venous insufficiency came to the medical clinic complaining of severe pain in the legs. They were swollen and covered with deep, draining, foul-smelling ulcers. What would the nurse suspect as an underlying cause of the venous insufficiency?

1. Congestive heart failure.
2. Hypertrophied leg muscles.
3. Decreased hemoglobin levels.
4. Poor blood return to the heart.

172. A 65-year-old man is admitted with venous stasis ulcers and chronic venous insufficiency. To help control the swelling, what intervention should the nurse teach the client to perform?

1. Exercise vigorously.
2. Restrict fluid intake.
3. Promote gravity drainage.
4. Eat a high-protein, low-salt diet.

173. Which are some of the common symptoms associated with cardiovascular disease?

1. Shortness of breath, chest discomfort, palpitations.
2. Dyspnea, chest discomfort, sputum production.
3. Fatigue, weight changes, mood swings.
4. Mood swings, headaches, fainting.

174. Which of the following assessment findings by the nurse is abnormal?

1. S_1 heard at the fourth-fifth left intercostal space in a 35-year-old man.
2. S_2 heard at the second-third left intercostal space in a 40-year-old female.
3. S_4 heard at the apex in an 80-year-old male.
4. S_3 heard at the apex in a 15-year-old female.

175. Which of the following instructions should the nurse give to a client prior to an exercise electrocardiogram?

1. Avoid coffee, tea, and alcohol the day of the test.
2. Smoking is permitted up to the time of the test.
3. Allow only 3 hours of sleep the night prior to the test.
4. Take all medications as prescribed prior to the test.

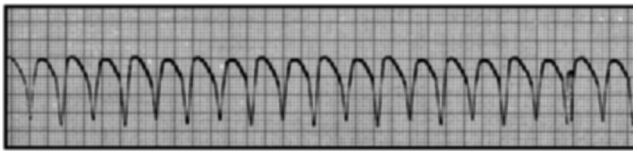
176. To prevent possible complication, which of the following questions should a nurse ask a client prior to a cardiac catheterization?

1. "Have you ever had a cardiac catheterization before?"
2. "Can you eat shellfish?"
3. "Have you ever had general anesthesia before?"
4. "Have you ever had a heart attack?"

177. Which of the following should the nurse include in the plan of care for a post-op coronary arteriogram client?

1. Assess pedal pulses.
2. Assess lung sounds.
3. Provide early ambulation.
4. Monitor vital signs every 8 hours.

178. A client has the following rhythm. The client has no pulse or blood pressure.



How should the nurse interpret this rhythm?

1. Ventricular tachycardia.
2. Ventricular fibrillation.
3. Sinus tachycardia.
4. Supraventricular tachycardia.

179. A client has the following rhythm. The client has no pulse or blood pressure.

How should the nurse interpret this rhythm?

1. Ventricular tachycardia.
2. Ventricular fibrillation.
3. Sinus tachycardia.
4. Supraventricular tachycardia.

180. A client had a myocardial infarction yesterday. His cardiac monitor shows 6 to 8 PVCs per minute, with occasional couplets. What is the nurse's best action?

1. Monitor the client for development of ventricular tachycardia.
2. Administer the ordered prn dose of lidocaine.
3. Perform a precordial thump.
4. Initiate manual chest compressions.

181. A client is admitted in cardiogenic shock. What will be inserted to best evaluate the heart's hemodynamic performance?

1. Intra-arterial line.
2. Pulmonary artery catheter.
3. Intra-aortic balloon pump (IABP).
4. Triple lumen catheter.

182. Which of the following statements by a client to the nurse indicates a risk factor for coronary artery disease?

1. "I exercise four times a week."
2. "No one in my family has heart problems."
3. "My cholesterol is 189."
4. "I smoke 1½ packs of cigarettes per day."

183. An adult female has a history of coronary artery disease and angina pectoris. After walking to the bathroom, she complains of aching substernal pain that radiates to her left shoulder. What is the nurse's best action?

1. Provide a warm shoulder massage.
2. Administer a prn dose of nitroglycerin sublingually.

3. Use pillows to support and immobilize the left shoulder.
4. Administer a prn dose of aspirin or acetaminophen (Tylenol).

184. A nitroglycerin transdermal patch was prescribed 6 weeks ago for an adult to treat angina pectoris. How will the nurse know the patch is effective?
1. The client's serum cholesterol level has decreased.
2. The client's pressure is within normal limits.
3. The client reports no episodes of chest pain.
4. Pulse oximetry shows the client's oxygen saturation is improved.

185. An adult has developed angina pectoris secondary to coronary artery disease. A low-fat, low-cholesterol diet is prescribed for the client. The nurse should praise the client for a wise choice if which of the following was selected for an evening snack?
1. Cheese cubes and crackers.
2. Tuna salad sandwich.
3. No-added sugar ice cream.
4. Jello mold with fruit slices.

186. Lidocaine is mixed 2 g in 500 mL D_5W. The nurse prepared to start an infusion at 2 mg/h using a 60-drop tubing. Which of the following is the correct rate to start the infusion on a pump?
1. 15 mL.
2. 30 mL.
3. 45 mL.
4. 60 mL.

187. An adult male is transferred to the step-down unit on the third day after a myocardial infarction. Which of the following should the nurse include in his care plan at this time?
1. Enforcing complete bed rest.
2. Supervising short walks in the hallway.
3. Performing passive range of motion exercises.
4. Having him sit on the side of the bed and dangle his legs.

188. A 55-year-old man with a history of angina pectoris complains of chest pain radiating to the jaw. After taking three nitroglycerin gr 1/150 tablets he is still having the chest pain. His skin is cool and pale and he is diaphoretic and mildly short of breath. What is the nurse's priority action?
1. Auscultate heart and lung sounds.
2. Administer another nitroglycerin tablet.
3. Encourage the man to void.
4. Assist him to a supine position.

189. An adult male is being discharged from the hospital following a myocardial infarction. Knowing he will wait 4–6 weeks before having sexual activity, what statement demonstrates the client understands the guidelines taught?
1. Bedtime is the best time to have intercourse.
2. He should exercise for 10–15 minutes before intercourse, to "warm up."
3. He should take a nitroglycerin before intercourse to prevent chest pain.
4. It is best to avoid having intercourse when the stomach is empty.

190. An adult is scheduled for a percutaneous transluminal coronary angioplasty (PTCA). The adult asks the nurse, "Can you tell me again what the doctor is going to do?" What is the nurse's best response?
1. "A clot dissolving drug is administered through a catheter into the blocked section of your artery."
2. "A piece of vein from your leg is used to bypass the blocked section of your artery."
3. "A tiny rotating blade is used to scrape off the plaque that is blocking your artery."
4. "A balloon is placed next to the plaque blocking your artery, then the balloon is inflated to crush the plaque."

191. A man is being discharged following coronary artery bypass graft surgery (CABG). The nurse recognizes that he needs additional teaching if he makes which of the following statements?
1. "I'll be going to a support group to help me quit smoking."
2. "I will take a walk twice a week."
3. "I should bake or broil my chicken instead of frying it."
4. "I've learned a breathing exercise to help me calm down if I get upset."

192. Which of the following assessment findings by the nurse indicates right ventricular failure in a client?
1. Pink frothy sputum.
2. Paroxysmal nocturnal dyspnea.
3. Jugular venous distention.
4. Crackles.

193. A nurse is assessing a client with fatigue, tachycardia, crackles, and pink frothy sputum. Which nursing diagnosis is of the *most* importance?

1. Impaired skin integrity.
2. Impaired gas exchange.
3. Potential for injury.
4. Anxiety.

194. An adult is admitted with an acute exacerbation of congestive heart failure. Assessment reveals tachycardia, hypertension, and crackles in the bases of the lung fields. The medications of 0.5 mg of digoxin (Lanoxin) IV and 40 mg of furosemide (Lasix) IV are administered immediately. How would the nurse be aware that the medications are having a therapeutic effect?

1. The client's pulse rate decreases below 100.
2. The client has an increased urine specific gravity.
3. The client expectorates frothy sputum.
4. The client's lungs are clear to auscultation.

195. A client is admitted with pulmonary edema. The nurse is preparing to administer morphine sulfate. What beneficial effect does morphine have in pulmonary edema?

1. Decreases anxiety, work of breathing, and vasodilates.
2. Decreases respiratory rate.
3. Provides an analgesic and sedative effect.
4. Decreases anxiety and vasoconstricts.

196. An adult female is being discharged after having a ventricular demand pacemaker inserted. The nurse should include which of the following in the teaching plan for this client?

1. She should not use remote control devices (e.g., TV channel selector).
2. She must leave the room while a microwave oven is in operation.
3. She will need to avoid air travel.
4. She should not pass through metal detectors.

197. An adult has a ventricular demand pacemaker that is set at 72 beats per minute. The nurse knows that the client's pacemaker is functioning correctly if which of the following appears on the ECG?

1. Pacemaker spikes instead of QRS complexes.
2. Pacemaker spikes followed by QRS complexes.
3. Pacemaker spikes before each P wave.
4. Pacemaker spikes appearing only if the heart rate is over 72.

198. Which strategy by the nurse provides safety during a defibrillation attempt?

1. A verbal and visual check of "all clear."
2. No lubricant on the paddles.
3. Placing paddles lightly on the chest.
4. Standing in alignment with the bed while administering the shock.

199. An adult client has experienced a cardiac arrest and the nurse is performing CPR. What is the correct hand position on the client's chest?

1. Over the upper half of the sternum.
2. Two finger widths below the sternal notch.
3. Two finger widths above the xiphoid process.
4. Over the xiphoid process.

200. A client with a history of a myocardial infarction 2 days ago reports chest pain that is worse on inspiration but is relieved on sitting forward. Based on this finding, what does the nurse suspect the client is experiencing?

1. Endocarditis.
2. Angina pectoris.
3. Pericarditis.
4. Recurrent myocardial infarction.

201. An adult has prazocin hydrochloride (Minipress) prescribed to treat hypertension. What instructions should the nurse provide to the client?

1. Take the medication with meals.
2. Take the first dose at bedtime.
3. Report a pulse rate below 50 to the physician.
4. Check the ankles daily for edema.

202. An adult has essential hypertension. She is being treated with a thiazide diuretic and dietary and lifestyle modifications. The nurse knows that she understands the treatment if she makes which of the following statements?

1. "I will use soy sauce or mustard instead of salt on my food."
2. "I need to cut back to two, 4-ounce glasses of wine a day."
3. "I will stop riding my bike because vigorous exercise will raise my blood pressure."
4. "Smoking helped cause my hypertension, but quitting won't reverse the damage."

203. Hydrochlorothiazide is prescribed to treat high blood pressure. Which dietary modifications will the nurse instruct the client to increase?

1. Fresh oranges.
2. Cold cereals.
3. Cola drinks.
4. Cranberry juice.

204. A client reports an aching pain and cramping sensation that occurs while walking. The pain disappears after cessation of walking. What condition does the nurse suspect is occurring?

1. Deep venous thrombosis (DVT).
2. Raynaud's disease.
3. Arteriosclerosis obliterans.
4. Thrombophlebitis.

205. An adult has severe arteriosclerosis obliterans and complains of intermittent claudication after walking 20 feet. How should the nurse plan to position the client when she is in bed?

1. Supine with legs elevated.
2. In semi-Fowler's position with knees extended.
3. In reverse Trendelenburg position.
4. In Trendelenburg position.

206. An adult female experiences painful arterial spasms in her hands due to Raynaud's phenomenon. Which of the following should the nurse include in the teaching plan for her?

1. Drink a hot beverage, such as tea or coffee, to relieve spasms.
2. Reduce intake of high fat or high cholesterol foods.
3. Raise the hands above the head to relieve spasms.
4. Wear gloves when handling refrigerated foods.

207. Which assessment finding by the nurse would indicate an abdominal aortic aneurysm?

1. Knifelike pain in the back.
2. Pulsatile mass in the abdomen.
3. Unequal femoral pulses.
4. Boardlike rigid abdomen.

208. A nurse is assessing a post-op femoral popliteal bypass client. Which of the following assessment findings indicates a complication?

1. BP 110/80, HR 86, RR 20.
2. Small amount of dark-red blood on dressing.
3. A decrease in pulse quality in the operated leg.
4. Swelling of the operative leg.

209. An adult has just returned to the surgical unit after a femoral-popliteal bypass on the right leg. The nurse should place the client in what position?

1. Fowler's position with the right leg extended.
2. Supine with the right knee flexed 45°.
3. Supine with the right leg extended and flat on the bed.
4. Semi-Fowler's position with the right leg elevated on two pillows.

210. The client has a large, venous stasis ulcer on her left ankle. Wound care is performed three times a week by a home health nurse. What instruction should the nurse include in the teaching?

1. Dangle the legs for 5–10 minutes several times a day.
2. Wear heavy cotton or wool socks when going outdoors.
3. Soak the feet in tepid water three or four times daily.
4. Take frequent rest periods with her legs elevated.

211. The nurse assesses signs of bleeding in a client taking Coumadin and notifies the physician. Which of the following would the nurse expect to administer?

1. Packed RBCs.
2. Plasma protein.
3. Platelets.
4. Vitamin K.

212. A client is being discharged after treatment of deep venous thrombosis. Coumadin (warfarin) 2.5 mg daily is prescribed. The nurse recognizes that which of the following statements indicates that the client understands the effects of Coumadin?

1. "I'll use an electric razor to shave my legs."
2. "This will prevent me from having future DVTs."
3. "I need to eat more salads and fresh fruits."
4. "I will take aspirin instead of Tylenol for headaches."

213. An adult female, who was admitted 4 hours ago with thrombophlebitis in the left leg, suddenly becomes confused and dyspneic. She begins coughing up blood-streaked sputum and complains of chest pain that worsens on inspiration. What is the nurse's best response?

1. Apply soft restraints to prevent excessive movement.
2. Perform a Heimlich maneuver.
3. Place her in bed in semi-Fowler's position.
4. Place her in Trendelenburg position on her left side.

214. A client is admitted to rule out pulmonary embolism (PE) from a deep venous thrombosis. A Dextran 70 infusion is ordered for the client. What is the action of Dextran?

1. Increase blood viscosity.
2. Decrease platelet adhesion.
3. Decrease plasma volume.
4. Increase the hemoglobin.

215. A client reports aching, heaviness, itching, and moderate swelling of the legs. On assessment, the nurse notes dilated tortuous skin veins. What condition does the nurse suspect?

1. Thrombophlebitis.
2. Venous thrombosis.
3. Varicose veins.
4. Chronic venous insufficiency.

216. An adult had an above-the-knee amputation of the left leg 2 days ago. The nurse should include which of the following in the care plan?

1. Resting in a prone or supine position with the stump extended several times a day.
2. Using a rolled towel or small pillow to elevate the stump at all times.
3. Applying warm soaks to the stump to reduce phantom limb pain.
4. Avoiding turning to the left side until the stump has healed completely.

217. An adult male had a below-the-knee amputation of the right foot 2 days ago. He is complaining of pain in his right foot. What is the best response by the nurse?

1. Explain to him that this is a common sensation after amputation.
2. Remind him that that foot was amputated and therefore cannot have pain.
3. Apply an ice pack to the stump.
4. Show him the stump so he will realize his right foot is gone.

Answers and Rationales

163. 1. Anginal pain is of short duration and is usually relieved by rest.

164. 3. The nurse should assess the couple's understanding of the disease process and rehabilitation, so that they can make rational decisions.

165. 1. The Swan-Ganz catheter measures pulmonary artery and capillary wedge pressures, which are good indicators of increase in pulmonary pressure caused by increase in left ventricular pressure.

166. *An increase in cardiac output* should be checked. This is an appropriate goal.

An elevation in renal blood flow should be checked. This is an appropriate goal. Renal blood flow will increase as cardiac output increases.

A reduction in the heart's workload should be checked. Reducing the venous return or the cardiac workload is an appropriate goal.

167. 3. With acute myocardial infarction there is ineffective myocardial perfusion, resulting in a decrease in the amount of oxygen available for tissue perfusion. Oxygen is administered to improve tissue perfusion in these clients.

168. 3. A regular heart rate is calculated by multiplying the number of QRS complexes in 6 seconds (8 QRS complexes) by 10 (because there are 60 seconds in 1 minute). The heart rate is 80. This method is not accurate if the client's heart rate is irregular.

169. 1. A common side effect of propranolol is slowed pulse rate because the drug is a beta blocker.

170. 3. Pain on dorsiflexion is a common manifestation of deep vein thrombosis.

171. 4. Venous insufficiency is stasis of venous blood flow or poor blood return to the heart. The leg muscles that normally compress the veins to force blood upward are not effective.

172. 3. Swelling is minimized by promoting gravity drainage. This could be accomplished by elevating the extremities.

173. 1. Some of the most common clinical manifestations of cardiovascular disease are shortness of breath, chest pain or discomfort, dyspnea, palpitations, fainting, and peripheral skin changes such as edema.

174. 3. S_4 is an abnormal heart sound. It is indicative of decreased ventricular compliance.

175. 1. Avoid any stimulants such as coffee, tea, or a depressant such as alcohol.

176. 2. Shellfish contains iodine, which is also in the contrast media used during a catheterization. It is *imperative* to obtain information regarding iodine allergies.

177. 1. Assessment of pedal pulses is imperative after a cardiac catheterization. Evaluation of presence and quality of pulses indicates blood flow to the catheterized extremity.

178. 1. The above rhythm is ventricular tachycardia.

179. 2. The above rhythm is ventricular fibrillation.

180. 2. Lidocaine, a class I antidysrhythmic drug, is indicated when the client has six or more PVCs per minute, multifocal PVCs, couplets or triplets, or PVCs occurring on the downslope of the T wave. Any of these situations is likely to progress to the more dangerous ventricular tachycardia or ventricular fibrillation if not treated immediately.

181. 2. A pulmonary artery catheter will show all right and left heart hemodynamic pressures and provide for cardiac output measurements.

182. 4. Smoking has been determined to increase the risk of coronary heart disease.

183. 2. Nitroglycerin dilates peripheral veins, reducing venous return to the heart. This immediately decreases cardiac workload, relieving ischemia and chest pain. It also dilates coronary arteries, improving oxygen supply to the heart.

184. 3. Nitroglycerin reduces cardiac workload and improves myocardial oxygenation. This prevents episodes of anginal pain.

185. 4. Most fruits and vegetables are low in fat and cholesterol-free. Jello also has no fat or cholesterol.

186. 2. 30 mL is 2 mg/h.
1000 mg = 1 g. 2 g is 200 mg.
2000 mg:500 mL::2 mg: x mL
2000x = 1000
x = 0.5 mL/hr
60 drops = 1 mL 60 drops × 0.5 mL = 30 mL/hr.

187. 2. To improve activity tolerance, supervised walks for gradually increasing distances are encouraged when the client is transferred out of the coronary care unit.

188. 1. Assessment is important to identify the probable cause of the pain so that definitive intervention can be planned. Dysrhythmias are a common complication of MI. Crackles in the lungs and an S_3 gallop may indicate heart failure.

189. 3. Nitroglycerin is used prophylactically before activities that are known to cause chest pain, including sexual intercourse.

190. 4. PTCA is also called balloon angioplasty because a balloon-tipped catheter is used. When the balloon is inflated, the plaque is compressed, leaving the artery unobstructed.

191. 2. Aerobic exercise, such as walking, helps to slow formation of atherosclerotic plaques in coronary artery disease. The client needs to make the necessary lifestyle changes to prevent further progression of his disease. Riding instead of walking would not provide aerobic exercise. Therefore, this statement shows that the client needs further teaching.

192. 3. Jugular venous distention is seen in right ventricular failure as volume overload occurs. This overload is reflected upward into the jugulars.

193. 2. With left ventricular heart failure, carbon dioxide and oxygen exchange is impaired due to fluid overload and leads to hypoxia.

194. 4. Crackles in the lungs are a sign of pulmonary edema due to HF. Improved cardiac output due to digoxin and reduced extracellular fluid volume due to furosemide should result in reduction of pulmonary edema.

195. 1. This is the beneficial effect of morphine in pulmonary edema.

196. 4. Metal detectors generate strong magnetic fields that can alter pacemaker settings or produce interference that causes malfunction.

197. 2. The ventricular pacemaker stimulates the ventricle if no atrial impulse is transmitted through the AV node. The appearance of the QRS complex shows that the ventricle has responded to the stimulus.

198. 1. The nurse must make sure both verbally and visually that all health care providers are clear.

199. 3. This hand position would depress the lower half of the sternum, which would compress the heart effectively.

200. 3. The pain of pericarditis is exacerbated with respirations. Rotating the trunk and sitting up frequently relieves the pain.

201. 2. First dose syncope occurs with prazocin. To reduce the risk of fainting, the client should take the first dose at bedtime.

202. 2. Moderation in alcohol intake is an important lifestyle change for controlling high blood pressure. Alcohol adds empty calories to the diet and elevates arterial blood pressure.

203. 1. Oranges are high in potassium. Thiazide diuretics, such as hydrochlorothiazide, deplete body potassium by increasing urinary excretion, so potassium intake should be increased.

204. 3. Intermittent claudication is the main symptom of narrowing of the arteries (arteriosclerosis).

205. 3. Gravity facilitates improved arterial blood flow. The reverse Trendelenburg position, in which the feet are below heart level, is used to improve circulation to the lower extremities.

206. 4. Cold induces arterial spasms. When the hands will be exposed to cold, warm gloves or mittens should be worn.

207. 2. A pulsating abdominal mass is a common finding of an abdominal aortic aneurysm.

208. 3. A decrease in pulse quality signifies a decrease in the patency of the artery.

209. 3. The best position for the affected leg is extended and flat in the bed. Elevating the leg would allow gravity to impede circulation. Having the leg dependent would promote development of edema, which could also impair circulation.

210. 4. Elevating the legs improves venous drainage and reduces edema, which will promote wound healing.

211. 4. An injection of vitamin K will increase the synthesis of prothrombin and balance clotting time, thereby decreasing the chance of bleeding.

212. 1. Warfarin is an anticoagulant, which increases the risk of bleeding from any injury. Use of an electric razor reduces the risk of a cut, which might bleed excessively.

213. 3. Her symptoms suggest that the client has pulmonary emboli. Her activity should be limited to prevent further embolization, and her head should be elevated to promote lung expansion and ease dyspnea.

214. 2. Dextran coats the platelet surface to decrease adhesion. In doing so, the plasma volume expands, and viscosity is decreased.

215. 3. This describes varicose veins.

216. 1. It is essential to prevent contractures of the hip joint so that the client will be able to walk with a prosthesis. Lying supine or prone with the stump extended helps to prevent hip contractures.

217. 1. Phantom limb pain is common after amputation. It is a real sensation and needs to be acknowledged by the nurse.

The Hematologic System

OVERVIEW OF ANATOMY AND PHYSIOLOGY

The structures of the hematologic or hematopoietic system include the blood, blood vessels, and blood-forming organs (bone marrow, spleen, liver, lymph nodes, and thymus gland). The major function of blood is to carry necessary materials (oxygen, nutrients) to cells and to remove carbon dioxide and metabolic waste products. The hematologic system also plays an important role in hormone transport, the inflammatory and immune responses, temperature regulation, fluid-electrolyte balance, and acid-base balance.

Bone Marrow

A. Contained inside all bones, occupies interior of spongy bones and center of long bones; collectively one of the largest organs of the body (4–5% of total body weight)

B. Primary function is hematopoiesis (the formation of blood cells)

C. Two kinds of bone marrow, red and yellow
  1. Red (functioning) marrow
    a. Carries out hematopoiesis; production site of erythroid, myeloid, and thrombocytic components of blood; one source of lymphocytes and macrophages
    b. Found in ribs, vertebral column, other flat bones
  2. Yellow marrow: red marrow that has changed to fat; found in long bones; does not contribute to hematopoiesis

D. All blood cells start as stem cells in the bone marrow; these mature into the different, specific types of cells, collectively referred to as formed elements of blood or blood components: erythrocytes, leukocytes, and thrombocytes.

Blood

A. Composed of plasma (55%) and cellular components (45%); see Figure 4-11.

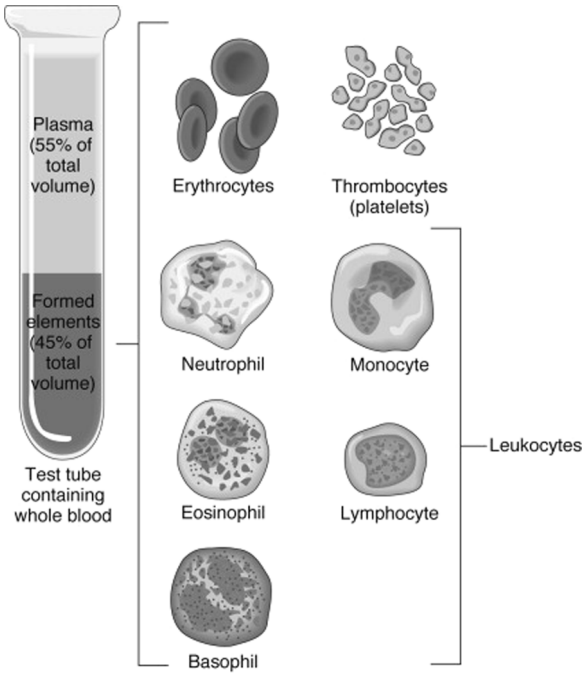


Figure 4–11 Components of blood

B. Hematocrit
  1. Reflects portion of blood composed of red blood cells
  2. Centrifugation of blood results in separation into top layer of plasma, middle layer of leukocytes and platelets, and bottom layer of erythrocytes.
  3. Majority of formed elements is erythrocytes; volume of leukocytes and platelets is negligible.

C. Distribution
  1. 1300 mL in pulmonary circulation
    a. 400 mL arterial
    b. 60 mL capillary
    c. 840 mL venous
  2. 3000 mL in systemic circulation
    a. 550 mL arterial
    b. 300 mL capillary
    c. 2150 mL venous

Plasma

A. Liquid part of blood; yellow in color because of pigments

B. Consists of serum (liquid portion of plasma) and fibrinogen

C. Contains plasma proteins such as albumin, serum globulins, fibrinogen, prothrombin, plasminogen
  1. Albumin: largest of plasma proteins, involved in regulation of intravascular plasma volume and maintenance of osmotic pressure
  2. Serum globulins: alpha, beta, gamma
    a. Alpha: role in transport of steroids, lipids, bilirubin
    b. Beta: role in transport of iron and copper
    c. Gamma: role in immune response, function of antibodies
  3. Fibrinogen, prothrombin, plasminogen (see Blood Coagulation)

Cellular Components

Cellular components or formed elements of blood are erythrocytes (red blood cells [RBCs]), which are responsible for oxygen transport; leukocytes (white blood cells [WBCs]), which play a major role in defense against microorganisms; and thrombocytes (platelets), which function in hemostasis.

A. Erythrocytes
  1. Bioconcave disc shape, no nucleus, chiefly sacs of hemoglobin
  2. Cell membrane is highly diffusible to O_2 and CO_2
  3. RBCs are responsible for oxygen transport via hemoglobin (Hgb)
    a. Two portions: iron carried on heme portion; second portion is protein
    b. Normal blood contains 12–18 g Hgb/100 mL blood; higher (14–18 g) in men than in women (12–14 g)
  4. Production
    a. Start in bone marrow as stem cells, released as reticulocytes (immature cells), mature into erythrocytes
    b. Erythropoietin stimulates differentiation; produced by kidneys and stimulated by hypoxia
    c. Iron, vitamin B_{12}, folic acid, pyridoxine (vitamin B_6), and other factors required for erythropoiesis
  5. Hemolysis (destruction)
    a. Average life span 120 days
    b. Immature RBCs destroyed in either bone marrow or other reticuloendothelial organs (blood, connective tissue, spleen, liver, lungs, and lymph nodes)
    c. Mature cells removed chiefly by liver and spleen
    d. Bilirubin: by-product of Hgb released when RBCs destroyed, excreted in bile
    e. Iron: freed from Hgb during bilirubin formation; transported to bone marrow via transferrin and reclaimed for new Hgb production
    f. Premature destruction: may be caused by RBC membrane abnormalities, Hgb abnormalities, extrinsic physical factors (such as the enzyme defects found in G6PD)
    g. Normal age RBCs may be destroyed by gross damage as in trauma or extravascular hemolysis (in spleen, liver, bone marrow)

B. Leukocytes: granulocytes and mononuclear cells: involved in protection from bacteria and other foreign substances
  1. Granulocytes: eosinophils, basophils, and neutrophils
    a. Eosinophils: involved in phagocytosis and allergic reactions
    b. Basophils: involved in prevention of clotting in microcirculation and allergic reactions
    c. Eosinophils and basophils are reservoirs of histamine, serotonin, and heparin
    d. Neutrophils: involved in short-term phagocytosis
      1) mature neutrophils: polymorphonuclear leukocytes
      2) immature neutrophils: band cells (bacterial infection usually produces increased numbers of band cells)
  2. Mononuclear cells: monocytes and lymphocytes: large nucleated cells
    a. Monocytes: involved in long-term phagocytosis; play a role in immune response
      1) largest leukocyte
      2) produced by bone marrow: give rise to histiocytes (Kupffer cells of liver), macrophages, and other components of reticuloendothelial system
    b. Lymphocytes: immune cells; produce substances against foreign cells; produced primarily in lymph tissue (B cells) and thymus (T cells) (see also Immune Response).

C. Thrombocytes (platelets)
  1. Fragments of megakaryocytes formed in bone marrow
  2. Production regulated by thrombopoietin
  3. Essential factor in coagulation via adhesion, aggregation, and plug formation
  4. Release substances involved in coagulation

Blood Groups

A. Erythrocytes carry antigens, which determine the different blood groups.

B. Blood-typing systems are based on the many possible antigens, but the most important are the antigens of the ABO and Rh blood groups because they are most likely to be involved in transfusion reactions.
  1. ABO typing
    a. Antigens of system are labelled A and B.
    b. Absence of both antigens results in type O blood.
    c. Presence of both antigens is type AB.
    d. Presence of either A or B results in type A and type B, respectively.
    e. Nearly half the population is type O, the universal donor.
    f. Antibodies are automatically formed against the ABO antigens not on person's own RBCs; transfusion with mismatched or incompatible blood results in a transfusion reaction (see Table 4-19).
  2. Rh typing
    a. Identifies presence or absence of Rh antigen (Rh positive or Rh negative).
    b. Anti-Rh antibodies not automatically formed in Rh-negative person, but if Rh-positive blood is given, antibody formation starts and a second exposure to Rh antigen will trigger a transfusion reaction.
    c. Important for Rh-negative woman carrying Rh-positive baby; first pregnancy not affected, but in a subsequent pregnancy with an Rh-positive baby, mother's antibodies attack baby's RBCs (see Unit 6).

Blood Coagulation

Conversion of fluid blood into a solid clot to reduce blood loss when blood vessels are ruptured.

A. Systems that initiate clotting
  1. Intrinsic system: initiated by contact activation following endothelial injury ("intrinsic" to vessel itself)
    a. Factor XII initiates as contact made between damaged vessel and plasma protein
    b. Factors VIII, IX, and XI activated
  2. Extrinsic system
    a. Initiated by tissue thromboplastins, released from injured vessels ("extrinsic" to vessel)
    b. Factor VII activated

B. Common pathway: activated by either intrinsic or extrinsic pathways
  1. Platelet factor 3 (PF3) and calcium react with factors X and V.
  2. Prothrombin converted to thrombin via thromboplastin.
  3. Thrombin acts on fibrinogen, forming soluble fibrin.
  4. Soluble fibrin polymerized by factor XIII to produce a stable, insoluble fibrin clot.

C. Clot resolution: takes place via fibrinolytic system by plasmin and proteolytic enzymes; clot dissolves as tissue repairs.

Spleen

A. Largest lymphatic organ: functions as blood filtration system and reservoir

B. Vascular, bean shaped; lies beneath the diaphragm, behind and to the left of the stomach; composed of a fibrous tissue capsule surrounding a network of fiber

C. Contains two types of pulp

Table 4–19 Complications of Blood Transfusion

Type	Causes	Mechanism	Occurrence	Signs and Symptoms	Intervention
Hemolytic	ABO incompatibility; Rh incompatibility; use of dextrose solutions; wide temperature fluctuations	Antibodies in recipient plasma react with antigen in donor cells. Agglutinated cells block capillary blood flow to organs. Hemolysis (Hgb into plasma and urine).	*Acute:* first 5 min after completion of transfusion *Delayed*: days to 2 weeks after	Headache, lumbar or sternal pain, nausea, vomiting, diarrhea, fever, chills, flushing, heat along vein, restlessness, anemia, jaundice, dyspnea, signs of shock, renal shutdown, DIC	Stop transfusion. Continue saline IV. Send blood unit and client blood sample to lab. Watch for hemoglobinuria. Treat or prevent shock, DIC, and renal shutdown.
Allergic	Transfer of an antigen or antibody from donor to recipient; allergic donors	Immune sensitivity to foreign serum protein	Within 30 min of start of transfusion	Urticaria, laryngeal edema, wheezing, dyspnea, bronchospasm, headache, anaphylaxis	Stop transfusion. Administer antihistamine and/or epinephrine. Treat life-threatening reactions.
Pyrogenic	Recipient possesses antibodies directed against WBCs; bacterial contamination; multitransfused clients; multiparous clients	Leukocyte agglutination Bacterial organisms	Within 15–90 min after initiation of transfusion	Fever, chills, flushing, palpitations, tachycardia, occasional lumbar pain	Stop transfusion. Treat temperature. Transfuse with leukocyte-poor blood or washed RBCs. Administer antibiotics prn.
Circulatory overload	Too rapid infusion in susceptible clients	Fluid volume overload	During and after transfusion	Dyspnea, tachycardia, orthopnea, increased blood pressure, cyanosis, anxiety	Slow infusion rate. Use packed cells instead of whole blood. Monitor CVP through a separate line.
Air embolism	Blood given under air pressure following severe blood loss	Bolus of air blocks pulmonary artery outflow	Anytime	Dyspnea, increased pulse, wheezing, chest pain, decreased blood pressure, apprehension	Clamp tubing. Turn client on left side.
Thrombo-cytopenia	Use of large amounts of banked blood	Platelets deteriorate rapidly in stored blood	When large amounts of blood given over 24 hr	Abnormal bleeding	Assess for signs of bleeding. Initiate bleeding precautions. Use fresh blood.
Citrate intoxication	Large amounts of citrated blood in clients with decreased liver function	Citrate binds ionic calcium	After large amounts of banked blood	Neuromuscular irritability Bleeding due to decreased calcium	Monitor/treat hypocalcemia. Avoid large amounts of citrated blood. Monitor liver function.
Hyperkalemia	Potassium levels increase in stored blood	Release of potassium into plasma with red cell lysis	In clients with renal insufficiency	Nausea, colic, diarrhea, muscle spasms, ECG changes (tall peaked T-wave, short Q-T segment)	Administer blood less than 5–7 days old in clients with impaired potassium excretion.

1. Red pulp: located between the fibrous strands, composed of RBCs, WBCs, and macrophages
2. White pulp: scattered throughout the red pulp, produces lymphocytes and sequesters lymphocytes, macrophages, and antigens

D. 1–2% of red cell mass or 200 mL blood/minute stored in spleen; blood comes via the splenic artery to the pulp for cleansing, then passes into splenic venules that are lined with phagocytic cells, and finally to the splenic vein to the liver.

E. Important hematopoietic site in fetus; postnatally produces lymphocytes and monocytes

F. Important in phagocytosis; removes misshapen erythrocytes, unwanted parts of erythrocytes

G. Also involved in antibody production by plasma cells and iron metabolism (iron released from Hgb portion of destroyed erythrocytes returned to bone marrow)

H. In the adult, functions of the spleen can be taken over by the reticuloendothelial system.

Liver

See also Gastrointestinal Tract.

A. Involved in bile production (via erythrocyte destruction and bilirubin production) and erythropoiesis (during fetal life and when bone marrow production is insufficient).

B. Kupffer cells of liver have reticuloendothelial function as histiocytes; phagocytic activity and iron storage.

C. Liver also involved in synthesis of clotting factors, synthesis of antithrombins.

ASSESSMENT

Health History

A. Presenting problem

1. Nonspecific symptoms may include chills, fatigue, fever, weakness, weight loss, night sweats, delayed wound healing, malaise, lethargy, depression, cold/heat intolerance
2. Note specific signs and symptoms
   - **a.** Skin: prolonged bleeding, petechiae, jaundice, ecchymosis, pruritus, pallor
   - **b.** Eyes: visual disturbance, yellowed sclera
   - **c.** Ears: vertigo, tinnitus
   - **d.** Mouth and nose: epistaxis; gingival bleeding, ulceration, pain; dysphagia, hoarseness
   - **e.** Neck: nuchal rigidity, lymphadenopathy
   - **f.** Respiratory: dyspnea, orthopnea, palpitations, chest discomfort or pain, cough (productive or dry), hemoptysis
   - **g.** GI: melena, abdominal pain, change in bowel habits
   - **h.** GU: hematuria, recurrent infection, amenorrhea, menorrhagia
   - **i.** CNS: confusion, headache, paresthesias, syncope
   - **j.** Musculoskeletal: joint, back, or bone pain

B. Lifestyle: exposure to chemicals, occupational exposure to radiation

C. Use of medications

1. Iron, vitamins (B_6, B_{12}, folic acid)
2. Corticosteroids
3. Anticoagulants
4. Antibiotics
5. Aspirin or aspirin-containing compounds
6. Cold or allergy preparations
7. Antiarrhythmics
8. Blood transfusions (cryoprecipitates)
9. Cancer chemotherapy drugs
10. Immunosuppressant drugs

D. Medical history

1. Surgery: splenectomy, tumor resection, cardiac valve replacement, GI tract resection
2. Allergies: multiple transfusions with whole blood or blood products, other known allergies
3. Mononucleosis; radiation therapy; recurrent infections; malabsorption syndrome; anemia; delayed wound healing; thrombophlebitis, pulmonary embolism, deep venous thrombosis (DVT); liver disease, ETOH abuse, vitamin K deficiency; angina pectoris, atrial fibrillation

E. Family history; jaundice, anemia, bleeding disorders (hemophilia, polycythemia), malignancies, congenital blood dyscrasias

Physical Examination

A. Auscultate for heart murmurs; bruits (cerebral, cardiac, carotid); pericardial or pleural friction rubs; bowel sounds.

B. Inspect for

1. Flush or pallor of mucous membranes, nail beds, palms, soles of feet
2. Infection or pallor of sclera, conjunctiva
3. Cyanosis
4. Jaundice of skin, mucous membranes, conjunctiva
5. Signs of bleeding, petechiae, ecchymoses, oral mucosal bleeding (especially gums), epistaxis, hemorrhage from any orifice
6. Ulcerations or lesions
7. Swelling or erythema
8. Neurologic changes: pain and touch, position and vibratory sense, superficial and deep tendon reflexes

C. Palpate lymph nodes; note location, size, texture, sensation, fixation; palpate the ribs for sternal, bone tenderness.

D. Evaluate joint range of motion and tenderness.

E. Percuss for lung excursion, splenomegaly, hepatomegaly.

Laboratory/Diagnostic Tests

A. Blood
  1. Complete blood count (CBC) with differential and peripheral smear
    a. White blood cell count (WBC) with differential
    b. Hgb and HCT
    c. Platelet and reticulocyte count
    d. Red blood cell count (RBC) with peripheral smear
  2. Coagulation studies
    a. Prothrombin time (PT)
    b. Partial thromboplastin time (PTT)
    c. Fibrin split products (FSP)
    d. Lee-White clotting time (whole blood clotting time)
  3. Blood chemistry
    a. Blood urea nitrogen (BUN)
    b. Creatinine
    c. Bilirubin: direct and indirect
    d. Uric acid
  4. Miscellaneous
    a. Erythrocyte sedimentation rate (ESR)
    b. Serum protein electrophoresis
    c. Serum iron and total iron-binding capacity
    d. Plasma protein assays
    e. Direct and indirect Coombs' tests

B. Urine and stool
  1. Urinalysis
  2. Hematest
  3. Bence-Jones protein assay (urine)

C. Radiologic
  1. Chest or other X-ray as indicated by history and physical exam
  2. Radionuclide scans (e.g., bone scan)
  3. Lymphangiography

D. Bone marrow aspiration and biopsy
  1. Puncture of iliac crest (preferred site), vertebrae body, sternum, or tibia (in infants) to collect tissue from bone marrow
  2. Purpose: study cells involved in blood production
  3. Nursing care
    a. Confirm that consent form has been signed.
    b. Allay client anxiety; prepare client for a sharp, brief pain when bone marrow is aspirated into syringe.
    c. Position client and assist physician to maintain sterile field.
    d. Immediately after the aspiration, apply pressure to the site for at least 5 minutes and longer, if necessary.
    e. Check the site frequently for signs of bleeding or infection.
    f. Send specimen to laboratory.

E. See Table 4-20

Table 4–20 Normal Adult Values

Hematocrit	
Male	41.5–50.4%
Female	35.9–44.6%
Hemoglobin	
Male	14.0–17.5 g/dL
Female	12.3–15.3 g/dL
Red cell count	4.7–6.1 M/mL
White cell count	4.8–10.8 K/mL
Mean corpuscular volume (MCV)	81–99 fL
Mean corpuscular hemoglobin (MCH)	27–34 pg
Mean corpuscular hemoglobin concentration (MCHC)	32–36 g/dL
Platelet count	150–400 K/mL
Neutrophils	35–70%
Lymphocytes	25–45%
Monocytes	0–12%
Eosinophils	0–7%
Basophils	0–2%

ANALYSIS

Nursing diagnoses for clients with disorders of the hematologic system may include:

A. Imbalanced nutrition
B. Risk for infection
C. Ineffective tissue perfusion: cerebral, peripheral
D. Impaired gas exchange
E. Ineffective protection
F. Risk for impaired skin integrity
G. Impaired oral mucous membrane
H. Risk for activity intolerance
I. Acute pain
J. Anxiety

PLANNING AND IMPLEMENTATION

Goals

A. Optimal nutrition will be maintained.
B. Client will be free from infection.
C. Adequate cerebral and peripheral tissue perfusion will be maintained.
D. Client will maintain optimal respiratory function.
E. Client will maintain adequate protective mechanisms.
F. Optimal skin integrity will be maintained.
G. Client maintains optimal health of oral mucous membranes.
H. Client will have increased strength and endurance.
I. Client's pain will be relieved/controlled.
J. Client's anxiety will be relieved/reduced.

Interventions

Blood Transfusion and Component Therapy

A. Purpose: improve oxygen transport (RBCs); volume expansion (whole blood, plasma, albumin); provision of proteins (fresh frozen plasma, albumin, plasma protein fraction); provision of coagulation factors (cryoprecipitate, fresh frozen plasma, fresh whole blood); provision of platelets (platelet concentrate, fresh whole blood)

B. Blood and blood products

1. Whole blood; provides all components
- **a.** Large volume can cause difficulty: 12–24 hours for Hgb and HCT to rise
- **b.** Complications: volume overload, transmission of hepatitis or AIDS, transfusion reaction, infusion of excess potassium and sodium, infusion of anticoagulant (citrate) used to keep stored blood from clotting, calcium binding and depletion (citrate) in massive transfusion therapy

2. Red blood cells
- **a.** Provide twice the amount of Hgb as an equivalent amount of whole blood
- **b.** Indicated in cases of blood loss, pre- and post-op clients, and those with incipient congestive failure
- **c.** Complications: transfusion reaction (less common than with whole blood due to removal of plasma proteins)

3. Fresh frozen plasma
- **a.** Contains all coagulation factors including V and VIII
- **b.** Can be stored frozen for 12 months; takes 20 minutes to thaw
- **c.** Hang immediately upon arrival to unit (loses its coagulation factors rapidly)

4. Platelets
- **a.** Will raise recipient's platelet count by 10,000/mm^3
- **b.** Pooled from 4–8 units of whole blood
- **c.** Single-donor platelet transfusions may be necessary for clients who have developed antibodies; compatibility testing may be necessary

5. Factor VIII fractions (cryoprecipitate): contains Factors VIII, fibrinogen, and XIII

6. Granulocytes
- **a.** Do not increase WBC; increase marginal pool (at tissue level) rather than circulating pool
- **b.** Premedication with steroids, antihistamines, and acetaminophen
- **c.** Respiratory distress with shortness of breath, cyanosis, and chest pain may occur; requires cessation of transfusion and immediate attention
- **d.** Shaking chills or rigors common, require brief cessation of therapy, administration of meperidine IV until rigors are diminished, and resumption of transfusion when symptoms relieved

7. Volume expanders: albumin; percentage concentration varies (50–100 mL/unit); hyperosmolar solutions should not be used in dehydrated clients.

C. Nursing care

1. Assess client for history of previous blood transfusions and any adverse reactions.

2. Ensure that the adult client has an 18–20 gauge IV catheter in place.

3. Use 0.9% sodium chloride.

4. At least two nurses should verify the ABO group, Rh type, client and blood numbers, and expiration date.

5. Take baseline vital signs before initiating transfusion.

6. Start transfusion slowly (2 mL/minute).

7. Stay with the client during the first 15 minutes of the transfusion and take vital signs frequently.

8. Maintain the prescribed transfusion rate.
- **a.** Whole blood: approximately 3–4 hours
- **b.** RBCs: approximately 2–4 hours
- **c.** Fresh frozen plasma: as quickly as possible
- **d.** Platelets: as quickly as possible
- **e.** Cryoprecipitate: rapid infusion
- **f.** Granulocytes: usually over 2 hours
- **g.** Volume expanders: volume-dependent rate

9. Monitor for adverse reactions (see Table 4-19).

10. Document the following:
- **a.** Blood component unit number (apply sticker if available)
- **b.** Date infusion starts and ends
- **c.** Type of component and amount transfused
- **d.** Client reaction and vital signs
- **e.** Signature of transfusionist
- **f.** If a reaction occurs, follow facility protocol for blood packaging and assessing client.

EVALUATION

A. Client maintains normal weight; no evidence of malnutrition.

B. Client's temperature is within normal range; no signs of infection.

C. Client neuro status is within normal limits.

D. Client demonstrates adequate peripheral capillary refill, sensation, and movement; palpable peripheral pulses; skin warm, dry, and usual color.

E. Client's respirations are of normal rate, rhythm, and depth; lungs clear to auscultation.

F. Client verbalizes signs and symptoms of infection and preventive measures; reports signs and symptoms of infection immediately.

G. Client's skin remains clear and intact.

H. Client's oral mucous membranes are healthy and intact.

I. Client experiences increased strength and endurance.
J. Client reports relief/control of pain.
K. Client expresses relief/reduction in anxiety.

DISORDERS OF THE HEMATOLOGIC SYSTEM

Anemias

Iron-Deficiency Anemia

A. General information
  1. Chronic microcytic, hypochromic anemia caused by either inadequate absorption or excessive loss of iron
  2. Acute or chronic bleeding principal cause in adults (chiefly from trauma, dysfunctional uterine bleeding, and GI bleeding)
  3. May also be caused by inadequate intake of iron-rich foods or by inadequate absorption of iron (from chronic diarrhea, malabsorption syndromes, high cereal-product intake with low animal protein ingestion, partial or complete gastrectomy, pica)
  4. Incidence related to geographic location, economic class, age group, and sex
    a. More common in developing countries and tropical zones (blood-sucking parasites)
    b. Women between ages 15 and 45 and children affected more frequently, as are the poor
  5. In iron-deficiency states, iron stores are depleted first, followed by a reduction in Hgb formation.

B. Assessment findings
  1. Mild cases usually asymptomatic
  2. Palpitations, dizziness, and cold sensitivity
  3. Brittleness of hair and nails; pallor
  4. Dysphagia, stomatitis, and atrophic glossitis
  5. Dyspnea, weakness
  6. Laboratory findings
    a. RBCs small (microcytic) and pale (hypochromic)
    b. Hgb markedly decreased
    c. HCT moderately decreased
    d. Serum iron markedly decreased
    e. Hemosiderin absent from bone marrow
    f. Serum ferritin decreased
    g. Reticulocyte count decreased

C. Nursing interventions
  1. Monitor for signs and symptoms of bleeding through hematest of all elimination including stool, urine, and gastric contents.
  2. Provide for adequate rest: plan activities so as not to overtire.
  3. Provide a thorough explanation of all diagnostic tests used to determine sources of possible bleeding (helps allay anxiety and ensure cooperation).
  4. Administer iron preparations as ordered.
    a. Oral iron preparations: route of choice
      1) Give following meals or a snack.
      2) Dilute liquid preparations well and administer using a straw to prevent staining teeth.
      3) When possible administer with orange juice as vitamin C (ascorbic acid) enhances iron absorption.
      4) Warn clients that iron preparations will change stool color and consistency (dark and tarry) and may cause constipation.
      5) Antacid ingestion will decrease oral iron effectiveness; milk products and eggs inhibit absorption.
    b. Parenteral: used in clients intolerant to oral preparations, who are noncompliant with therapy, or who have continuing blood losses.
      1) Use one needle to withdraw and another to administer iron preparations as tissue staining and irritation are a problem.
      2) Use the Z-track injection technique to prevent leakage into tissues
      3) Do not massage injection site but encourage ambulation as this will enhance absorption; advise against vigorous exercise and constricting garments.
      4) Observe for local signs of complications: pain at the injection site, development of sterile abscesses, lymphadenitis as well as fever, headache, urticaria, hypotension, or anaphylactic shock.
  5. Provide dietary teaching regarding food high in iron (meats, fortified cereals, nuts, seeds, dried beans, dried fruit).
  6. Encourage ingestion of roughage and increase fluid intake to prevent constipation if oral iron preparations are being taken.

Pernicious Anemia

A. General information
  1. Chronic progressive, macrocytic anemia caused by a deficiency of intrinsic factor; the result is abnormally large erythrocytes and hypochlorhydria (a deficiency of hydrochloric acid in gastric secretions)
  2. Characterized by neurologic and GI symptoms; death usually results if untreated
  3. Lack of intrinsic factor is caused by gastric mucosal atrophy (possibly due to heredity, prolonged iron deficiency, or an autoimmune disorder); can also result in clients who have

had a total gastrectomy if vitamin B_{12} not administered

4. Usually occurs in men and women over age 50, with an increase in blue-eyed persons of Scandinavian descent
5. Pathophysiology
   a. Intrinsic factor is necessary for the absorption of vitamin B_{12} into the small intestine.
   b. B_{12} deficiency diminishes DNA synthesis, which results in defective maturation of cells (particularly rapidly dividing cells such as blood cells and GI tract cells).
   c. B_{12} deficiency can alter structure and function of peripheral nerves, spinal cord, and the brain.

B. Medical management
1. Drug therapy
   a. Vitamin B_{12} injections: monthly maintenance
   b. Iron preparations (if Hgb level inadequate to meet increased numbers of erythrocytes)
   c. Folic acid
      1) Controversial
      2) Reverses anemia and GI symptoms but may intensify neurologic symptoms
      3) May be safe if given in small amounts in addition to vitamin B_{12}
2. Transfusion therapy

C. Assessment findings
1. Anemia, weakness, pallor, dyspnea, palpitations, fatigue
2. GI symptoms: sore mouth; smooth, beefy, red tongue; weight loss; dyspepsia; constipation or diarrhea; jaundice
3. CNS symptoms; tingling, paresthesias of hands and feet, paralysis, depression, psychosis
4. Laboratory tests
   a. Erythrocyte count decreased
   b. Blood smear: oval, macrocytic erythrocytes with a proportionate amount of Hgb
   c. Bone marrow
      1) Increased megaloblasts (abnormal erythrocytes)
      2) Few normoblasts or maturing erythrocytes
      3) Defective leukocyte maturation
   d. Bilirubin (indirect): elevated unconjugated fraction
   e. Serum LDH elevated
   f. Positive Schilling test
      1) Measures absorption of radioactive vitamin B_{12} both before and after parenteral administration of intrinsic factor
      2) Definitive test for pernicious anemia
      3) Used to detect lack of intrinsic factor
      4) Fasting client is given radioactive vitamin B_{12} by mouth and nonradioactive vitamin B_{12} IM to saturate tissue binding sites and to permit some excretion of radioactive vitamin B_{12} in the urine if it is absorbed
      5) 24–48 hour urine collection is obtained; client is encouraged to drink fluids
      6) If indicated, second stage Schilling test performed 1 week after first stage. Fasting client is given radioactive vitamin B_{12} combined with human intrinsic factor and test is repeated.
   g. Gastric analysis: decreased free hydrochloric acid
   h. Large numbers of reticulocytes in the blood following parenteral vitamin B_{12} administration

D. Nursing interventions
1. Provide a nutritious diet high in iron, protein, and vitamins (fish, meat, milk/milk products, and eggs).
2. Avoid highly seasoned, coarse, or very hot foods if client has mouth sores.
3. Provide mouth care before and after meals using a soft toothbrush and nonirritating rinses.
4. Bed rest may be necessary if anemia is severe.
5. Provide safety when ambulating (especially if carrying hot items, etc.).
6. Provide client teaching and discharge planning concerning:
   a. Dietary instruction
   b. Importance of lifelong vitamin B_{12} therapy
   c. Rehabilitation and physical therapy for neurologic deficits, as well as instruction regarding safety

Aplastic Anemia

A. General information
1. Pancytopenia or depression of granulocyte, platelet, and erythrocyte production due to fatty replacement of the bone marrow
2. Bone marrow destruction may be idiopathic or secondary
3. Secondary aplastic anemia may be caused by
   a. Chemical toxins (e.g., benzene)
   b. Drugs (e.g., chloramphenicol, cytotoxic drugs)
   c. Radiation
   d. Immunologic injury

B. Medical management
1. Blood transfusions: key to therapy until client's own marrow begins to produce blood cells
2. Aggressive treatment of infections
3. Bone marrow transplantation
4. Drug therapy
   a. Corticosteroids and/or androgens to stimulate bone marrow function and to

increase capillary resistance (effective in children but usually not in adults)
    - **b.** Estrogen and/or progesterone to prevent amenorrhea in female clients
  - **5.** Identification and withdrawal of offending agent or drug
- **C.** Assessment findings
  - **1.** Fatigue, dyspnea, pallor
  - **2.** Increased susceptibility to infection
  - **3.** Bleeding tendencies and hemorrhage
  - **4.** Laboratory findings: normocytic anemia, granulocytopenia, thrombocytopenia
  - **5.** Bone marrow biopsy: marrow is fatty and contains very few developing cells
- **D.** Nursing interventions
  - **1.** Administer blood transfusions as ordered.
  - **2.** Provide nursing care for client with bone marrow transplantation.
  - **3.** Administer medications as ordered.
  - **4.** Monitor for signs of infection and provide care to minimize risk.
    - **a.** Maintain neutropenic precautions.
    - **b.** Encourage high-protein, high-vitamin diet to help reduce incidence of infection.
    - **c.** Provide mouth care before and after meals.
  - **5.** Monitor for signs of bleeding and provide measures to minimize risk.
    - **a.** Use a soft toothbrush and electric razor.
    - **b.** Avoid intramuscular injections.
    - **c.** Hematest urine and stool.
    - **d.** Observe for oozing from gums, petechiae, or ecchymoses.
  - **6.** Provide client teaching and discharge planning concerning
    - **a.** Self-care regimen
    - **b.** Identification of offending agent and importance of avoiding it (if possible) in future

Hemolytic Anemia

- **A.** General information
  - **1.** A category of diseases in which there is an increased rate of RBC destruction.
  - **2.** May be congenital or acquired.
    - **a.** Congenital: includes hereditary spherocytosis, G6PD deficiency, sickle cell anemia, thalassemia
    - **b.** Acquired: includes transfusion incompatibilities, thrombotic thrombocytopenic purpura, disseminated intravascular clotting, spur cell anemia
  - **3.** Cause often unknown, but erythrocyte life span is shortened and hemolysis occurs at a rate that the bone marrow cannot compensate for.
  - **4.** The degree of anemia is determined by the lag between erythrocyte hemolysis and the rate of bone marrow erythropoiesis.
  - **5.** Diagnosis is based on laboratory evidence of an increased rate of erythrocyte destruction and a corresponding compensatory effort by bone marrow to increase production.
- **B.** Medical management
  - **1.** Identify and eliminate (if possible) causative factors
  - **2.** Drug therapy
    - **a.** Corticosteroids in autoimmune types of anemia
    - **b.** Folic acid supplements
  - **3.** Blood transfusion therapy
  - **4.** Splenectomy
- **C.** Assessment findings
  - **1.** Clinical manifestations vary depending on severity of anemia and the rate of onset (acute vs. chronic)
  - **2.** Pallor, scleral icterus, and slight jaundice (chronic)
  - **3.** Chills, fever, irritability, precordial spasm, and pain (acute)
  - **4.** Abdominal pain and nausea, vomiting, diarrhea, melena
  - **5.** Hematuria, marked jaundice, and dyspnea
  - **6.** Splenomegaly and symptoms of cholelithiasis, hepatomegaly
  - **7.** Laboratory tests
    - **a.** Hgb and HCT decreased
    - **b.** Reticulocyte count elevated (compensatory)
    - **c.** Coombs' test (direct): positive if autoimmune features present
    - **d.** Bilirubin (indirect): elevated unconjugated fraction
- **D.** Nursing interventions
  - **1.** Monitor for signs and symptoms of hypoxia including confusion, cyanosis, shortness of breath, tachycardia, and palpitations.
  - **2.** Note that the presence of jaundice may make assessment of skin color in hypoxia unreliable.
  - **3.** If jaundice and associated pruritus are present, avoid soap during bathing and use cool or tepid water.
  - **4.** Frequent turning and meticulous skin care are important as skin friability is increased.
  - **5.** Teach clients about the nature of the disease and identification of factors that predispose to episodes of hemolytic crisis.

Splenectomy

- **A.** General information
  - **1.** Indications
    - **a.** Rupture of the spleen caused by trauma, accidental tearing during surgery, diseases causing softening or damage (e.g., infectious mononucleosis)
    - **b.** Hypersplenism: excessive splenic damage of cellular blood components
    - **c.** As the spleen is a major source of antibody formation in children, splenectomy is not recommended during the early years of

life; if absolutely necessary, client should receive prophylactic antibiotics post-op

2. Primary hypersplenism can be alleviated with splenectomy; procedure is palliative only in secondary hypersplenism

B. Nursing interventions: postoperatively

1. Provide routine preoperative care and explain what to expect postoperatively.
2. Administer pneumococcal vaccine as ordered since client will be at increased risk for pneumococcal infections for several years after splenectomy.

C. Nursing interventions: postoperatively

1. Be aware that it is crucial to monitor carefully for hemorrhage and shock as clients with pre-op bleeding tendencies will remain at risk post-op.
2. Monitor post-op temperature elevation: fever may not be the best indicator of post-op complications such as pneumonia or urinary tract infection, as fever without concomitant infection is common following splenectomy.
3. Observe for abdominal distension and discomfort secondary to expansion of the intestines and stomach; an abdominal binder may reduce distension.
4. Know that postoperative infection in a child is considered life threatening; administer prophylactic antibiotics as ordered.
5. Ambulate early and provide chest physical therapy as location of the incision makes post-op atelectasis or pneumonia a risk.
6. Emphasize to client the need to report even minor signs or symptoms of infection immediately to the physician.

Sickle Cell Anemia

See Unit 5

Disorders of Platelets and Clotting Mechanism

Disseminated Intravascular Coagulation (DIC)

A. General information

1. Diffuse fibrin deposition within arterioles and capillaries with widespread coagulation all over the body and subsequent depletion of clotting factors.
2. Hemorrhage from kidneys, brain, adrenals, heart, and other organs.
3. Cause unknown.
4. Clients are usually critically ill with an obstetric, surgical, hemolytic, or neoplastic disease.
5. May be linked with entry of thromboplastic substances into the blood.
6. Pathophysiology
   a. Underlying disease (e.g., toxemia of pregnancy, cancer) causes release of thromboplastic substances that promote the deposition of fibrin throughout the microcirculation.
   b. Microthrombi form in many organs, causing microinfarcts and tissue necrosis.
   c. RBCs are trapped in fibrin strands and are hemolysed.
   d. Platelets, prothrombin, and other clotting factors are destroyed, leading to bleeding.
   e. Excessive clotting activates the fibrinolytic system, which inhibits platelet function, causing further bleeding.
7. Mortality rate is high, usually because underlying disease cannot be corrected.

B. Medical management

1. Identification and control of underlying disease is key
2. Blood transfusions: include whole blood, packed RBCs, platelets, plasma, cryoprecipitates, and volume expanders
3. Heparin administration
   a. Somewhat controversial
   b. Inhibits thrombin thus preventing further clot formation, allowing coagulation factors to accumulate

C. Assessment findings

1. Petechiae and ecchymoses on the skin, mucous membranes, heart, lungs, and other organs
2. Prolonged bleeding from breaks in the skin (e.g., IV or venipuncture sites)
3. Severe and uncontrollable hemorrhage during childbirth or surgical procedures
4. Mental status changes
5. Oliguria and acute renal failure
6. Convulsions, coma, death
7. Laboratory findings
   a. PT prolonged
   b. PTT usually prolonged
   c. Thrombin time usually prolonged
   d. Fibrinogen level usually decreased
   e. Platelet count usually depressed
   f. Fibrin split products elevated
   g. Protamine sulfate test strongly positive
   h. Factor assays (II, V, VII) depressed

D. Nursing interventions

1. Monitor blood loss and attempt to quantify.
2. Observe for signs of additional bleeding or thrombus formation.
3. Monitor appropriate laboratory data.
4. Prevent further injury.
   a. Avoid IM injections.
   b. Apply pressure to bleeding sites.
   c. Turn and position client frequently and gently.
   d. Provide frequent nontraumatic mouth care (e.g., soft toothbrush or gauze sponge).
5. Provide emotional support to client and significant others.

6. Administer blood transfusions and medications as ordered.
7. Teach client the importance of avoiding aspirin or aspirin-containing compounds.

Hemophilia

See Unit 5.

Idiopathic Thrombocytopenic Purpura

See Unit 5.

Immunologic Disorders

Acquired Immune Deficiency Syndrome (AIDS)

A. General information
1. Characterized by severe deficits in cellular immune function; manifested clinically by opportunistic infections and/or unusual neoplasms
2. Etiologic factors
   a. Results from infection with human immunodeficiency virus (HIV), a retrovirus that preferentially infects helper T-lymphocytes (T_4 cells)
   b. Transmissible through sexual contact, contaminated blood or blood products, and from infected woman to child in utero or possibly through breast-feeding
   c. HIV is present in an infected person's blood, semen, and other body fluids
3. Epidemiology is similar to that of hepatitis B; increased incidence in populations in which sexual promiscuity is common and in IV drug abusers
4. Proposed strategies for prevention
   a. Early detection; include HIV testing as routine part of medical care
   b. Expand opportunities for testing outside of the medical settings
   c. Behavior modification with persons diagnosed with HIV and partners
   d. Reduce viral load in pregnant woman with HIV; reduce perinatal transmission of HIV disease to newborn

B. Medical management
1. No effective cure for AIDS at present; several categories of antiretroviral drugs are available (see Table 4-21).
2. Highly active antiretroviral therapy (HAART) refers to combination of antiretroviral drugs to avoid development of viral resistance to drugs; drug therapy is initiated as early as possible to reduce HIV RNA levels in blood and to maintain or increase CD4+ levels to greater than 200 cells/μL
3. Drugs used to treat *Pneumocystis carinii* pneumonia (PCP) include:
   a. PO or IV trimethoprim-sulfamethoxazole (Bactrim, Septra); side effects include rash, leukopenia, fever
   b. IM or IV pentamidine (Pentam 300); side effects include hepatotoxicity, nephrotoxicity, blood sugar imbalances, abscess or necroses at IM injection site, hypotension
   c. Corticosteroids are also frequently used.

C. Assessment findings (see Table 4-22)
1. Fatigue, weakness, anorexia, weight loss, diarrhea, pallor, fever, night sweats
2. Shortness of breath, dyspnea, cough, chest pain, and progressive hypoxemia secondary to infection (pneumonia)
3. Progressive weight loss secondary to anorexia, nausea, vomiting, diarrhea, and a general wasting syndrome; fatigue, malaise
4. Temperature elevations (persistent or intermittent); night sweats
5. Neurologic dysfunction secondary to acute meningitis, progressive dementia, encephalopathy, encephalitis
6. Presence of opportunistic infection, for example
   a. *Pneumocystis carinii* pneumonia
   b. Herpes simplex, cytomegalovirus, and Epstein-Barr viruses

Table 4–21 Antiretroviral Drug Classifications

Nucleoside Reverse Transcriptase Inhibitors (NRTIs)
Zidovudine (AZT, ZDV, Retrovir)—the first developed drug
Didanosine (ddI, Videx)
Stavudine (d4T, Zerit)
Lamivudine (3TC, Epivir)
Abacavir (Ziagen)

Nucleotide Reverse Transcriptase Inhibitor
Tenofovir DF (viread)

Nonnucleoside Reverse Transcriptase Inhibitors (NNRTIs)
Nevirapine (Viramune)
Delavirdne (Rescriptor)
Efavirenz (Sustival)

Protease Inhibitors (PIs)
Saquinavir (Fortovase)
Indinavir (Crixivan)
Ritonavir (Norvir)
Nelfinavir (Viracept)
Amprenavir (Agenerase)
Kaletra (combination of lopinavir and ritonvir)

Fusion Inhibitor (Entry Inhibitor)
Enfuvirtide (Fuzeon)

Adapted from Broyles, B.E., Reiss, B.S., & Evans, M.E. (2007). Pharmacological aspects of nursing care *(7th ed.). New York: Thomson Delmar Learning.*

Table 4–22 Classification System for HIV Infection

CD4 + T-cell categories	A Asymptomatic, acute HIV or PGL	B Symptomatic, not (A) or (C) conditions	C AIDS-indicator conditions
(**1**) 500/uL	A1	B1	C1
(**2**) 200–499/uL	A2	B2	C2
(**3**) < 200/uL	A3	B3	C3

Clinical Category A	Clinical Category B	Clinical Category C
1 or more of the following, confirmed HIV infection, and without conditions in B and C • Asymptomatic HIV infection • Persistent Generalized Lymphadenopathy (PGL) • Acute (primary) HIV infection with accompanying illness or history of acute HIV infection	• Candidiasis (oral or vaginal), frequent or poorly resistant to therapy • Cervical dysplasia/cervical carcinoma in situ • Fever or diarrhea exceeding 1 month • Hairy leukoplakia, oral • Herpes zoster, involving 2 episodes or more than one dermatome • ITP • PID • Peripheral neuropathy	• Candidiasis of bronchi, trachea, or lungs • Cervical cancer, invasive • Coccidiomycosis • Cryptosporidiosis • Cytomegalovirus • Encephalopathy • Herpes simplex: chronic ulcer—exceeding 1 month duration • Histoplasmosis • Kaposi's sarcoma • Lymphoma • Mycobacterium—avium complex • Mycobacterium tuberculosis • *Pneumocystis carinii* pneumonia • Salmonella • Toxoplasmosis of brain • Wasting syndrome due to HIV

NOTE: Adapted from 1993 *Revised Classification System for HIV Infections and Expanded Surveillance Case Definition for AIDS Among Adolescents and Adults*, by Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, 1993, Atlanta, GA: Author.

   c. Candidiasis: oral or esophageal
   d. Mycobacterium-avium complex
7. Neoplasms
   a. Kaposi's sarcoma
   b. CNS lymphoma
   c. Burkitt's lymphoma
   d. Diffuse undifferentiated non-Hodgkin's lymphoma
8. Laboratory findings: diagnosis based on clinical criteria and positive HIV antibody test—ELISA (enzyme-linked immunosorbent assay) confirmed by Western blot assay. Other lab findings may include
   a. Leukopenia with profound lymphopenia
   b. Anemia
   c. Thrombocytopenia
   d. Decreased circulatory CD4 lymphocyte cells
   e. Low CD4:CD8 lymphocyte ratio

D. Nursing interventions
1. Administer medications as ordered for concomitant disease; monitor for signs of medication toxicity.
2. Monitor respiratory status; provide care as appropriate for respiratory problems, e.g., pneumonia.
3. Assess neurological status; reorient client as needed; provide safety measures for the confused/disoriented client.
4. Assess for signs and symptoms of fluid and electrolyte imbalances; monitor lab studies; ensure adequate hydration.
5. Monitor client's nutritional intake; provide supplements, total parenteral nutrition, etc., as ordered.
6. Assess skin daily (especially perianal area) for signs of breakdown; keep skin clean and dry; turn q4 h while in bed.
7. Inspect oral cavity daily for ulcerations, signs of infection; instruct client to rinse mouth with normal saline and hydrogen peroxide or normal saline and sodium bicarbonate rinses.
8. Observe for signs and symptoms of infection; report immediately if any occur.
9. If severe leukopenia develops, institute neutropenic precautions
   a. Prevent trauma to skin and mucous membranes, e.g., avoid enemas, rectal temperatures; minimize all parenteral infections
   b. Do not place client in a room with clients having infections

c. Screen visitors for colds, infections, etc.
d. Do not allow fresh fruits, vegetables, or plants in client's room.
e. Mask client when leaving room for walks, X-rays, etc.

10. Institute blood and body fluid precautions
11. Provide emotional support for client/significant others; help to decrease sense of isolation
12. Provide client teaching and discharge planning concerning
    a. Importance of observing for signs of infections and notifying physician immediately if any occur
    b. Ways to reduce chance of infection
        1) Clean kitchen and bathroom surfaces regularly with disinfectants.
        2) Avoid direct contact with pet's litter boxes or stool, bird cage droppings, and water in fish tanks.
        3) Avoid contact with people with infections, e.g., cold, flu.
        4) Importance of balancing activity with rest.
        5) Need to eat a well-balanced diet with plenty of fluids.
    c. Prevention of disease transmission
        1) Use safer sex practices, e.g., condoms for sexual intercourse.
        2) Do not donate blood, semen, organs.
        3) Do not share razors, toothbrushes, or other items that may draw blood.
        4) Inform all physicians, dentists, sexual partners of diagnosis.
    d. Resources include Public Health Service, National Gay Task Force, American Red Cross, local support groups

Malignancies

Multiple Myeloma

A. General information
1. A neoplastic condition characterized by the abnormal proliferation of plasma cells in the bone marrow, causing the development of single or multiple tumors composed of abnormal plasma cells. Disease disseminates into lymph nodes, liver, spleen, and kidneys and causes bone destruction throughout the body.
2. Cause unknown, but environmental factors thought to be involved
3. Disease occurs after age 40; affects men twice as often as women
4. Pathophysiology
    a. Bone demineralization and destruction with osteoporosis and a negative calcium balance
    b. Disruption of erythrocyte, leukocyte, and thrombocyte production

B. Medical management
1. Drug therapy
    a. Analgesics for bone pain
    b. Chemotherapy (melphalan [Alkeran] and cyclophosphamide [Cytoxan]) to reduce tumor mass; may intensify the pancytopenia to which these clients are prone; requires careful monitoring of laboratory studies
    c. Antibiotics to treat infections
    d. Gammaglobulin for infection prophylaxis
    e. Corticosteroids and mithramycin for severe hypercalcemia
2. Radiation therapy to reduce tumor mass and for palliation of bone pain
3. Transfusion therapy

C. Assessment findings
1. Headache and bone pain increasing with activity
2. Pathologic fractures
3. Skeletal deformities of sternum and ribs
4. Loss of height (spinal column shortening)
5. Osteoporosis
6. Renal calculi
7. Anemia, hemorrhagic tendencies, and increased susceptibility to infection
8. Hypercalcemia
9. Renal dysfunction secondary to obstruction of convoluted tubules by coagulated protein particles
10. Neurologic dysfunction: spinal cord compression and paraplegia
11. Laboratory tests
    a. Radiologic: diffuse bone lesions, widespread demineralization, osteoporosis, osteolytic lesions of skull
    b. Bone marrow; many immature plasma cells; depletion of other cell types
    c. CBC: reduced Hgb, WBC, and platelet counts
    d. Serum globulins elevated
    e. Bence-Jones protein: positive (abnormal globulin that appears in the urine of clients with multiple myeloma and other bone tumors)

D. Nursing interventions
1. Provide comfort measures to help alleviate bone pain.
2. Encourage ambulation to slow demineralization process.
3. Promote safety as clients are prone to pathologic and other fractures.
4. Encourage fluids: 3000–4000 mL/day to counteract calcium overload and to prevent protein from precipitating in the renal tubules.
5. Provide nursing care for clients with bleeding tendencies and susceptibility to infection.
6. Provide a supportive atmosphere to enhance communication and reduce anxiety.

7. Provide client teaching and discharge planning concerning
   a. Crucial importance of long-term hydration to prevent urolithiasis and renal obstruction
   b. Safety measures vital to decrease the risk of injury
   c. Avoidance of crowds or sources of infection if leukopenic

Polycythemia Vera

A. General information
   1. An increase in both the number of circulating erythrocytes and the concentration of Hgb within the blood
   2. Three forms: polycythemia vera, secondary polycythemia, and relative polycythemia
   3. Classified as a myeloproliferative disorder (bone marrow overgrowth)
   4. Cause unknown, but thought to be a form of malignancy similar to leukemia
   5. Usually develops in middle age, common in Jewish men
   6. Pathophysiology
      a. A pronounced increase in the production of erythrocytes accompanied by an increase in the production of myelocytes (leukocytes within bone marrow) and thrombocytes.
      b. The consequences of this overproduction are an increase in blood viscosity, an increase in total blood volume (2–3 times greater than normal), and severe congestion of all tissues and organs with blood.

B. Assessment findings
   1. Ruddy complexion and duskiness of mucosa secondary to capillary congestion in the skin and mucous membranes
   2. Hypertension associated with vertigo, headache, and "fullness" in the head secondary to increased blood volume
   3. Symptoms of HF secondary to overwork of the heart
   4. Thrombus formation: CVA, MI, gangrene of the extremities, DVT, and pulmonary embolism can occur
   5. Bleeding and hemorrhage secondary to congestion and overdistension of capillaries and venules
   6. Hepatomegaly and splenomegaly
   7. Peptic ulcer secondary to increased gastric secretions
   8. Gout secondary to increased uric acid released by nucleoprotein breakdown
   9. Laboratory tests
      a. CBC: increase in all mature cell forms (erythrocytes, leukocytes, and platelets)
      b. HCT: increased
      c. Bone marrow: increase in immature cell forms
      d. Bilirubin (indirect): increase in unconjugated fraction
      e. Liver enzymes may be increased
      f. Uric acid increased
      g. Hematuria and melena possible

C. Nursing interventions
   1. Monitor for signs and symptoms of bleeding complications.
   2. Force fluids and record I&O.
   3. Prevent development of DVT.
   4. Monitor for signs and symptoms of CHF.
   5. Provide care for the client having a phlebotomy.
   6. Prevent/provide care for bleeding or infection complications.
   7. Administer medications as ordered.
      a. Radioactive phosphorus (^{32}P): reduction of erythrocyte production, produces a remission of 6 months to 2 years
      b. Nitrogen mustard, busulfan (Myleran), chlorambucil, cyclophosphamide to effect myelosuppression
      c. Antigout and peptic ulcer drugs as needed.
   8. Provide client teaching and discharge planning concerning
      a. Decrease in activity tolerance, need to space activity with periods of rest
      b. Phlebotomy regimens: outclient frequency is determined by HCT; importance of long-term therapy
      c. High fluid intake
      d. Avoidance of iron-rich foods to avoid counteracting the therapeutic effects of phlebotomy
      e. Recognition and reporting of bleeding
      f. Need to avoid persons with infections, especially in leukopenic clients.

Leukemia

See Unit 5.

Hodgkin's and Non-Hodgkin's Lymphoma

See Unit 5.

Sample Questions

218. A client is admitted to the hospital with a bleeding ulcer and is to receive 4 units of packed cells. Which nursing intervention is of PRIMARY importance in the administration of blood?

1. Checking the flow rate.
2. Identifying the client.
3. Monitoring the vital signs.
4. Maintaining blood temperature.

219. Within 20 minutes of the start of transfusion, the client develops a sudden fever. What is the nurse's first action?

1. Force fluids.
2. Continue to monitor the vital signs.
3. Increase the flow rate of IV fluids.
4. Stop the transfusion.

220. A male client who is HIV positive is admitted to the hospital with a diagnosis of *Pneumocystis carinii* pneumonia. His live-in partner has accompanied him. During the history interview, the nurse is aware of feeling a negative attitude about the client's lifestyle, what action is most appropriate?

1. Share these feelings with the client.
2. Develop a written interview form.
3. Avoid eye contact with the client.
4. Discuss the negative feelings with the charge nurse.

221. What should the client at risk for developing AIDS be advised to do?

1. Abstain from anal intercourse.
2. Have an ELISA test for antibodies.
3. Have a semen analysis done.
4. Inform all sexual contacts.

222. A client who is HIV positive should have the mouth examined for which oral problem common associated with AIDS?

1. Halitosis.
2. Carious teeth.
3. Creamy white patches.
4. Swollen lips.

223. The nurse is caring for a client who is HIV positive. To prevent the spread of the HIV virus, what do the Centers for Disease Control and Prevention (CDC) recommend?

1. Universal blood and body fluid precautions.
2. Laminar flow rooms during active infection.
3. Body systems isolation.
4. Needle and syringe precautions.

224. An adult has been diagnosed with some type of anemia. The results of his blood tests showed: decreased WBC, normal RBC, decreased HCT, decreased Hgb. Based on these data, which of the following nursing diagnoses should the nurse prioritize as being the most important?

1. Potential for infection.
2. Alteration in nutrition.
3. Self-care deficit.
4. Fluid volume excess.

225. A client has the following blood lab values:

Platelets 50,000/uL
RBCs 3.5 ($\times 10^6$)
Hemoglobin 10 g/dL
Hematocrit 30%
WBCs 10,000/uL

Which nursing instruction should be included in the teaching plan?

1. Bleeding precautions.
2. Seizure precautions.
3. Isolation to prevent infection.
4. Control of pain with analgesics.

226. A hospitalized client has the following blood lab values:

WBC 3,000/uL
RBC 5.0 ($\times 10^6$)
platelets 300,000

What would be a priority nursing intervention?

1. Preventing infection.
2. Controlling blood loss.
3. Alleviating pain.
4. Monitoring blood transfusion reactions.

227. A man's blood type is AB and he requires a blood transfusion. To prevent complications of blood incompatibilities, which blood type(s) may the client receive?

1. Type A or B blood only.
2. Type AB blood only.
3. Type O blood only.
4. Either type A, B, AB, or O blood.

228. Which nursing intervention is appropriate for the nurse to take when setting up supplies for a client who requires a blood transfusion?

1. Add any needed IV medication in the blood bag within one-half hour of planned infusion.
2. Obtain blood bag from laboratory and leave at room temperature for at least one hour prior to infusion.
3. Prime tubing of blood administration set with 0.9% NS solution, completely filling filter.
4. Use a small-bore catheter to prevent rapid infusion of blood products that may lead to a reaction.

229. A client who is receiving a blood transfusion begins to experience chills, shortness of breath, nausea, excessive perspiration, and a vague sense of uneasiness. What is the nurse's first best action?

1. Report the signs and symptoms to the physician.
2. Stop the transfusion.

3. Monitor the client's vital signs.
4. Assess respiratory status.

230. A client with iron deficiency anemia is ordered parenteral iron to be given intramuscularly. Which of the following actions should the nurse take in the preparation/administration of this medication?
1. Use the same large (19–20) gauge needle for drawing up the medication and injecting it.
2. Inject medication into the upper arm muscle.
3. Use a 1-inch needle to administer the medication.
4. Use the Z-track technique to administer the medication.

231. The nurse has been teaching an adult who has iron deficiency anemia about those foods that she needs to include in her meal plans. Which of the following, if selected, would indicate to the nurse that the client understands the dietary instructions?
1. Citrus fruits and green leafy vegetables.
2. Bananas and nuts.
3. Coffee and tea.
4. Dairy products.

232. In assessing clients for pernicious anemia, the nurse should be alert for which of the following risk factors?
1. Positive family history.
2. Acute or chronic blood loss.
3. Infectious agents or toxins.
4. Inadequate dietary intake.

233. A client has been scheduled for a Schilling test. What instruction will the nurse give the client?
1. Take nothing by mouth for 12 hours prior to the test.
2. Collect his urine for 12 hours.
3. Administer a fleets enema the evening before the test.
4. Empty his bladder immediately before the test.

234. A 40-year-old woman with aplastic anemia is prescribed estrogen with progesterone. The nurse can expect that these medications are given for which of the following reasons?
1. To stimulate bone growth.
2. To regulate fluid balance.
3. To enhance sodium and potassium absorption.
4. To promote utilization and storage of fluids.

235. Which of the following lab value profiles should the nurse know to be consistent with hemolytic anemia?
1. Increased RBC, decreased bilirubin, decreased hemoglobin and hematocrit, increased reticulocytes.
2. Decreased RBC, increased bilirubin, decreased hemoglobin and hematocrit, increased reticulocytes.
3. Decreased RBC, decreased bilirubin, increased hemoglobin and hematocrit, decreased reticulocytes.
4. Increased RBC, increased bilirubin, increased hemoglobin and hematocrit, decreased reticulocytes.

236. A client is admitted for a splenectomy. What problem is the nurse aware that could develop?
1. Infection.
2. Congestive heart failure.
3. Urinary retention.
4. Viral hepatitis.

237. An adult is diagnosed with disseminated intramuscular coagulation (DIC). The nurse should identify that the client is at risk for which of the following nursing diagnoses?
1. Risk for increased cardiac output related to fluid volume excess.
2. Disturbed sensory perception related to bleeding into tissues.
3. Alteration in tissue perfusion related to bleeding and diminished blood flow.
4. Risk for aspiration related to constriction of the respiratory musculature.

238. A client diagnosed with DIC is ordered heparin. What is the reason for this medication?
1. Prevent clot formation.
2. Increase blood flow to target organs.
3. Increase clot formation.
4. Decrease blood flow to target organs.

239. A 34-year-old client is diagnosed with AIDS. His pharmacologic management includes zidovudine (AZT). During a home visit, the client states, "I don't understand how this medication works. Will it stop the infection?" What is the nurse's best response?
1. "The medication helps to slow the disease process, but it won't cure or stop it totally."
2. "The medication blocks reverse transcriptase, the enzyme required for HIV replication."

3. "Don't you know? There aren't any medications to stop or cure HIV."
4. "No, it won't stop the infection. In fact, sometimes the HIV can become immune to the drug itself."

240. Which statement, from a participant attending a class on AIDS prevention, indicates an understanding of how to reduce transmission of HIV?

1. "Mothers who are HIV-positive should still be encouraged to breastfeed their babies because breast milk is superior to cow's milk."
2. "I think a needle exchange program, where clean needles are exchanged for dirty needles, should be offered in every city."
3. "Females taking birth control pills are protected from getting HIV."
4. "It's okay to use natural skin condoms since they offer the same protection as the latex condoms."

241. What should be included in the teaching plan to young adults about the spread of AIDS?

1. Heterosexual transmission of HIV is on the rise.
2. The increase of HIV in children is primarily attributed to the rise in sexual abuse.
3. Herpes zoster is a form of the HIV virus.
4. Transmission of HIV by IV drug users is prominent even when sterile equipment is used.

242. What orders would likely be included for a client diagnosed with multiple myeloma?

1. Bed rest.
2. Corticosteroid therapy.
3. Fluid restrictions.
4. Calcium replacement therapy.

243. Which client statement would indicate to the nurse that the client with polycythemia vera is in need of further instruction?

1. "I'll be flying overseas to see my son and grandchildren for the holidays."
2. "I plan to do my leg exercises at least three times a week."
3. "I'm going to be walking in the mall every day to build up my strength."
4. "At night when I sleep, I like to use two pillows to raise my head up."

Answers and Rationales

218. 2. The most important consideration in transfusion therapy is to give the correct blood product to the correct client.

219. 4. Sudden development of fever during a blood transfusion may be indicative of a pyrogenic reaction. The most appropriate nursing action is to discontinue the blood flow to prevent a more severe reaction.

220. 4. When performing the interview, it is important to communicate an attitude of trust. If the nurse senses negative feelings with a client, it is necessary to share this information with the charge nurse, who will obtain a more accurate assessment. This strategy also provides the opportunity for the nurse to seek the counsel of others.

221. 2. The ELISA test detects the presence of antibodies to the AIDS virus and is a useful screening tool. It is not a definitive diagnostic test but provides additional information for the high-risk individual.

222. 3. Creamy white patches indicating an opportunistic infection (candidiasis) are often seen in the client with AIDS.

223. 1. Universal blood and body fluid precautions, general infection control outlines, and disease-specific measures are recommended by the CDC for AIDS and AIDS-related infections.

224. 1. These blood values are consistent with a diagnosis of aplastic anemia in which the nurse's primary goals are to prevent complications from infection and hemorrhage. Whenever WBC blood levels are low, this should cue the nurse to recognize that the client's immune system is weakened and the potential for infection is great.

225. 1. The RBCs are decreased (normal 4.5–5.0), which is associated with either the decreased production of RBCs, increased destruction of RBCs, or blood loss. Both hemoglobin (normal 12–18) and hematocrit (normal 38–54) values are subsequently decreased. Low platelets (normal 150,000–400,000) are most frequently associated with a tendency to bleed. These factors support the need for the nurse to monitor the client closely for bleeding problems.

226. **1.** The WBC is very low (normal 4,000–11,000). This indicates that the client's immune system is deficient and the client is subject to infection.

227. **4.** Persons with type AB blood, because they are universal blood recipients, are able to receive either type A, B, AB, or O blood. People with any blood type other than AB, are restricted as to the type of blood they can receive.

228. **3.** The tubing is primed with 0.9% NS solution. If the filter is not completely primed, debris will coagulate in the filter and the transfusion will be slowed. In addition, saline is prepared to infuse in case a transfusion reaction occurs.

229. **2.** The signs and symptoms the client is experiencing are indicative of a transfusion reaction and the transfusion must first be discontinued.

230. **4.** A Z-track injection technique should be used to prevent leakage of the iron to subcutaneous tissues.

231. **1.** Dark, leafy green vegetables (as well as meats, eggs, legumes, and whole-grain or enriched breads and cereals) are rich in iron. In addition, both citrus foods and green leafy vegetables are high in vitamin C, which aids in iron absorption.

232. **1.** There is a familial predisposition for pernicious anemia, and although the disease cannot be prevented, it can be controlled if detected and treated early. Pernicious anemia occurs as a result of the lack of the protein intrinsic factor that is secreted by the gastric mucosa.

233. **1.** The client is to fast for 12 hours prior to the test. No food or drink is permitted. Following administration of the vitamin B_{12} dose, food is delayed for 3 hours.

234. **1.** In aplastic anemia, the bone marrow elements (erythrocytes, leukocytes, and platelets) are suppressed. Treatments include, but are not limited to, bone marrow transplantation, transfusions to reduce symptomatology, and drugs to stimulate bone marrow function. Drugs like estrogen and progesterone work to stimulate bone growth. Estrogen and progesterone also stop menstruation so there is less blood loss.

235. **2.** Decreased RBCs are a result of the excessive destruction of the red blood cells. With this destruction, there is a subsequent decrease in both hemoglobin and hematocrit. In addition, this increased destruction causes an elevation in bilirubin levels. The reticulocyte count is high because the numbers of immature RBCs are increased when RBCs are being destroyed. This count reflects the bone marrow activity, which is active in producing RBCs to compensate for the destruction.

236. **1.** Following a splenectomy, immunologic deficiencies may develop, and vulnerability to infection is greatly increased. The postsplenectomy client is highly susceptible to infection from organisms such as *Pneumococcus*. A preventive measure is immunization with Pneumovax.

237. **3.** Cerebral, cardiopulmonary, and peripheral tissue perfusion is affected by DIC. The many clots can cause obstruction to blood flow and tissue damage can subsequently occur.

238. **1.** In DIC, the paradoxical events of hemorrhage and clotting occur. Although it may seem counterproductive to administer heparin while a client is bleeding, it is necessary to prevent the clotting that is simultaneously occurring in the microcirculation. It is critical that the client be monitored closely.

239. **1.** This statement answers the client's question in a simple, matter of fact manner that is truthful and to the point.

240. **2.** Although needle exchange programs are very controversial, it is evident the transmission of HIV can be significantly reduced when needle exchange programs are introduced.

241. **1.** Heterosexual transmission of HIV is a concern, especially in this age group. It is on the rise and this is often overlooked because the more known transmissions take place among homosexuals and IV drug abusers.

242. **2.** Corticosteroids may be added to the chemotherapy regime because of their antitumor effect. In addition, they assist in the excretion of calcium, which helps to treat the hypercalcemia that occurs in clients who have multiple myeloma.

243. **1.** With polycythemia vera, maintaining oxygenation is critical. High altitudes can precipitate hypoxia. This client needs further instruction.

The Respiratory System

OVERVIEW OF ANATOMY AND PHYSIOLOGY

Upper Respiratory Tract

Structures of the respiratory system, primarily an air conduction system, include the nose, pharynx, and larynx. Air is filtered, warmed, and humidified in the upper airway before passing to lower airway (see Figure 4-12).

Nose

A. External nose is a framework of bone and cartilage, internally divided into two passages or nares (nasal cavities) by the septum; air enters the system through the nares.
B. The septum is covered with a mucous membrane, where the olfactory receptors are located. Turbinates, located internally, assist in warming and moistening the air.
C. The major functions of the nose are warming, moistening, and filtering the air.

Pharynx

A. Muscular passageway commonly called the throat.
B. Air passes through the nose to the pharynx, composed of three sections

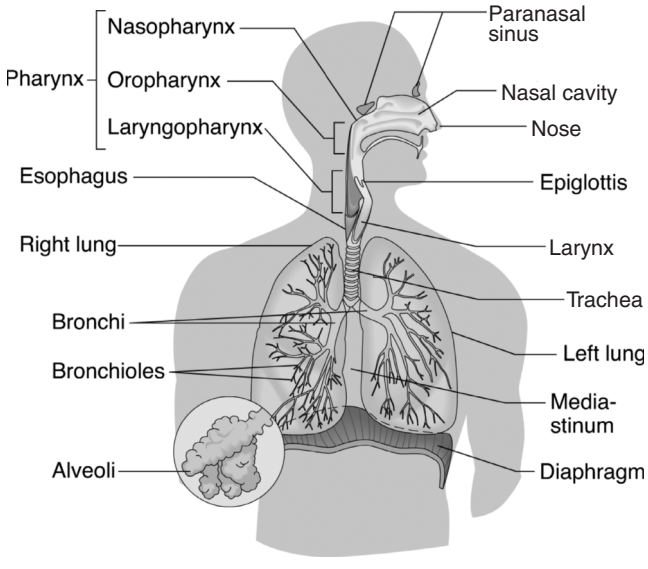


Figure 4–12 The respiratory system

1. Nasopharynx: located above the soft palate of the mouth, contains the adenoids and openings to the eustachian tubes.
2. Oropharynx: located directly behind the mouth and tongue, contains the palatine tonsils; air and food enter body through oropharynx.
3. Laryngopharynx: extends from the epiglottis to the sixth cervical level.

Larynx

A. Sometimes called "voice box," connects upper and lower airways; framework is formed by the hyoid bone, epiglottis, and thyroid, cricoid, and arytenoid cartilages. The opening of the larynx is called the glottis.
B. Larynx opens to allow respiration and closes to prevent aspiration when food passes through the pharynx.
C. Vocal cords of larynx permit speech and are involved in the cough reflex.

Lower Respiratory Tract

Consists of the trachea, bronchi and branches, and the lungs and associated structures (see Figure 4-12).

Trachea

A. Air moves from the pharynx to larynx to trachea (length 11–13 cm, diameter 1.5–2.5 cm in adult).
B. Extends from the larynx to the second costal cartilage, where it bifurcates and is supported by 16–20 C-shaped cartilage rings.
C. The area where the trachea divides into two branches is called the carina.

Bronchi

A. Formed by the division of the trachea into two branches (bronchi)
   1. Right mainstem bronchus: larger and straighter than the left; further divides into three lobar branches (upper, middle, and lower lobar bronchi) to supply the three lobes of right lung. If passed too far, endotracheal tube might enter right mainstem bronchus; only right lung is then intubated.
   2. Left mainstem bronchus: divides into the upper and lower lobar bronchi, to supply two lobes of left lung.
B. At the point a bronchus reaches about 1 mm in diameter it no longer has a connective tissue sheath and is called a bronchiole.

Bronchioles

A. In the bronchioles, airway patency is primarily dependent upon elastic recoil formed by network of smooth muscles.
B. The tracheobronchial tree ends at the terminal bronchioles. Distal to the terminal bronchioles the major function is no longer air conduction, but gas exchange between blood and alveolar air. The *respiratory bronchioles* serve as the transition to the alveolar epithelium.

Lungs (Right and Left)

A. Main organs of respiration, lie within the thoracic cavity on either side of the heart.
B. Broad area of lung resting on diaphragm is called the base; the narrow, superior portion is the apex.
C. Each lung is divided into lobes: three in the right lung, two in the left.
D. Pleura: serous membrane covering the lungs; continuous with the parietal pleura that lines the chest wall.
E. Lungs and associated structures are protected by the chest wall.

Chest Wall

A. Includes the rib cage, intercostal muscles, and diaphragm.
B. Parietal pleura lines the chest wall and secretes small amounts of lubricating fluid into the intrapleural space (space between the visceral and parietal pleura). This fluid holds the lung and chest wall together as a single unit while allowing them to move separately.
C. The chest is shaped and supported by 12 pairs of ribs and costal cartilages; the ribs have several attached muscles.
  1. Contraction of the external intercostal muscles raises the rib cage during inspiration and helps increase the size of the thoracic cavity.
  2. The internal intercostal muscles tend to pull ribs down and in and play a role in forced expiration.
D. The diaphragm is the major muscle of ventilation (the exchange of air between the atmosphere and the alveoli). Contraction of muscle fibers causes the dome of the diaphragm to descend, thereby increasing the volume of the thoracic cavity. As exertion increases, additional chest muscles or even abdominal muscles may be employed in moving the thoracic cage.

Pulmonary Circulation

A. Provides for reoxygenation of blood and release of CO_2; gas transfer occurs in the pulmonary capillary bed.
B. Pulmonary arteries arise from the right ventricle of the heart and continue to the bronchi and alveoli, gradually decreasing in size to capillaries.
C. The capillaries, after contact with the gas-exchange surface of the alveoli, reform to form the pulmonary veins.
D. The two pulmonary veins, superior and inferior, empty into the left atrium.

Gas Exchange

Alveolar Ducts and Alveoli

A. Alveolar ducts arise from the respiratory bronchioles and lead to the alveoli.
B. Alveoli are the functional cellular units of the lungs; about half arise directly from the alveolar ducts and are responsible for about 35% of alveolar gas exchange.
C. Alveoli produce surfactant, a phospholipid substance found in the fluid lining the alveolar epithelium. Surfactant reduces surface tension and increases the stability of the alveoli and prevents their collapse.
D. Alveolar sacs form the last part of the airway; functionally the same as the alveolar ducts, they are surrounded by alveoli and are responsible for 65% of the alveolar gas exchange.

ASSESSMENT

Health History

A. Presenting problem
  1. Nose/nasal sinuses: symptoms may include colds, discharge, epistaxis, sinus problems (swelling, pain)
  2. Throat: symptoms may include sore throat, hoarseness, difficulty swallowing, strep throat
  3. Lungs: symptoms may include
    a. Cough: note duration; frequency; type (dry, hacking, bubbly, barky, hoarse, congested); sputum (productive vs nonproductive); circumstances related to cough (time of day, positions, talking, anxiety); treatment.
    b. Dyspnea: note onset, severity, duration, efforts to treat, whether associated with radiation, if accompanied by cough or diaphoresis, time of day when it most likely occurs, interference with ADL, whether precipitated by any specific activities, whether accompanied by cyanosis.
    c. Wheezing
    d. Chest pain
    e. Hemoptysis
B. Lifestyle: smoking (note type of tobacco, duration, number per day, number of years of smoking, inhalation, related cough, desire to quit); occupation (work conditions that could irritate

respiratory system [asbestos, chemical irritants, dry-cleaning fumes] and monitoring or protection of exposure conditions); geographical location (environmental conditions that could irritate respiratory system [chemical plants/industrial pollutants]); type and frequency of exercise/recreation.

C. Nutrition/diet: fluid intake per 24-hour period; intake of vitamins

D. Past medical history: immunizations (yearly immunizations for colds/flu; frequency and results of tuberculin skin testing); allergies (foods, drugs, contact or inhalant allergens, precipitating factors, specific treatment, desensitization)

Physical Examination

A. Inspect for configuration of the chest (kyphosis, scoliosis, barrel chest) and cyanosis.

B. Determine rate and pattern of breathing (normal rate 12–18/minute); note tachypnea, hyperventilation, or labored breathing pattern.

C. Palpate skin, subcutaneous structures, and muscles for texture, temperature, and degree of development.

D. Palpate for tracheal position, respiratory excursion (symmetric or asymmetric movement of the chest), and for fremitus.

1. Fremitus is normally increased in intensity at second intercostal spaces at sternal border and interscapular spaces only.
2. Increased intensity elsewhere may indicate pneumonia, pulmonary fibrosis, or tumor.
3. Decreased intensity may indicate pneumothorax, pleural effusion, COPD.

E. Percuss lung fields (should find resonance over normal lung tissue, note hyperresonance or dullness) and for diaphragmatic excursion (normal distance between levels of dullness on full expiration and full inspiration is 6–12 cm).

F. Auscultate for normal (vesicular, bronchial, bronchovesicular) and adventitious (rales or crackles, rhonchi, pleural friction rub) breath sounds (see Figure 4-13).

Laboratory/Diagnostic Tests

A. Arterial blood gases (ABGs)

1. Measure base excess/deficit, blood pH, CO_2, total CO_2, O_2 content, O_2 saturation (SaO_2), pCO_2 (partial pressure of carbon dioxide), pO_2 (partial pressure of oxygen)
2. Nursing care
   - **a.** If drawn by arterial stick, place a 4 × 4 bandage over puncture site after withdrawal of needle and maintain pressure with two fingers for at least 2 minutes.
   - **b.** Gently rotate sample in test tube to mix heparin with the blood.
   - **c.** Place sample in ice-water container until it can be analyzed.

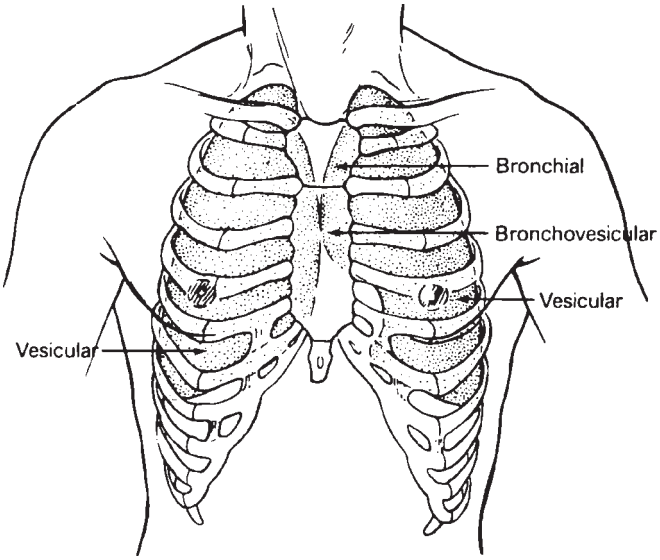


Figure 4–13 Locations for hearing normal breath sounds

B. Pulmonary function studies

1. Evaluation of lung volume and capacities by spirometry: tidal volume (TV), vital capacity (VC), inspiratory and expiratory reserve volume (IRV and ERV), residual volume (RV), inspiratory capacity (IC), functional residual capacity (FRC)
2. Involves use of a spirometer to diagram movement of air as client performs various respiratory maneuvers; shows restriction or obstruction to airflow, or both
3. Nursing care
   - **a.** Carefully explaining procedure will help allay anxiety and ensure cooperation.
   - **b.** Perform tests before meals.
   - **c.** Withhold medication that may alter respiratory function unless otherwise ordered.
   - **d.** After procedure assess pulse and provide for rest period.

C. Hematologic studies (ESR, Hgb and hct, WBC)

D. Sputum culture and sensitivity

1. Culture: isolation and identification of specific microorganism from a specimen
2. Sensitivity: determination of antibiotic agent effective against organism (sensitive or resistant)
3. Nursing care
   - **a.** Explain necessity of effective coughing.
   - **b.** If client unable to cough, heated aerosol will assist with obtaining a specimen.
   - **c.** Collect specimen in a sterile container that can be capped afterwards.
   - **d.** Volume need not exceed 1–3 mL.
   - **e.** Deliver specimen to lab rapidly.

E. Tuberculin skin test
  1. Intradermal test done to detect tuberculosis infection; does not differentiate active from dormant infections
  2. Purified protein derivative (PPD) tuberculin administered to determine any previous sensitization to tubercle bacillus
  3. Several methods of administration
    a. Mantoux test: 0.1 mL solution containing 0.5 tuberculin units of PPD-tuberculin is injected into the forearm.
    b. Tine test: a stainless steel disc with 4 tines impregnated with PPD-tuberculin is pressed into the skin.
  4. Results: read within 48–72 hours; inspect skin and circle zone of induration with a pencil; measure diameter in mm
    a. Negative: zone diameter less than 5 mm
    b. Doubtful or probable: zone diameter 5–10 mm
    c. Positive: zone diameter 10 mm or more

F. Thoracentesis
  1. Insertion of a needle through the chest wall into the pleural space to obtain a specimen for diagnostic evaluation, removal of pleural fluid accumulation, or to instill medication into the pleural space
  2. Nursing care: prior to procedure
    a. Confirm that a signed permit has been obtained.
    b. Explain procedure; instruct client not to cough or talk during procedure.
    c. Position client at side of bed, with upper torso supported on overbed table, feet and legs well supported. (See Figure 4-14)
    d. Assess vital signs.
  3. Nursing care: following procedure
    a. Observe for signs and symptoms of pneumothorax, shock, leakage at puncture site.
    b. Auscultate chest to ascertain breath sounds.

G. Bronchoscopy
  1. Insertion of a fiber-optic scope into the bronchi for diagnosis, biopsy, specimen collection, examination of structures/tissues, removal of foreign bodies
  2. Nursing care: prior to procedure
    a. Confirm that a signed permit has been obtained.
    b. Explain procedure, remove dentures, and provide good oral hygiene.
    c. Keep client NPO 6–12 hours pretest.
  3. Nursing care: following procedure
    a. Position client on side or in semi-Fowler's.
    b. Keep NPO until return of gag reflex.
    c. Assess for and report frank bleeding.
    d. Apply ice bags to throat for comfort; discourage talking, coughing, smoking for a few hours to decrease irritation.

Figure 4–14 Client position for thoracentesis

ANALYSIS

Nursing diagnoses for the client with a respiratory dysfunction may include:
A. Impaired gas exchange
B. Ineffective airway clearance
C. Ineffective breathing pattern
D. Impaired verbal communication
E. Activity intolerance
F. Anxiety
G. Imbalanced nutrition: less than body requirements
H. Risk for infection

PLANNING AND IMPLEMENTATION

Goals

A. Adequate ventilation will be maintained.
B. Maintenance of patent airway.
C. Effective breathing patterns will be maintained.
D. Client will communicate in an effective manner.
E. Client will demonstrate increased tolerance for activity.
F. Anxiety will be reduced.
G. Adequate nutritional status will be maintained.
H. Client remains free from infection.

Interventions

Chest Drainage Systems

A. Insertion of a catheter into the intrapleural space to maintain constant negative pressure when air/fluid have accumulated.

B. Chest tube is attached to underwater drainage to allow for the escape of air/fluid and to prevent reflux of air into the chest.

C. For evacuation of air, chest tube is placed in the second or third intercostal space, anterior or midaxillary line (air rises to the upper chest).

D. For drainage of fluid, chest tube is placed in the eighth or ninth intercostal space, midaxillary line.

E. Chest tube is connected to tubing for the collection system; the distal end of the collection tubing must be placed below the water level in order to prevent atmospheric air from entering the pleural space.

F. Traditional water-seal drainage; also known as wet suction; can be set up using one, two, or three bottles. No longer used in the United States because it has been replaced by the newer technology of dry-suction water-seal drainage. For explanatory purposes it is included here. Also may be used in other countries.

1. One-bottle system (Figure 4-15A)
   - **a.** Operates by gravity, not suction; the bottle serves as both collection chamber and water seal.
   - **b.** Two hollow tubes (glass rods) are inserted into the stopper of the bottle; the drainage tube is connected to the glass rod that is submerged approximately 2 cm below the water level; the second glass tube allows for the escape of air.
   - **c.** If considerable drainage accumulates it is difficult for the client to expel air and fluid from the pleural space. If this occurs, the glass rod may be pulled up or a new drainage bottle may be set up (according to physician's orders).
2. Two-bottle system (see Figure 4-15B,C)
   - **a.** One bottle serves as a drainage collection chamber, the other as a water seal.
   - **b.** The first bottle is the drainage collection chamber and has two short tubes in the rubber stopper. One of these tubes is attached to the drainage tubing coming from the client; the other is attached to the underwater tube of the second bottle (the water-seal bottle). The air vent of the water-seal bottle must be left open to atmospheric air. If suction is used, the first bottle serves as drainage collection and water-seal chamber, and the second bottle serves as the suction chamber.
3. Three-bottle system (Figure 4-15D)
   - **a.** This system has a drainage collection, a water-seal, and a suction-control bottle.
   - **b.** The third bottle controls the amount of pressure in the system. The suction-control bottle has three tubes inserted in the stopper, two short and one long. One short tube is joined with the tubing to the former air vent of the water-seal bottle; the second short tube is connected to suction. The third (long) tube (or suction-control tube) is located between the short tubes and has one end open to the atmosphere and the other below the water level.
   - **c.** The depth to which the suction-control tube is immersed controls the amount of pressure within the system. The pressure is determined by the physician.

G. Dry-suction water-seal drainage; also referred to as dry suction; has three chambers (collection chamber, water seal chamber, and wet suction control chamber) (see Figure 4-15E).

H. Dry-suction one-way valve system (also known as Heimlich Flutter Valve); allows unidirectional flow of air and fluid from pleural space, prevents reflux, sets up quickly in emergency, works when knocked over, works well for ambulatory clients.

I. Nursing care: without suction

1. Prepare the unit for use and connect the chest catheter to the drainage tubing.
2. Examine the entire system to ensure airtightness and absence of obstruction from kinks or dependent loops of tubing.
3. Note oscillation of the fluid level within the water-seal tube. It will rise on inspiration and fall on expiration due to changes in the intrapleural pressure. If oscillation stops and system is intact, notify physician.
4. Check the amount, color, and characteristics of the drainage. If drainage ceases and system is not blocked, assess for signs of respiratory distress from fluid/air accumulation.
5. Always keep drainage system lower than the level of the client's chest.
6. Keep Vaseline gauze at bedside at all times in case chest tube falls out.
7. Keep clamps at bedside in case of accidental disconnection. Clamp, troubleshoot, and immediately reconnect.
8. Encourage coughing and deep breathing to facilitate removal of air and drainage from pleural cavity.
9. Provide ROM exercises.

J. Nursing care: with suction

1. Attach suction tubing to suction apparatus, and chest catheter to drainage tubing.
2. Open suction slowly until a stream of bubbles is seen in the suction chamber. There should be continuous bubbling in this chamber and intermittent bubbling in the water seal. Check for an air leak in the system if bubbling in water seal is constant; notify physician if air leak.

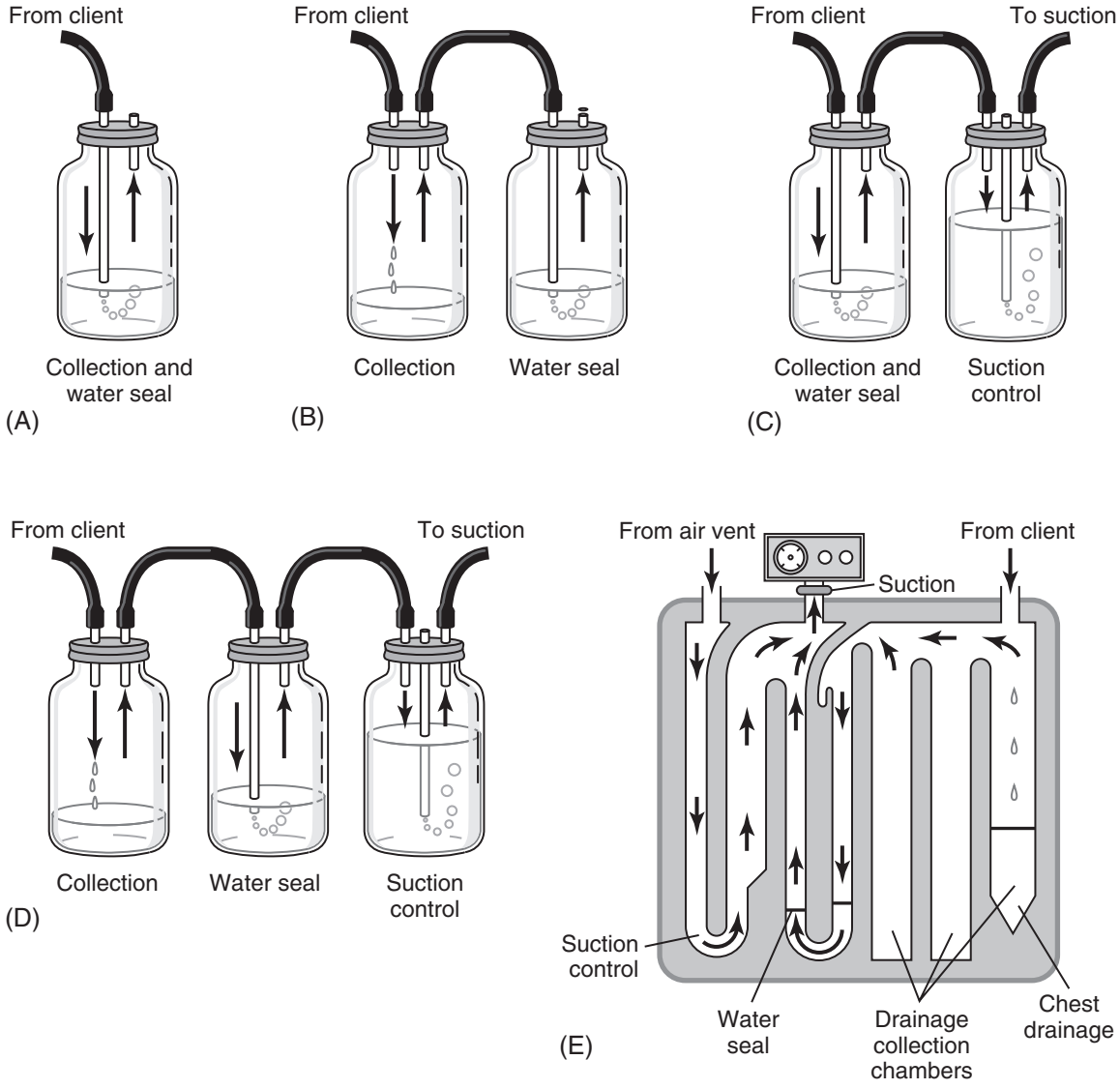


Figure 4–15 Water-seal drainage systems: (A) one-bottle system; (B) two-bottle system; (C) two-bottle system with suction; (D) three-bottle system; (E) underwater seal chest drainage device

3. Check drainage, keep drainage system below level of client's chest, keep Vaseline gauze at bedside, encourage coughing and deep breathing, and provide ROM exercises.

K. General principles of chest tube management:

1. Never clamp chest tubes over an extended period of time unless a specific order is written by the physician. Clamping the chest tubes of a client with air in the pleural space will cause increased pressure buildup and possible tension pneumothorax.
2. Removal of the chest tube: instruct the client to perform Valsalva maneuver; apply a Vaseline or gauze dressing to the site (per hospital protocol).
3. If the water-seal bottle should break, immediately obtain some type of fluid-filled container to create an emergency water seal until a new unit can be obtained.

Heimlich Flutter Valve

A. This disposable valve allows a unidirectional flow of air and fluid from the pleural space into a drainage bag and prevents any reflux of air or fluid. A water-seal drainage system is not necessary.

B. Controlled suction can be attached if ordered.

C. The valve is encased in clear plastic, which eliminates the possibility of kinks. Its small size, approximately 7 inches, permits greater mobility.

Chest Physiotherapy

A. General information
  1. Used for individuals with increased production of secretions or thick, sticky secretions, and for clients with impaired removal of secretions or with ineffective cough. May also be used as a preventive measure for clients with weakness of the muscles of respiration or a predisposition to increased production or thickness of secretions.
  2. Includes the techniques of postural drainage, percussion, and vibration.
    a. Postural drainage: uses gravity and various positions to stimulate the movement of secretions.
      1) Postural drainage positions are determined by the areas of involved lung, assessed by chest X-ray and physical assessment findings.
      2) Careful positioning is required to help secretions flow from smaller airways into the segmental bronchus and larger airways where secretions can be coughed up.
    b. Percussion: involves clapping with cupped hands on the chest wall over the segment to be drained.
      1) The hand is cupped by holding the fingers together so that the shape of the hand conforms with chest wall.
      2) Clapping should be vigorous but not painful.
    c. Vibration: in this technique the hand is pressed firmly over the appropriate segment of chest wall, and muscles of upper arm and shoulder are tensed (isometric contraction); done with flattened, not cupped hand; mechanical vibration is performed by a hand-held instrument.

B. Nursing care
  1. Perform procedure before or 3 hours after meals.
  2. Administer bronchodilators about 20 minutes before procedure.
  3. Remove all tight/constricting clothing.
  4. Have all equipment available (tissues, emesis basin, towel, paper bag).
  5. Assist client to correct prescribed position for postural drainage (client to assume each postural drainage position for approximately 3–5 minutes).
  6. Place towel over area to be percussed.
  7. Instruct client to take several deep breaths.
  8. Percuss designated area for approximately 3 minutes during inspiration and expiration.
  9. Vibrate same designated area during exhalations of 4–5 deep breaths.
  10. Assist client with coughing when in postural drainage position; some clients may need to sit upright to produce a cough.
  11. Repeat the same procedure in all designated positions.
  12. After procedure, assist client to comfortable position and provide good oral hygiene.

Mechanical Ventilation

A. General information
  1. Ventilation is performed by mechanical means in individuals who are unable to maintain normal levels of oxygen and carbon dioxide in the blood.
  2. Indicated in clients with COPD, obesity, neuromuscular disease, severe neurologic depression, thoracic trauma, ARDS; clients who have undergone thoracic or open-heart surgery are likely to be maintained on mechanical ventilation post-op.

B. Types (positive pressure ventilators)
  1. Positive pressure-cycled ventilator: pushes air into the lungs until a predetermined pressure is reached within the tracheobronchial tree; expiration occurs by passive relaxation of the diaphragm.
  2. Volume-cycled ventilator: most popular type for intubated adults and older children; delivers air into the lungs until a certain predetermined tidal volume is reached before terminating inspiration.
  3. Time-cycled ventilator: terminates inspiration after a preset time; tidal volume is regulated by adjusting length of inspiration and flow rate of pressurized gas.

C. Modes of mechanical ventilation
  1. Assist/control mode: client's inspiratory effort triggers ventilator, which then delivers breath; may be set to deliver breath automatically if client does not trigger it. The same tidal volume is delivered with each breath.
  2. Intermittent mandatory ventilation (IMV): client may breathe at own rate. IMV breaths are delivered under positive pressure; however, all other respirations taken by the client are delivered at ambient pressure and tidal volume is of client's own determination.
  3. Positive end expiratory pressure (PEEP): ventilator delivers additional positive pressure at the end of expiration, which maintains the alveoli in an expanded state.
  4. Controlled mandatory ventilation (CMV): all breaths initiated by ventilator as there is no pressure sensed by the machine. Same tidal volume is delivered with each breath.
  5. Continuous positive airway pressure (CPAP): achieves the same results as PEEP, except CPAP is used on adult clients who are on a T-piece.
  6. Pressure support (PS): client's inspiratory efforts trigger each breath; every breath ventilator assisted without dyssynchrony, which can occur with SIMV. Often used prior to extubation.

D. Nursing care
1. Assess for decreased cardiac output and administer appropriate nursing care.
2. Monitor for positive water balance. Pressure breathing may cause increase in antidiuretic hormone (ADH) and retention of water.
   a. Maintain accurate I&O.
   b. Assess daily weights.
   c. Take PCWP readings as ordered.
   d. Palpate for peripheral edema.
   e. Auscultate chest for altered breath sounds.
3. Monitor for barotrauma (see Tension Pneumothorax).
   a. Assess ventilator settings every 4 hours.
   b. Auscultate breath sounds every 2 hours.
   c. Monitor ABGs.
   d. Perform complete pulmonary physical assessment every shift.
4. Monitor for GI problems (stress ulcer).
5. Administer muscle relaxants, tranquilizers, analgesics, or paralyzing agents as ordered to increase client-machine synchrony by relaxing the client.

Oxygen Therapy

A. Most common therapy for clients with respiratory disease
B. Indications include arterial hypoxemia; COPD; ARDS; tissue, cellular, and circulatory hypoxia
C. Delivery systems
1. Low-flow system: delivers oxygen at variable liter flows designed to add to client's inspired air.
   a. Nasal cannula
      1) Most common mode of oxygen delivery; consists of delivering 100% oxygen through two prongs inserted 1 cm into each nostril; general flow rates of 1–4 liters/minute are used with desired FiO_2 range of 24–40%.
      2) Nursing care
         a) Instruct client to breathe through the nose.
         b) Remove cannula and clean nares every 8 hours.
         c) Provide mouth care every 2–3 hours.
         d) Use gauze pads behind ears to decrease irritation.
         e) Assess arterial pO_2 frequently.
   b. Standard mask
      1) Simple face mask that covers the nose and mouth and provides an additional area for oxygen collection; ranges: 6–12 liters/minute; FiO_2: 40–65%.
      2) Nursing care
         a) Instruct client to breathe through the nose.
         b) Remove and clean mask every 2–3 hours.
         c) Monitor carefully in clients who are prone to develop obstructed airways.
         d) Replace mask with nasal cannula during meals and reposition mask immediately after eating.
   c. Nonrebreathing mask
      1) Standard mask with a reservoir bag designed to deliver 90–100% oxygen; a one-way valve between reservoir bag and mask allows the client to inhale only from the reservoir bag and exhale through separate valves on the side of the mask; ranges: 6–15 liters/minute; FiO_2: 60–90%.
      2) Nursing care
         a) Instruct client to breathe through the nose.
         b) Ensure that bag does not collapse completely with each inspiration.
         c) Remove and clean mask every 2–3 hours.
2. High-flow system: client receives entire inspired gas from the apparatus, flow rates must exceed the volume of air required for a person's minute ventilation; Venturi mask commonly used.
   a. Provides precise delivery of oxygen concentrations of 24–50%.
   b. Nursing care
      1) Provide supplemental oxygen by cannula during meals and other activities where mask interferes.
      2) Remove and clean mask every 2–3 hours.

Tracheobronchial Suctioning

A. Suction removal of secretions from the tracheobronchial tree using a sterile catheter inserted into the airway.
B. Catheters may be inserted through various routes: nasopharyngeal, oropharyngeal, or via an artificial airway.
C. Purposes
1. Maintain a patent airway through removal of secretions
2. Promote adequate exchange of oxygen/carbon dioxide
3. Substitute for effective coughing
4. Obtain a specimen for analysis

D. Procedure
1. Gather suctioning equipment (receptacle for secretions, sterile catheter, sterile gloves, and container of sterile normal saline), or use inline device for endotracheal tube suctioning.
2. Turn vacuum on and test suction system.
3. Place client in semi- to high-Fowler's position.
4. Apply sterile glove, fill sterile cup with solution, and attach sterile catheter to connecting tube.

5. Increase inspired oxygen concentration to highest point and hyperinflate the lungs before and after each catheter insertion by using self-inflating bag; have client deep breathe if able.
6. Use gloved hand to insert catheter.
   a. Oral route
      1) If oral airway in place, slide the catheter alongside it and back to the pharynx; if no oral airway in place, have client protrude the tongue and guide the catheter into the oropharynx.
      2) Insert during inspiration until cough is stimulated or secretion obtained.
   b. Nasal route: advance catheter along the floor of the nares or pass it through an artificial nasal airway (nasal trumpet) until cough is stimulated or secretions obtained.
   c. Artificial airway: insert the catheter into the artificial airway until cough is stimulated or secretions obtained.
7. Do not cover the thumb control and do not apply suction during insertion of the catheter.
8. During withdrawal, rotate the catheter while applying intermittent suction.
9. Whole suctioning procedure including insertion and removal of the catheter should not exceed 10 seconds.
10. If it is necessary to continue the suctioning process, hyperinflate the lungs, allow the client to rest briefly, and repeat the process.
11. Discard catheter, glove, and cup; record amount, color, characteristics of the secretions obtained; note client's tolerance of procedure.
12. Auscultate for changes in breath sounds.

Tracheostomy Care

A. Performed to avoid bacterial contamination and obstruction of tracheostomy tube; frequency varies depending on amount of secretions

B. Procedure
1. Explain procedure and provide reassurance to the client.
2. If not contraindicated, place client in semi-Fowler's position to promote lung reexpansion.
3. Disconnect ventilator or humidification device.
4. Suction trachea to clear secretions.
5. Reconnect ventilator or humidifier.
6. Remove all tracheostomy dressing.
7. Assemble equipment ("trach care kit").
8. Set up sterile field and put on sterile glove.
   a. For a single-cannula tube
      1) With sterile gloved hand, wipe client's neck under trach tube flanges with presoaked sterile sponge.
      2) Wipe skin around tracheostomy with a second sponge until cleansed thoroughly (may use wet cotton-tipped applicators to cleanse around stoma).
      3) Use each sponge or applicator only once.
      4) Allow area to dry and apply a new sterile dressing (free of lint and fibers).
      5) Change tracheostomy ties as needed.
   b. For a double-cannula tube (nondisposable inner cannula)
      1) Disconnect ventilator or humidification device and unlock the inner cannula of trach tube using ungloved hand.
      2) Place inner cannula in basin containing H_2O_2 to remove encrustations.
      3) If client on a ventilator, insert another inner cannula while old one is being cleaned and reconnect client to ventilator.
      4) Cleanse stomal area and trach tube flanges with presoaked gauze sponges.
      5) Clean inner cannula.
      6) Remove excess liquid by gentle shaking.
      7) If client not on a ventilator, gently reinsert inner cannula into tracheostomy tube and lock in place.
      8) Allow area to dry, apply dressing and new tracheostomy ties as described above.
   c. For a double-cannula tube (disposable inner cannula)
      1) Disconnect ventilator tube.
      2) Remove inner cannula.
      3) Insert replacement cannula.
      4) Cleanse stomal area and trach tube flanges with presoaked gauze sponges.
      5) Allow area to dry, apply dressing and new tracheostomy ties as described above.

EVALUATION

A. Client demonstrates ABGs or O_2 saturation within normal limits; absence of dyspnea and cyanosis; usual or improved breath sounds and usual mentation.

B. Client demonstrates effective coughing with expectoration of secretions; absence of dyspnea; rate and depth of ventilation within normal range; improved breath sounds.

C. ABGs or O_2 saturation within normal range; lungs clear to auscultation; rate and depth of respirations within client's normal range; effective use of muscles of respiration.

D. Client identifies plans for appropriate alternate speech methods.

E. Client demonstrates increased activity tolerance with absence of dyspnea and excessive fatigue and vital signs within normal limits.

F. Improved rest/sleep patterns; respiratory rate and rhythm within client's normal range; demonstrates effective problem-solving abilities.
G. Client demonstrates behaviors/lifestyle changes to regain and maintain appropriate body weight. Verbalizes importance of nutrition to general well-being. Stable weight; improved anthropometric measurements.
H. Vital signs within client's normal range; client verbalizes understanding of causative/risk factors and utilizes techniques to promote a safe environment.

DISORDERS OF THE RESPIRATORY SYSTEM

Chronic Obstructive Pulmonary Disease (COPD)

Refers to respiratory conditions that produce obstruction of airflow; includes emphysema, bronchitis, and bronchiectasis. Asthma is now considered a separate disorder because it is often reversible.

Emphysema

A. General information
  1. Enlargement and destruction of the alveolar, bronchial, and bronchiolar tissue with resultant loss of recoil, air trapping, thoracic overdistension, sputum accumulation, and loss of diaphragmatic muscle tone
  2. These changes cause a state of carbon dioxide retention, hypoxia, and respiratory acidosis.
  3. Caused by cigarette smoking, infection, inhaled irritants, heredity, allergic factors, aging
B. Assessment findings
  1. Anorexia, fatigue, weight loss, clubbing (bulbous enlargement of distal fingers/nails)
  2. Feeling of breathlessness, cough, sputum production, flaring of the nostrils, use of accessory muscles of respiration, increased rate and depth of breathing, dyspnea
  3. Decreased respiratory excursion, resonance to hyperresonance, decreased breath sounds with prolonged expiration, normal or decreased fremitus
  4. Diagnostic tests: pCO_2 elevated or normal; pO_2 normal or slightly decreased
C. Nursing interventions
  1. Administer medications as ordered.
    a. Bronchiodilators: aminophylline, isoproterenol (Isuprel), terbutaline (Brethine), metaproterenol (Alupent), theophylline, isoetharine (Bronkosol); used in treatment of bronchospasm
    b. Antimicrobials: tetracycline, ampicillin to treat bacterial infections
    c. Corticosteroids: prednisone
  2. Facilitate removal of secretions.
    a. Ensure fluid intake of at least 3 liters/day.
    b. Provide (and teach client) chest physical therapy, coughing and deep breathing, and use of hand nebulizers.
    c. Suction as needed.
    d. Provide oral hygiene after expectoration of sputum.
  3. Improve ventilation.
    a. Position client in semi- or high-Fowler's.
    b. Instruct client to use diaphragmatic muscle to breathe.
    c. Encourage productive coughing after all treatments (splint abdomen to help produce more expulsive cough).
    d. Employ pursed-lip breathing techniques (prolonged, slow relaxed expiration against pursed lips).
    e. Oxygen delivery is used with caution, usually via nasal cannula keeping pulse oximetry at or above 90% (keep oxygen flow rate low to prevent suppressing respiratory drive).
  4. Provide client teaching and discharge planning concerning
    a. Prevention of recurrent infections
      1) Avoid crowds and individuals with known infection.
      2) Adhere to high-protein, high-carbohydrate, increased vitamin C diet.
      3) Receive immunizations for influenza and pneumonia.
      4) Report changes in characteristics and color of sputum immediately.
      5) Report worsening of symptoms (increased tightness of chest, fatigue, increased dyspnea).
    b. Control of environment
      1) Use home humidifier at 30–50% humidity.
      2) Wear scarf over nose and mouth in cold weather to prevent bronchospasm.
      3) Avoid smoking and contact with environmental smoke.
      4) Avoid abrupt changes in temperature.
    c. Avoidance of inhaled irritants
      1) Stay indoors if pollution levels are high.
      2) Use air conditioner with high-efficiency particulate air filter to remove particles from air.
    d. Increasing activity tolerance
      1) Start with mild exercises, such as walking, and gradually increase amount and duration.
      2) Use breathing techniques (pursed lip, diaphragmatic) during

activities/exercises to control breathing.
3) Have oxygen available as needed to assist with activities.
4) Plan activities that require low amounts of energy.
5) Plan rest periods before and after activities.

Bronchitis

A. General information
  1. Excessive production of mucus in the bronchi with accompanying persistent cough.
  2. Characteristic changes include hypertrophy/hyperplasia of the mucus-secreting glands in the bronchi, decreased ciliary activity, chronic inflammation, and narrowing of the small airways.
  3. Caused by the same factors that cause emphysema.
B. Medical management: drug therapy includes bronchodilators, antimicrobials, expectorants (e.g., Robitussin)
C. Assessment findings
  1. Productive (copious) cough, dyspnea on exertion, use of accessory muscles of respiration, scattered rales and rhonchi
  2. Feeling of epigastric fullness, slight cyanosis, distended neck veins, ankle edema
  3. Diagnostic tests: increased pCO_2, decreased pO_2
D. Nursing interventions: same as for emphysema

Bronchiectasis

A. General information
  1. Permanent abnormal dilation of the bronchi with destruction of muscular and elastic structure of the bronchial wall
  2. Caused by bacterial infection; recurrent lower respiratory tract infections; congenital defects (altered bronchial structures); lung tumors; thick, tenacious secretions
B. Medical management: same as for emphysema
C. Assessment findings
  1. Chronic cough with production of mucopurulent sputum, hemoptysis, exertional dyspnea, wheezing
  2. Anorexia, fatigue, weight loss
  3. Diagnostic tests
    a. Bronchoscopy reveals sources and sites of secretions
    b. Possible elevation of WBC
D. Nursing interventions: same as for emphysema

Asthma

See Unit 5.

Pulmonary Tuberculosis

A. General information
  1. Bacterial infectious disease caused by *M. tuberculosis* and spread via airborne droplets when infected persons cough, sneeze, or laugh.
  2. Once inhaled, the organisms implant themselves in the lung and begin dividing slowly, causing inflammation, development of the primary tubercle, and eventual caseation and fibrosis.
  3. Infection spreads via the lymph and circulatory systems.
  4. The CDC (2006) reports that the highest incidence is in foreign-born persons and racial/ethnic minority populations (Hispanics, African Americans, Asians). Socially and economically disadvantaged, alcoholic, and malnourished individuals are affected more often.
  5. The causative agent, *M. tuberculosis*, is an acid-fast bacillus spread via droplet nuclei from infected persons.
B. Assessment findings
  1. Cough (yellow mucoid sputum), dyspnea, hemoptysis, rales or crackles
  2. Anorexia, malaise, weight loss, afternoon low-grade fever, pallor, pain, fatigue, night sweats
  3. Diagnostic tests
    a. Chest X-ray indicates presence and extent of disease process but cannot differentiate active from inactive form
    b. Skin test (PPD) positive; area of induration 10 mm or more in diameter after 48 hours
    c. Sputum positive for acid-fast bacillus (three samples is diagnostic for disease)
    d. Culture positive
    e. WBC and ESR increased
C. Nursing interventions
  1. Administer medications as ordered (see Unit 2).
  2. Prevent transmission.
    a. Strict isolation not required if client/significant others adhere to special respiratory precautions for tuberculosis.
    b. Client should be in a well-ventilated private room, with the door kept closed at all times.
    c. All visitors and staff should wear masks when in contact with the client and should discard the used masks before leaving the room; client should wear a mask when leaving the room for tests.
    d. All specimens should be labeled "AFB precautions."
    e. Handwashing is required after direct contact with the client or contaminated articles.
  3. Promote adequate nutrition.
    a. Make ongoing assessments of client's appetite and do kcal counts for 3 days; consult dietitian for diet guidelines.

b. Offer small, frequent feedings and nutritional supplements; assist client with menu selection stressing balanced nutrition.
c. Weigh client at least twice a week.
d. Encourage activity as tolerated to increase appetite.

4. Prevent social isolation.
   a. Impart a comfortable, confident attitude when caring for the client.
   b. Explain the nature of the disease to the client, significant others, and visitors in simple terms.
   c. Stress that visits are important, but isolation precautions must be followed.
5. Vary the client's routine to prevent boredom.
6. Discuss the client's feelings and assess for boredom, depression, anxiety, fatigue, or apathy; provide support and encourage expression of concerns.
7. Provide client teaching and discharge planning concerning:
   a. Medication regimen: prepare a sheet with each drug name, dosage, time due, and major side effects; stress importance of following medication schedule for prescribed period of time (usually 9 months); include significant others
   b. Transmission prevention: client should cover mouth when coughing, expectorate into a tissue and place it in a paper bag; client should also wash hands after coughing or sneezing; stress importance of plenty of fresh air; include significant others
   c. Importance of notifying physician at the first sign of persistent cough, fever, or hemoptysis (may indicate recurrence)
   d. Need for follow-up care including physical exam, sputum cultures, and chest X-rays
   e. Availability of community health services
   f. Importance of high-protein, high-carbohydrate diet with inclusion of supplemental vitamins

Histoplasmosis

A. General information: a systemic fungal disease caused by inhalation of dust contaminated by Histoplasma capsulatum; fungus has been found in poultry house litter, caves, areas harboring bats, and in bird roosts.

B. Medical management: antifungal agent Amphotericin B
1. Very toxic: toxicity includes anorexia, chills, fever, headache, and renal failure
2. Acetaminophen, Benadryl, and steroids given with Amphotericin B to prevent reactions

C. Assessment findings
1. Symptoms similar to tuberculosis or pneumonia
   a. Cough
   b. Fever
   c. Joint pain
   d. Malaise
2. Sometimes asymptomatic
3. Diagnostic tests
   a. Chest X-ray (often appears similar to tuberculosis)
   b. Histoplasmin skin test (read the same as PPD)

D. Nursing interventions
1. Monitor respiratory status
2. Administer medications as ordered; observe for severe side effects of Amphotericin B: fever (acetaminophen given prophylactically), anaphylactic reaction (Benadryl and steroids given prophylactically), abnormal renal function with hypokalemia and azotemia.

Chest Trauma

Fractured Ribs

A. General information
1. Common chest injury resulting from blunt trauma.
2. Ribs 4–8 are most commonly fractured because they are least protected by chest muscles. Splintered or displaced fractured ribs may penetrate the pleura and lungs.

B. Medical management: drug therapy consists of narcotics, intercostal nerve block (injection of intercostal nerves above and below the injury with an anesthetic agent) for pain relief.

C. Assessment findings
1. Pain, especially on inspiration
2. Point tenderness and bruising at injury site, splinting with shallow respirations, apprehensiveness
3. Diagnostic tests
   a. Chest X-ray reveals area and degree of fracture
   b. pCO_2 elevated; pO_2 decreased (later)

D. Nursing interventions
1. Provide pain relief/control.
   a. Administer ordered narcotics and analgesics cautiously and monitor effects.
   b. Place client in semi- or high-Fowler's position to ease pain associated with breathing.
2. Monitor client closely for complications.
   a. Assess for bloody sputum (indicative of lung penetration).
   b. Observe for signs and symptoms of pneumothorax or hemothorax.

Flail Chest

A. General information
1. Fracture of several ribs and resultant instability of the affected chest wall.

2. Chest wall is no longer able to provide the bony structure necessary to maintain adequate ventilation; consequently, the flail portion and underlying tissue move paradoxically (in opposition) to the rest of the chest cage and lungs.
3. The flail portion is sucked in on inspiration and bulges out on expiration.
4. Result is hypoxia, hypercarbia, and increased retained secretions.
5. Caused by trauma (sternal rib fracture with possible costochondral separations).

B. Medical management
1. Internal stabilization with a volume-cycled ventilator
2. Drug therapy (narcotics, sedatives)

C. Assessment findings
1. Severe dyspnea; rapid, shallow, grunty breathing; paradoxical chest motion
2. Cyanosis, possible neck vein distension, tachycardia, hypotension
3. Diagnostic tests
   a. pO_2 decreased
   b. pCO_2 elevated
   c. pH decreased

D. Nursing interventions
1. Maintain an open airway: suction secretions/blood from nose, throat, mouth, and via endotracheal tube; note changes in amount, color, characteristics.
2. Monitor mechanical ventilation.
3. Encourage turning, coughing, and deep breathing.
4. Monitor for signs of shock.

Pneumothorax/Hemothorax

A. General information
1. Partial or complete collapse of the lung due to an accumulation of air or fluid in the pleural space
2. Types
   a. Spontaneous pneumothorax: the most common type of closed pneumothorax; air accumulates within the pleural space without an obvious cause. Rupture of a small bleb on the visceral pleura most frequently produces this type of pneumothorax. Occurs most often among tall, thin men between the ages of 20 and 40 years.
   b. Open pneumothorax: air enters the pleural space through an opening in the chest wall; usually caused by stabbing or gunshot wound.
   c. Tension pneumothorax: air enters the pleural space with each inspiration but cannot escape; causes increased intrathoracic pressure and shifting of the mediastinal contents to the unaffected side (mediastinal shift).
   d. Hemothorax: accumulation of blood in the pleural space; frequently found with an open pneumothorax resulting in a hemopneumothorax.

B. Assessment findings
1. Sudden sharp pain in the chest, dyspnea, diminished or absent breath sounds on affected side, decreased respiratory excursion on affected side, hyperresonance on percussion, decreased vocal fremitus, tracheal shift to the opposite side (tension pneumothorax accompanied by mediastinal shift)
2. Weak, rapid pulse; anxiety; diaphoresis
3. Diagnostic tests
   a. Chest X-ray reveals area and degree of pneumothorax
   b. pCO_2 elevated
   c. pO_2, pH decreased

C. Nursing interventions
1. Provide nursing care for the client with an endotracheal tube: suction secretions, vomitus, blood from nose, mouth, throat, or via endotracheal tube; monitor mechanical ventilation.
2. Restore/promote adequate respiratory function.
   a. Assist with thoracentesis and provide appropriate nursing care.
   b. Assist with insertion of a chest tube to water-seal drainage and provide appropriate nursing care.
   c. Continuously evaluate respiratory patterns and report any changes.
3. Provide relief/control of pain.
   a. Administer narcotics/analgesics/sedatives as ordered and monitor effects.
   b. Position client in high-Fowler's position.

Atelectasis

A. General information
1. Collapse of part or all of a lung due to bronchial obstruction
2. May be caused by intrabronchial obstruction (secretions, tumors, bronchospasm, foreign bodies); extrabronchial compression (tumors, enlarged lymph nodes); or endobronchial disease (bronchogenic carcinoma, inflammatory structures)

B. Assessment findings
1. Signs and symptoms may be absent depending upon degree of collapse and rapidity with which bronchial obstruction occurs
2. Dyspnea, decreased breath sounds on affected side, decreased respiratory excursion, dullness to flatness upon percussion over affected area
3. Cyanosis, tachycardia, tachypnea, elevated temperature, weakness, pain over affected area
4. Diagnostic tests
   a. Bronchoscopy: may or may not reveal an obstruction

b. Chest X-ray shows diminished size of affected lung and lack of radiance over atelectic area
c. pO_2 decreased

C. Nursing interventions (prevention of atelectasis in hospitalized clients is an important nursing responsibility)
1. Turn and reposition every 1–2 hours while client is bedridden or obtunded.
2. Encourage mobility (if permitted).
3. Promote liquification and removal of secretions.
4. Avoid administration of large doses of sedatives and opiates that depress respiration and cough reflex.
5. Prevent abdominal distension.
6. Administer prophylactic antibiotics as ordered to prevent respiratory infection.

Pleural Effusion

A. General information
1. Collection of fluid in the pleural space
2. A symptom, not a disease; may be produced by numerous conditions
3. Classification
a. Transudative: accumulation of protein-poor, cell-poor fluid
b. Suppurative (empyema): accumulation of pus
4. May be found in clients with liver/kidney disease, pneumonia, tuberculosis, lung abscess, bronchial carcinoma, leukemia, trauma, pulmonary edema, systemic infection, disseminated lupus erythematosus, polyarteritis nodosa

B. Medical management
1. Identification and treatment of the underlying cause
2. Thoracentesis
3. Drug therapy
a. Antibiotics: either systemic or inserted directly into pleural space
b. Fibrinolytic enzymes: trypsin, streptokinase-streptodornase to decrease thickness of pus and dissolve fibrin clots
4. Closed chest drainage
5. Surgery: open drainage

C. Assessment findings
1. Dyspnea, dullness over affected area upon percussion, absent or decreased breath sounds over affected area, pleural pain, dry cough, pleural friction rub
2. Pallor, fatigue, fever, and night sweats (with empyema)
3. Diagnostic tests
a. Chest X-ray positive if greater than 250 mL pleural fluid
b. Pleural biopsy may reveal bronchogenic carcinoma
c. Thoracentesis may contain blood if cause is cancer, pulmonary infarction, or tuberculosis; positive for specific organism in empyema

D. Nursing interventions: vary depending on etiology
1. Assist with repeated thoracentesis.
2. Administer narcotics/sedatives as ordered to decrease pain.
3. Assist with instillation of medication into pleural space (reposition client every 15 minutes to distribute the drug within the pleurae).
4. Place client in high-Fowler's position to promote ventilation.

Pneumonia

A. General information
1. An inflammation of the alveolar spaces of the lung, resulting in consolidation of lung tissue as the alveoli fill with exudate.
2. The various types of pneumonias are classified according to the offending organism.
3. Bacterial pneumonia accounts for 10% of all hospital admissions; affects infants and elderly most often, and most often occurs in winter and early spring.
4. Caused by various organisms: *D. pneumoniae, S. aureus, E. coli, H. influenzae*.

B. Assessment findings
1. Cough with greenish to rust-colored sputum production; rapid, shallow respirations with an expiratory grunt; nasal flaring; intercostal rib retraction; use of accessory muscles of respiration; dullness to flatness upon percussion; possible pleural friction rub; high-pitched bronchial breath sounds; rales or crackles (early) progressing to coarse (later)
2. Fever, chills, chest pain, weakness, generalized malaise
3. Tachycardia, cyanosis, profuse perspiration, abdominal distension
4. Diagnostic tests
a. Chest X-ray shows consolidation over affected areas
b. WBC increased
c. pO_2 decreased
d. Sputum specimens reveal particular causative organism

C. Nursing interventions
1. Facilitate adequate ventilation.
a. Administer oxygen as needed and assess its effectiveness.
b. Place client in semi-Fowler's position.
c. Turn and reposition frequently clients who are immobilized/obtunded.
d. Administer analgesics as ordered to relieve pain associated with breathing (codeine is drug of choice).
e. Auscultate breath sounds every 2–4 hours.
f. Monitor ABGs.

2. Facilitate removal of secretions (general hydration, deep breathing and coughing, tracheobronchial suctioning as needed, expectorants as ordered, aerosol treatments via nebulizer, humidification of inhaled air, chest physical therapy).
3. Observe color, characteristics of sputum and report any changes; encourage client to perform good oral hygiene after expectoration.
4. Provide adequate rest and relief/control of pain.
   a. Provide bed rest with limited physical activity.
   b. Limit visits and minimize conversations.
   c. Plan for uninterrupted rest periods.
   d. Institute nursing care in blocks to ensure periods of rest.
   e. Maintain pleasant and restful environment.
5. Administer antibiotics as ordered, monitor effects and possible toxicity.
6. Prevent transmission (respiratory isolation may be required for clients with staphylococcal pneumonia).
7. Control fever and chills: monitor temperature and administer antipyretics as ordered, maintain increased fluid intake, provide frequent clothing and linen changes.
8. Provide client teaching and discharge planning concerning prevention of recurrence.
   a. Medication regimen/antibiotic therapy
   b. Need for adequate rest, limited activity, good nutrition with adequate fluid intake, and good ventilation
   c. Need to continue deep breathing and coughing for at least 6–8 weeks after discharge
   d. Availability of vaccines (pneumonococcal pneumonia, influenza)
   e. Techniques that prevent transmission (use of tissues when coughing, adequate disposal of secretions)
   f. Avoidance of persons with known respiratory infections
   g. Need to report signs and symptoms of respiratory infection (persistent or recurrent fever; changes in characteristics, color of sputum; chills; increased pain; difficulty breathing; weight loss; persistent fatigue)
   h. Need for follow-up medical care and evaluation

Bronchogenic Carcinoma

A. General information
   1. The majority of primary pulmonary tumors arise from the bronchial epithelium and are therefore referred to as bronchogenic carcinomas.
   2. Characteristic pathologic changes include nonspecific inflammation with hypersecretion of mucus, desquamation of cells, hyperplasia, and obstruction.
   3. Metastasis occurs primarily by direct extension and via the circulatory or lymphatic system.
   4. Men over age 40 affected most often; 1 out of every 10 heavy smokers; affects right lung more often than left.
   5. Caused by inhaled carcinogens (primarily cigarette smoke but also asbestos, nickel, iron oxides, air silicone pollution; preexisting pulmonary disorders [TB, COPD]).
B. Medical management: depends on cell type, stage of disease, and condition of client; may include
   1. Radiation therapy
   2. Chemotherapy: usually includes cyclophosphamide, methotrexate, vincristine, doxorubicin, and procarbazine; concurrently in some combination
   3. Surgery: when entire tumor can be removed
C. Assessment findings
   1. Persistent cough (may be productive or blood tinged), chest pain, dyspnea, unilateral wheezing, friction rub, possible unilateral paralysis of the diaphragm
   2. Fatigue, anorexia, nausea, vomiting, pallor
   3. Diagnostic tests
      a. Chest X-ray may show presence of tumor or evidence of metastasis to surrounding structures
      b. Sputum for cytology reveals malignant cells
      c. Bronchoscopy: biopsy reveals malignancy
      d. Thoracentesis: pleural fluid contains malignant cells
      e. Biopsy of scalene lymph nodes may reveal metastasis
D. Nursing interventions
   1. Provide support and guidance to client as needed.
   2. Provide relief/control of pain.
   3. Administer medications as ordered and monitor effects/side effects.
   4. Control nausea: administer medications as ordered, provide good oral hygiene, provide small and more frequent feedings.
   5. Provide nursing care for a client with a thoracotomy.
   6. Provide client teaching and discharge planning concerning:
      a. Disease process, diagnostic and therapeutic interventions
      b. Side effects of radiation and chemotherapy
      c. Realistic information about prognosis

Thoracic Surgery

A. General information
   1. Types
      a. Exploratory thoracotomy: anterior or posterolateral incision through the fourth,

fifth, sixth, or seventh intercostal spaces to expose and examine the pleura and lung
   - **b.** Lobectomy: removal of one lobe of a lung; treatment for bronchiectasis, bronchogenic carcinoma, emphysematous blebs, lung abscesses
   - **c.** Pneumonectomy: removal of an entire lung; most commonly done as treatment for bronchogenic carcinoma
   - **d.** Segmental resection: removal of one or more segments of lung; most often done as treatment for bronchiectasis
   - **e.** Wedge resection: removal of lesions that occupy only part of a segment of lung tissue; for excision of small nodules or to obtain a biopsy
2. Nature and extent of disease and condition of client determine type of pulmonary resection.

B. Nursing interventions: preoperative
1. Provide routine pre-op care.
2. Perform a complete physical assessment of the lungs to obtain baseline data.
3. Explain expected post-op measures: care of incision site, oxygen, suctioning, chest tubes (except if pneumonectomy performed).
4. Teach client adequate splinting of incision with hands or pillow for turning, coughing, and deep breathing.
5. Demonstrate ROM exercises for affected side.
6. Provide chest physical therapy to help remove secretions.

C. Nursing interventions: postoperative
1. Provide routine postoperative care.
2. Promote adequate ventilation.
   - **a.** Perform complete physical assessment of lungs and compare with preoperative findings.
   - **b.** Auscultate lung fields every 1–2 hours.
   - **c.** Encourage turning, coughing, and deep breathing every 1–2 hours after pain relief obtained.
   - **d.** Perform tracheobronchial suctioning if needed.
   - **e.** Assess for proper maintenance of chest drainage system (except after pneumonectomy).
   - **f.** Monitor ABGs and report significant changes.
   - **g.** Place client in semi-Fowler's position (if pneumonectomy performed, follow surgeon's orders about positioning, often on back or operative side, but not turned to unoperative side).
3. Provide pain relief.
   - **a.** Administer narcotics/analgesics prior to turning, coughing, and deep breathing.
   - **b.** Assist with splinting while turning, coughing, deep breathing.
4. Prevent impaired mobility of the upper extremities by doing ROM exercises; passive day of surgery, then active.
5. Provide client teaching and discharge planning concerning
   - **a.** Need to continue with coughing/deep breathing for 6–8 weeks post-op and to continue ROM exercises
   - **b.** Importance of adequate rest with gradual increases in activity levels
   - **c.** High-protein diet with inclusion of adequate fluids (at least 2 liters/day)
   - **d.** Chest physical therapy
   - **e.** Good oral hygiene
   - **f.** Need to avoid persons with known upper respiratory infections
   - **g.** Adverse signs and symptoms (recurrent fever; anorexia; weight loss; dyspnea; increased pain; difficulty swallowing; shortness of breath; changes in color, characteristics of sputum) and importance of reporting to physician
   - **h.** Avoidance of crowds and poorly ventilated areas

Acute Respiratory Distress Syndrome (ARDS)

A. General information
1. A form of pulmonary insufficiency more commonly encountered in adults with no previous lung disorders than in those with existing lung disease.
2. Initial damage to the alveolar-capillary membrane with subsequent leakage of fluid into the interstitial spaces and alveoli, resulting in pulmonary edema and impaired gas exchange.
3. There is cell damage, decreased surfactant production, and atelectasis, which in turn produce hypoxemia, decreased compliance, and increased work of breathing.
4. Predisposing conditions include shock, trauma, infection, fluid overload, aspiration, oxygen toxicity, smoke inhalation, pneumonia, DIC, drug allergies, drug overdoses, neurologic injuries, fat emboli.
5. Has also been called shock lung.

B. Assessment findings
1. Dyspnea, cough, tachypnea with intercostal/suprasternal retraction, scattered to diffuse rales/rhonchi
2. Changes in orientation, tachycardia, cyanosis (rare)
3. Diagnostic tests
   - **a.** pCO_2 increased and pO_2 decreased
   - **b.** Hypoxemia
   - **c.** Hgb and hct possibly decreased
   - **d.** pO_2 and O_2 saturation not reflective of high O_2 administration

C. Nursing interventions
1. Promote optimal ventilatory status.
   - **a.** Perform ongoing assessment of lungs with auscultation every 1–2 hours.

b. Elevate head and chest.
c. Administer/monitor mechanical ventilation with PEEP.
d. Assist with chest physical therapy as ordered.
e. Encourage coughing and deep breathing every hour.
f. Monitor ABGs, O_2 saturation, and report significant changes.

2. Promote rest by spacing activities and treatments.
3. Maintain fluid and electrolyte balance.
4. Treat cause.

Cancer of the Larynx

A. General information
1. Most common upper respiratory malignancy.
2. The majority of laryngeal malignancies are squamous cell carcinomas.
3. Types
a. Supraglottic (also called extrinsic laryngeal cancer): involves the epiglottis and false cords and is likely to produce no symptoms until advanced stages.
b. Glottic (also referred to as intrinsic laryngeal cancer): affects the true vocal cords; the most frequently occurring laryngeal cancer; produces early symptoms.
4. Occurs most often in white men in middle or later life
5. Caused by cigarette smoking, excessive alcohol consumption, chronic laryngitis, vocal abuse, family predisposition to cancer of larynx

B. Medical management
1. Radiation therapy: may be effective in cases of localized disease, affecting only one vocal cord
2. Chemotherapy: used as adjuvant therapy to help shrink tumor and eradicate metastases (experimental)
3. Surgery
a. Partial laryngectomy: a lesion on the true cord on one side is removed along with adjoining tissue. Useful in early, intrinsic lesions. Client is able to talk and has a normal airway post-op.
b. Total laryngectomy
c. Radical neck dissection
1) Performed when metastasis from cancer of the larynx is suspected
2) Includes removal of entire larynx, lymph nodes, sternocleidomastoid muscle, internal jugular vein, and spinal accessory nerve
3) May also involve removal of the mandible, submaxillary gland, part of the thyroid and parathyroid gland
4) Nursing care: same as for total laryngectomy, below

C. Assessment findings
1. Supraglottic: localized throat pain; burning when drinking hot liquids or orange juice; lump in the neck; eventual dysphagia; dyspnea; weight loss; debility; cough; hemoptysis; muffled voice
2. Glottic: progressive hoarseness (more than 2-week duration), eventual dyspnea
3. Enlarged cervical lymph nodes

D. Nursing interventions: provide care for the client with a laryngectomy.

Total Laryngectomy

A. General information: consists of removal of the entire larynx, hyoid bone, pre-epiglottic space, cricoid cartilage, and 3–4 rings of trachea. The pharyngeal opening to the trachea is closed and remaining trachea brought out to the neck to form a permanent tracheostomy. The result is loss of normal speech and breathing and loss of olfaction.

B. Nursing care: preoperative
1. Provide routine pre-op care.
2. Explain expected procedures after surgery including suctioning, humidification, coughing and deep breathing, IV fluids, nasogastric tube feedings, tracheostomy or laryngectomy tube.
3. Reinforce physician's teaching regarding loss of normal speech, breathing patterns, and sense of smell.
4. Encourage client/significant others to talk about fears and hopes following surgery.
5. Introduce client to changes in modes of communication (esophageal speech, artificial larynx).
6. Establish method of communication to be used immediately post-op (Magic Slate, gestures).

C. Nursing interventions: postoperative
1. Promote optimum ventilatory status.
2. Suction nose frequently because of rhinitis.
3. Assess function of tracheostomy/laryngectomy tube and suction as needed.
4. Promote pain relief.
a. Elevate head of bed to decrease pressure on suture line.
b. Administer analgesics as needed and monitor effects.
c. Assist with moving head and turning by supporting back of neck with hands.
5. Promote wound drainage.
a. Elevate head of bed to promote lymphatic drainage from head.
b. Monitor amount, characteristics of drainage.
6. Promote nutrition.
a. Institute and monitor tube feedings as ordered.
b. Increase fluid intake as tolerated to improve hydration.

c. Encourage self-feeding.
d. Advance to normal diet as soon as client able to tolerate.

7. Prevent infection.
   a. Assess WBC and report significant increases.
   b. Take temperature every 4 hours.
   c. Maintain sterile technique when suctioning and performing tracheostomy care.
   d. Observe stoma/suture lines for signs of infection.
   e. Provide frequent oral hygiene.
   f. Monitor sputum and drainage for changes in color, odor, characteristics.
8. Enhance communication.
   a. Carry out modes of communication determined pre-op.
   b. Assess nonverbal behavior.
   c. Allow client time to ask questions and do not anticipate answers.
   d. Arrange for volunteer laryngectomy client to visit client and assist with esophageal speech, artificial larynx, and living with a laryngectomy.
   e. Consult with speech therapist if needed.
   f. Progress to normal diet as soon as possible to regain muscle tone of throat and abdomen.
9. Support client during adaptation to altered physical status.
   a. Encourage client to discuss feelings about changes in appearance, body functioning, and lifestyle; be aware of nonverbal responses to the changes.
   b. Assist to identify and use coping techniques that have been helpful in past.
   c. Suggest flattering clothing styles that don't emphasize chest or neck configuration.
   d. Monitor for and support behaviors indicative of positive adaptation to changes (e.g., interest in appearance).
10. Assess for respiratory complications (dyspnea, cyanosis, tachycardia, tachypnea, restlessness).
11. Provide client teaching and discharge planning concerning
    a. Tracheostomy/laryngectomy and stomal care
    b. Proper administration of nasogastric tube feedings and maintenance of nasogastric tube
    c. Control of dryness/crusting of tongue by brushing tongue regularly with soft toothbrush and toothpaste and using mouthwashes
    d. Need for humidified air at home
    e. Importance of protecting the stoma with a shield or towel while showering, directing shower nozzle away from stoma
    f. Need to use only electric razors for 6 months after surgery as facial area will be numb
    g. Need to lean forward when expectorating secretions and to cover stoma when coughing or sneezing
    h. Snorkle devices to enable swimming (caution is advised since drowning can occur rapidly in these clients)
    i. Need to wear an identification bracelet indicating that client is a neck breather
    j. Types of stoma guards available
    k. Necessity of installing smoke detectors since sense of smell is lost
    l. Information about prosthetic devices, speech therapy, and reconstructive surgery

Sample Questions

244. A male client is admitted following an automobile accident. He is very anxious, dyspneic, and in severe pain. The left chest wall moves in during inspiration and balloons out when he exhales. What condition are these symptoms most suggestive of?

1. Hemothorax.
2. Flail chest.
3. Atelectasis.
4. Pleural effusion.

245. A young man is admitted with a flail chest following a car accident. He is intubated with an endotracheal tube and is placed on a mechanical ventilator (control mode, positive pressure). Which physical finding alerts the nurse to an additional problem in respiratory function?

1. Dullness to percussion in the third to fifth intercostal space, midclavicular line.
2. Decreased paradoxical motion.
3. Louder breath sounds on the right chest.
4. pH of 7.36 in arterial blood gases.

246. The nurse is caring for a client who has had a chest tube inserted and connected to a portable water-seal drainage. The nurse determines the drainage system is functioning correctly when which of the following is observed?

1. Continuous bubbling in the water-seal chamber.
2. Fluctuation in the water-seal (U-tube) chamber.
3. Suction tubing attached to a wall unit.
4. Vesicular breath sounds throughout the lung fields.

247. The nurse is caring for a client who has just had a chest tube attached to a portable water-seal drainage system.

1. Observe for intermittent bubbling in the water-seal chamber.
2. Flush the chest tubes with 30 to 60 mL of NSS q4 to 6 hours.
3. Maintain the client in an extreme lateral position.
4. Strip the chest tubes in the direction of the client.

248. The nurse enters the room of a client who has a chest tube attached to a water-seal drainage system and notices the chest tube is dislodged from the chest. What is the most appropriate nursing intervention?

1. Notify the physician.
2. Insert a new chest tube.
3. Cover the insertion site with petroleum gauze.
4. Instruct the client to breathe deeply until help arrives.

249. An adult is ordered oxygen via nasal prongs. What is true of administering oxygen this way?

1. Mixes room air with oxygen.
2. Delivers a precise concentration of oxygen.
3. Requires humidity during delivery.
4. Is less traumatic to the respiratory tract.

250. An adult is receiving oxygen by nasal prongs. Which statement by the client indicates that client teaching regarding oxygen therapy has been effective?

1. "I was feeling fine so I removed my nasal prongs."
2. "It will be good to rest from taking deep breaths now that my oxygen is on."
3. "Don't forget to come back quickly when you get me out of bed; I don't like to be without my oxygen for too long."
4. "My family was angry when I told them they could not smoke in my room."

251. The client diagnosed with tuberculosis is taught prevention of disease transmission. Which correct answer will the client state is a means of transmission?

1. Hands.
2. Droplet nuclei.
3. Milk products.
4. Eating utensils.

252. The treatment plan for a client newly diagnosed with tuberculosis is likely to include which of the following medications as initial treatment?

1. Ethambutol (Myambutol) and isoniazid (INH).
2. Streptomycin and penicillin G (Crysticillin).
3. Tetracycline and thioridazine (Mellaril).
4. Pyridoxine (Beesix) and tetracycline.

253. A 64-year-old has been smoking since he was 11 years old. He has a long history of emphysema and is admitted to the hospital because of a respiratory infection that has not improved with outpatient therapy. Which finding would the nurse expect to observe during the client's nursing assessment?

1. Electrocardiogram changes.
2. Increased anterior-posterior chest diameter.
3. Slow, labored respiratory pattern.
4. Weight-height relationship indicating obesity.

254. Supplemental low-flow oxygen therapy is prescribed for a man with emphysema. Which is the most essential action for the nurse to initiate?

1. Anticipate the need for humidification.
2. Notify the physician that this order is contraindicated.
3. Place the client in an upright position.
4. Schedule frequent pulse oximeter checks.

255. When auscultating the lung fields, a sound described as a rustling, like the wind in the trees, is heard. What is the correct term for this occurrence?

1. Crackles.
2. Rhonchi.
3. Wheezes.
4. Vesicular.

256. The nurse's assessment of a client with lung cancer reveals the following: copious secretions, dyspnea, and cough. Based on these finding, what is the most appropriate nursing diagnosis?

1. Impaired gas exchange.
2. Ineffective airway clearance.
3. Pain.
4. Altered tissue perfusion.

257. A client has just had arterial blood gases drawn. What will the nurse do with the specimen collected?

1. Gently shake the syringe.
2. Place the sample in a syringe of warm water.
3. Aspirate 0.5 mL of heparin into the syringe.
4. Have the specimen analyzed immediately.

258. The nurse is to obtain a sputum specimen from a client. Select the correct set of statements instructing the client in the proper technique for obtaining a sputum specimen.

1. "Collect the specimen right before bed. Spit carefully into the container."
2. "Brush your teeth, then cough into the container. Do this first thing in the morning."
3. "Right after lunch, cough and spit into the container."
4. "Spit into the container, then add two tablespoons of water."

259. The nurse is checking tuberculin skin test results at a health clinic. One client has an area of induration measuring 12 mm in diameter. What does this finding indicate?

1. This finding is a normal reading.
2. This finding indicates active TB.
3. This is a positive reaction and can indicate exposure to TB.
4. This client needs to come back in two more days and let the nurse look at the area of induration again.

260. An adult has undergone a bronchoscopy. Which assessment findings indicate to the nurse that he is ready for discharge?

1. Use of accessory muscles for breathing, decreased lung sounds.
2. Stable vital signs, return of gag and cough reflex.
3. Hemoptysis, rhonchi.
4. Development of tachycardia with occasional PVCs, able to eat and drink.

261. An adult has a chest tube to a Pleur-evac® drainage system attached to a wall suction. An order to ambulate the client has been received. How should the nurse ambulate the client safely?

1. Clamp the chest tube and carefully ambulate the client a short distance.
2. Question the order to ambulate the client.
3. Carefully ambulate the client, keeping the Pleur-evac lower than the client's chest.
4. Disconnect the Pleur-evac from the client's chest tube, leave it attached to the bed, ambulate the client, and then reconnect the chest tube when he is returned to bed.

262. Approximately 10 minutes after a client returns from surgery with a tracheostomy tube the nurse assesses increasing noisy respiration and an increased pulse. What action should be taken immediately?

1. Take the client's blood pressure.
2. Suction the tracheostomy tube.
3. Drain water from the O_2 tubing.
4. Change the tracheostomy tube.

263. The nurse will perform chest physiotherapy (CPT) on a client every 4 hours. What is the appropriate action by the nurse?

1. Gently slap the chest wall.
2. Use vibration techniques to move secretions from affected lung areas during the inspiration phase.
3. Perform CPT at least 2 hours after meals.
4. Plan apical drainage at the beginning of the CPT session.

264. A client is on a ventilator. The ventilator alarm goes off. The nurse assesses the client and observes increased respiratory rate, use of accessory muscles, and agitation. What should be the nurse's first action?

1. Remove the client from the ventilator and ambu bag the client, while continuing to assess to determine the cause of the client's distress.
2. Call respiratory therapy to check the ventilator.
3. Notify the physician.
4. Turn off the alarm.

265. A client with respiratory failure is on a ventilator. The alarm goes off. What should be the nurse's first action?

1. Notify the physician.
2. Assess the client to determine the cause of the alarm.
3. Turn off the alarm.
4. Disconnect the client and use the ambu bag to ventilate the client.

266. A nurse is setting up oxygen for an adult male. He is to receive oxygen at 2 liters per nasal cannula. What should be included for this treatment?

1. Adjust the flow rate to keep the reservoir bag inflated ⅔ full during inspiration.
2. Monitor the client carefully for risk of aspiration.
3. Make sure the valves and rubber flaps are patent, functional, and not stuck.
4. Remind the client not to use Vaseline lip balm.

267. A long-term COPD client is receiving oxygen at 1 liter/minute. A family member decides she "doesn't look too good" and increases her

oxygen to 7 liter/minute. What should the nurse's initial action be?

1. Thank the client's cousin and continue to observe the client.
2. Immediately decrease the oxygen.
3. Notify the physician.
4. Add humidity to the oxygen.

268. An adult is receiving oxygen per face mask at 40%. The nurse should include which of the following in her plan of care?

1. Provide good skin care, making sure the mask fits well.
2. Keep all visitors out of the room.
3. Turn off the CPAP during the day.
4. Keep the bag inflated at all time.

269. An adult has a new tracheostomy in place. He has a small amount of thin, white secretions. The stoma is pink with no drainage noted. How often should the nurse perform trach care?

1. 4 hours.
2. 8 hours.
3. 24 hours.
4. Every hour.

270. A female client is admitted to the hospital. She has smoked two packs per day for 30 years. While providing her history, she becomes breathless, pauses frequently between words, and appears very anxious. She has a cough with thick white sputum production. Her chest is barrel shaped. Based on the data, on what condition will the nurse develop a plan of care?

1. Pneumonia.
2. Chronic obstructive pulmonary disease.
3. Tuberculosis.
4. Asthma.

271. A 68-year-old male is being admitted to the hospital for an exacerbation of his COPD. What will most likely be included in the plan of care?

1. Placed on 10 liters of oxygen per nasal cannula.
2. Placed in respiratory isolation.
3. Require frequent rest periods throughout the day.
4. Placed on fluid restriction.

272. A client with suspected tuberculosis will most likely relate which clinical manifestations?

1. Fatigue, weight loss, low-grade fevers, night sweats.
2. Asymmetrical chest expansion.
3. Rapid shallow breathing, prolonged labored expiration, stridor.
4. Dyspnea, hypoxemia, decreased pulmonary compliance.

273. An adult is being admitted to the nursing unit with a diagnosis of pneumonia. She has a history of arrested TB. What will be the nurse's initial action?

1. Place the client in respiratory isolation.
2. Encourage cough and deep breathing.
3. Force fluids.
4. Administer O_2.

274. An adult is being followed in the outpatient clinic for a diagnosis of active TB. She is receiving isoniazid 200 mg po daily, rifampin 500 mg po daily, and streptomycin 1500 mg IM twice weekly. Which statement by the client best indicates she understands her therapeutic regime?

1. "I'm glad I only have to take these drugs for a couple of weeks."
2. "I need to take these two drugs every day and come back to the clinic once a week for the shot."
3. "It may work best to take these pills in the evening right before bed."
4. "I'm glad my birth control pills aren't affected by these drugs—the doctor told me not to get pregnant!"

275. The nurse is counseling the family of an 18-year-old with active TB, about measures to prevent transmission of the disease. Which statement by the family best indicates understanding of these instructions?

1. "I won't let her and her sister share clothes."
2. "We will have to keep her in her room."
3. "We all need to wash our hands carefully, but especially our daughter."
4. "We cannot get TB from exposure to her sputum."

276. An elderly client has fallen and broken her eighth rib on her left side. The nurse should include which of the following when developing the plan of care?

1. Bind the client's chest with a 6-inch Ace bandage.
2. Keep the client on bed rest for 3 days.
3. Encourage the client to use her incentive spirometer and cough and deep breathe.
4. Administer large doses of narcotic analgesic so that the client will be able to more fully participate in pulmonary care.

277. A man is injured in an industrial accident. The industrial nurse assesses him and observes use of accessory muscles, severe chest pain, agitation, shortness of breath. The nurse also notices one side of his chest moving differently than the other. The nurse suspects flail chest. What will be the nurse's initial action?

1. Apply a sandbag to the flail side of his chest.
2. Prepare for intubation and mechanical ventilation.
3. Prepare for chest tube placement.
4. Administer pain medication.

278. What manifestation would the client with pleural effusion display?

1. Pain.
2. Swelling.
3. Dyspnea.
4. Increased sputum production.

279. An 86-year-old female was admitted to the hospital two days ago with pneumonia. She now has an order to be up in the chair as much as possible. How will the nurse plan the client's morning care?

1. Get her up before breakfast. Have her eat in the chair, then bathe while still up.
2. Allow her to eat breakfast in bed, rest for 30 minutes, get up in the chair, and rest for a few minutes. Allow her to wash her hands and face—nurse to complete bath.
3. Allow her to eat in bed, get her up, and provide her with a pan of water for her to bathe.
4. Get her up before breakfast, have her bathe before breakfast, eat in the chair, then a rest in the chair.

280. A client has been admitted to the hospital. Lung assessment reveals the following: bronchial breath sounds over (L) lower lobe, diminished breath sounds (L) lower lobe, tactile fremitus present, percussion dulled in this area. Based on the assessment findings, what condition does the nurse suspect?

1. Pneumonia.
2. Asthma.
3. Emphysema.
4. Early left-sided heart failure.

281. A nurse is teaching a class in a community center about lung cancer. Which statement best demonstrates the client's understanding of the risk factors for lung cancer?

1. "My husband smokes, but I don't! So, I really don't need to worry about getting lung cancer."
2. "I guess I will need to eat more green and yellow vegetables."
3. "Just because I have COPD doesn't mean that I have a higher risk."
4. "I've worked with asbestos all my life and have never had any problems."

282. An adult male was diagnosed with lung cancer 18 months ago. He is now in the terminal stages and is experiencing severe generalized pain. He has ordered morphine sulfate 10 mg IM q 4–6 h prn. What is the most appropriate action by the nurse?

1. Teach him that the pain medicine prescribed will take away all his pain and he will have no discomfort.
2. Counsel him about the addictive qualities of his prescribed narcotic.
3. Inform him that he may only ask for the pain medicine every 4 hours and there is nothing else you can offer in between medication times.
4. Encourage him to ask for the pain medicine before the pain becomes too severe.

283. A client is admitted to the nursing unit from the recovery room following a left pneumonectomy. What will the nurse expect in the plan of care?

1. Have a chest tube to water seal.
2. Have a chest tube to suction.
3. Be monitored closely for respiratory and cardiac complications.
4. Have his left arm maintained in a sling to prevent pain and discomfort.

284. An adult who has had a right thoracotomy for a wedge resection of his lung repeatedly refuses to do breathing or arm exercises because of the pain. What should the nurse include on the client's plan of care?

1. Offer the client pain medication immediately after arm exercises are completed.
2. Offer the client sips of ice water prior to a deep breathing and coughing session.
3. Schedule the client's activity 30–45 minutes after his IM injection of pain medication.
4. Have the client hold a pillow against his abdomen for support.

285. The nurse may expect a client with suspected early ARDS to exhibit which of the following?

1. PaO_2 of 90, $PaCO_2$ of 45, X-ray showing enlarged heart, bradycardia.
2. Thick green sputum production, PaO_2 of 75, pH 7.45.

3. Restlessness, suprasternal retractions, PaO_2 of 65.
4. Wheezes, slow deep respirations, $PaCO_2$ of 55, pH of 7.25.

286. The client had a removal of the larynx and a permanent opening made into the trachea. What is the correct name of this procedure?
1. Total laryngectomy.
2. Tracheostomy.
3. Radical neck dissection.
4. Partial laryngectomy.

287. An adult will undergo a total laryngectomy tomorrow. She is concerned about communicating post-op. The nurse should plan for her to communicate by which method the first 24–48 hours after surgery?
1. Using the artificial larynx.
2. Writing or pointing on a communication board.
3. Using esophageal speech.
4. Using a voice button.

288. An adult has had a total laryngectomy. The nurse is discussing options for verbal communication with the client. Which statement indicates the client understands the available options for verbal communication?
1. "Because of the arthritis in my hands, I think the voice button method would be easiest to use."
2. "By the time I leave the hospital, I will be able to talk."
3. "If I use the esophageal speech, my voice will be high pitched and soft."
4. "Using an artificial larynx will make me sound sort of monotone."

289. An adult is ready for discharge after undergoing a total laryngectomy. The nurse is discussing safety aspects of his home care. Which statement by the client best indicates that he understands the safety aspects of his care at home?
1. "It is okay to swim as long as I'm careful."
2. "I should use paper tissues to cover my stoma when I'm coughing."
3. "I should not wear anything to cover my stoma."
4. "I will need to use a humidifier in my home."

Answers and Rationales

244. 2. Paradoxical breathing movements (opposite the normal) are characteristic of flail chest. The flail portion is sucked in on inspiration and bulges out on expiration. Flail chest occurs when there are multiple rib fractures due to trauma.

245. 3. Louder breath sounds on the right side of the chest indicate that the endotracheal tube may be misplaced and is aerating only one lung.

246. 2. Fluctuation in the water-seal chamber demonstrates that the tubing system is patent.

247. 1. Intermittent bubbling in the water-seal chamber indicates that air is leaving the thoracic cavity. If there is no bubbling in the water-seal chamber, it indicates either obstruction of the tubing or reexpansion of the lung. Reexpansion of the lung is unlikely, as the tube has just been inserted.

248. 3. Covering the insertion site with petroleum gauze is a priority nursing measure that prevents air from entering the chest cavity.

249. 1. Low-flow oxygen systems provide an oxygen concentration that is determined by the amount of air drawn into the system and the dilution of oxygen with room air.

250. 4. Oxygen is a flammable gas and smoking is not permitted in the area.

251. 2. The most frequent means of transmission of the tubercle bacillus is by droplet nuclei. The bacillus is present in the air as a result of coughing, sneezing, and expectorating by infected persons.

252. 1. Ethambutol, isoniazid, streptomycin, and rifampin are first-line drugs used in the treatment of tuberculosis.

253. 2. An increased anterior-posterior chest diameter, commonly referred to as "barrel chest," is seen in clients with emphysema as a result of chronic hyperinflation of the lungs.

254. 4. The stimulus to breathe in a client with emphysema becomes low oxygen levels rather than rising CO_2 levels. Frequent pulse oximeter checks are necessary to see how the client handles low-flow oxygen administration.

255. 4. This is a description of the normal vesicular breath sounds. They are low pitched, soft sounds heard over the peripheral lung fields where air flows through smaller bronchioles.

256. 2. A client with lung cancer demonstrating the assessment findings provided would indicate a nursing diagnosis of ineffective airway clearance. The goal is this client will breathe without dyspnea or discomfort and maintain a patent airway.

257. 4. The sample must be analyzed within 20 minutes, or if the client has leukocytosis immediately, to ensure accurate results.

258. 2. Teeth are brushed to reduce contamination, then the client coughs into the container. Sputum is best collected in the morning when it is more plentiful.

259. 3. A positive reaction is present when the induration is greater than 10 mm in diameter. The positive reaction indicates exposure to TB or the presence of inactive disease, not active disease.

260. 2. Vital signs are taken frequently. Nothing is given by mouth until the cough and swallow reflexes have returned. Both are important criteria for discharge.

261. 3. The Pleur-evac must not be raised above chest level because it can cause backflow of the fluid into the pleural space precipitating collapse of the lung or mediastinal shift. The Pleur-evac must remain upright and the chest tube should not have traction on it.

262. 2. Noisy, increasing respirations and increasing pulse are signs that the client requires suctioning.

263. 3. Chest physiotherapy should be performed at least 2 hours after meals to reduce the risk of vomiting and aspiration.

264. 1. The nurse's best initial action should be to remove the client from the ventilator, ventilating the client with an ambu bag. Obviously, the client is experiencing respiratory distress and is not receiving adequate ventilation. The nurse should continue to closely assess to determine the cause and determine if the respiratory distress is related to ventilator malfunction or change in client status.

265. 2. It is important for the nurse to quickly assess the client and determine the cause of the alarm. Once the cause has been determined, the nurse must intervene promptly to prevent complications.

266. 4. Oxygen supports combustion. Smoking is not permitted in the room while O_2 is set up or being administered. A sign should be posted to that effect.

267. 2. The COPD client's drive to breathe is hypoxia. In COPD the CO_2 level gradually rises over time and central chemoreceptors are no longer sensitive to high CO_2 levels. Instead, the peripheral chemoreceptors found in the carotid and aortic arch bodies become the major stimuli for breathing. When the client with COPD receives high levels of O_2, the hypoxic drive to breathe is eliminated. The client experiences respiratory depression that may lead to apnea.

268. 1. The mask must fit properly, as a poor-fitting mask reduces the amount of oxygen delivered. The mask may also cause skin breakdown, so it is very important to provide skin care. Loosen the strap holding the mask frequently and assess the skin.

269. 2. Trach care should be provided once every 8 hours.

270. 2. These are signs and symptoms of COPD. The nurse would also need to evaluate breathing rate/pattern, use of accessory muscles for breathing, cyanosis, capillary refill, and clubbing of fingernails.

271. 3. A major goal for the COPD client is that the client will use a breathing pattern that does not lead to tiring and to plan activities so that the client does not become overtired. Care should be spaced, allowing frequent rest periods, to prevent fatigue.

272. 1. Typically, the client with TB will present with fatigue, lethargy, nausea, anorexia, weight loss, low-grade fever, and night sweats.

273. 1. The client should be placed in respiratory isolation until active TB is ruled out. TB is spread by droplet infection, thus her sputum should be handled according to respiratory isolation protocol.

274. 3. These medications frequently cause nausea. The nausea may be decreased if the medications are taken at bedtime.

275. 3. Handwashing is the best tool for prevention of infection. The client should wash her hands very carefully after any contact with body substances, masks, or soiled tissues. The family should also use good handwashing techniques.

276. 3. Pulmonary care is a vital part of the management of this type of client. Measures are taken to prevent stasis of secretions and promote chest expansion, preventing complications such as atelectasis and pneumonia.

277. 2. Based on the client's symptoms the nurse suspects impending respiratory failure and should prepare for intubation and mechanical ventilation.

278. 3. With pleural effusions, lung expansion may be restricted and the client will experience dyspnea, primarily on exertion.

279. 2. This plan allows frequent rest periods for the client. The client should not rush through morning care activities as rushing will increase hypoxemia, dyspnea, and fatigue.

280. 1. In a client with pneumonia, bronchial breath sounds are heard over areas of density or consolidation. Breath sounds are diminished when the airflow is decreased as is typical with pneumonia. Tactile fremitus is increased over the affected area. Percussion is dulled. In pneumonia, the alveoli fill with fluid, red cells, and white cells creating consolidation.

281. 2. Research has shown that there may be a correlation between vitamin A deficiency in the diet and the development of lung cancer. Daily consumption of green and yellow vegetables is encouraged.

282. 4. A preventive approach to pain control provides a more consistent level of relief and reduces client anxiety, which in turn can reduce discomfort and pain.

283. 3. Post-op respiratory insufficiency may result from an altered level of consciousness related to anesthesia, pain medications, decreased respiratory effort secondary to pain, or inadequate airway clearance. So the client must be monitored very closely with frequent vital sign checks and respiratory assessments.

284. 3. Thirty or 45 minutes after the administration of IM pain medication is the time when the pain medication is most effective. Thus, this is the best time to schedule coughing and deep breathing and arm exercises.

285. 3. It is common for the client to have suprasternal and intercostal retractions as the client loses lung capacity. The nurse should anticipate restlessness, apprehension, agitation, sluggishness, disorientation, and tachycardia.

286. 1. A total laryngectomy is the removal of the larynx and formation of the tracheostomy. The esophagus remains attached to the pharynx. No air will enter through the nose. The client will breathe through the tracheostomy. The procedure is indicated for large glottic tumors with fixation of vocal cords.

287. 2. For the first few days after surgery, the client should communicate by writing. If the client is very tired, a communication board may be used allowing the client to point to statements.

288. 4. An artificial larynx is an electronic device held along the neck and vibration produces mechanical speech. The speech quality is monotone and artificial.

289. 4. To substitute for the nose and pharynx, where air is usually warmed and humidified, a humidifier, pans of water, or houseplants should be used to increase the humidity in the home.

The Gastrointestinal System

OVERVIEW OF ANATOMY AND PHYSIOLOGY

The organs of the digestive system are grouped into the alimentary canal (GI tract), consisting of the mouth, esophagus, stomach, and small and large intestine; and the accessory digestive organs, including the liver, pancreas, gallbladder, and ductal system (Figure 4-16). The primary functions of this system are movement of food, digestion, absorption, elimination, and provision of a continuous supply of nutrients, electrolytes, and water.

Mouth

A. Consists of the lips and oral cavity: provides entrance and initial processing for nutrients and sensory data, such as taste, texture, and temperature.
B. Oral cavity contains the teeth, used for mastication, and the tongue, which assists in deglutition, taste sensation, and mastication.
C. The salivary glands, located in the mouth, produce secretions containing ptyalin for starch digestion and mucus for lubrication.

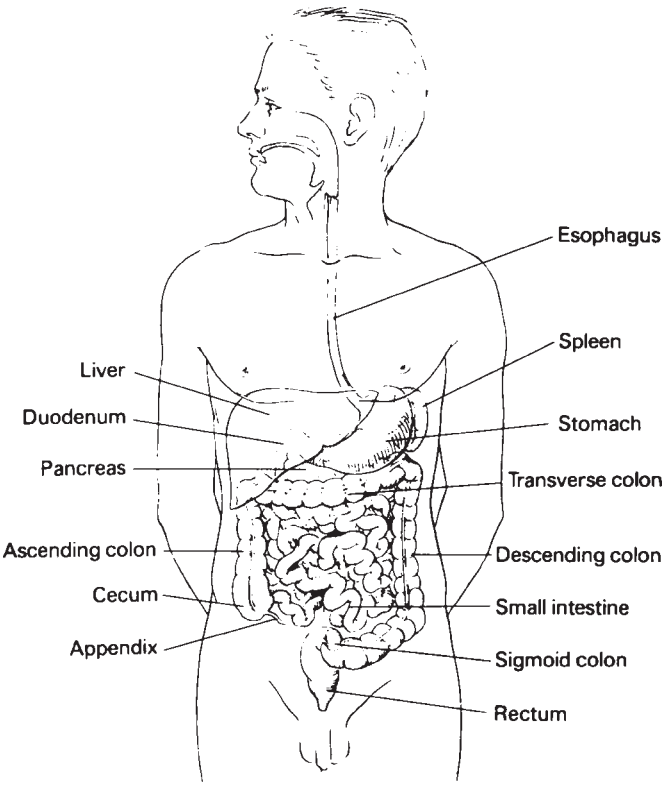


Figure 4–16 Anterior view of the structures of the GI tract

D. The pharynx aids in swallowing and functions in ingestion by providing a route for food to pass from the mouth to the esophagus.

Esophagus

Muscular tube that receives food from the pharynx and propels it into the stomach by peristalsis.

Stomach

A. Located on the left side of the abdominal cavity, occupying the hypochondriac, epigastric, and umbilical regions.
B. Stores and mixes food with gastric juices and mucus, producing chemical and mechanical changes in the bolus of food.
  1. The secretion of digestive juices is stimulated by smelling, tasting, and chewing food, which is known as the cephalic phase of digestion.
  2. The gastric phase is stimulated by the presence of food in the stomach; regulated by neural stimulation via the PNS and hormonal stimulation through secretions of gastrin by the gastric mucosa.
  3. After processing in the stomach, the food bolus, called chyme, is released into the small intestine through the duodenum.
C. Two sphincters control the rate of food passage.
  1. Cardiac sphincter: located at the opening between the esophagus and stomach
  2. Pyloric sphincter: located between the stomach and duodenum
D. Three anatomic divisions: fundus, body, and antrum.
E. Gastric secretions
  1. Pepsinogen: secreted by chief cells, located in fundus, aids in protein digestion
  2. Hydrochloric acid: secreted by parietal cells, functions in protein digestion, released in response to gastrin
  3. Intrinsic factor: secreted by parietal cells, promotes absorption of vitamin B_{12}
  4. Mucoid secretions: coat stomach wall and prevent autodigestion

Small Intestine

A. Composed of the duodenum, jejunum, and ileum
B. Extends from the pylorus to the ileocecal valve, which regulates flow into the large intestine and prevents reflux into the small intestine.
C. Major functions of the small intestine are digestion and absorption of the end products of digestion.
D. Structural features
  1. Villi (functional units of the small intestine): fingerlike projections located in the mucous membrane; contain goblet cells that secrete mucus and absorptive cells that absorb digested foodstuffs.
  2. Crypts of Lieberkuhn: produce secretions containing digestive enzymes.
  3. Brunner's glands: found in the submucosa of the duodenum, secrete mucus.

Large Intestine

A. Divided into four parts: cecum (with appendix), colon (ascending, transverse, descending, sigmoid), rectum, and anus.
B. Serves as a reservoir for fecal material until defecation occurs; functions to absorb water and electrolytes.
C. Microorganisms present in the large intestine are responsible for a small amount of further breakdown and also make some vitamins.
  1. Amino acids are deaminated by bacteria, resulting in ammonia, which is converted to urea in the liver.
  2. Bacteria in the large intestine aid in the synthesis of vitamin K and some of the vitamin B groups.
D. Feces (solid waste) leave the body via the rectum and anus.
  1. Anus contains internal sphincter (under involuntary control) and external sphincter (voluntary control)

2. Fecal matter usually 75% water and 25% solid wastes (roughage, dead bacteria, fat, protein, inorganic matter)

Liver

A. Largest internal organ; located in the right hypochondriac and epigastric regions of the abdomen.
B. Liver lobules: functional units of the liver, composed of hepatic cells.
C. Hepatic sinusoids (capillaries) are lined with Kupffer cells, which carry out the process of phagocytosis.
D. Portal circulation brings blood to the liver from the stomach, spleen, pancreas, and intestines.
E. Functions
1. Metabolism of fats, carbohydrates, and proteins; oxidizes these nutrients for energy and produces compounds that can be stored
2. Production of bile
3. Conjugation and excretion (in the form of glycogen, fatty acids, minerals, fat-soluble and water-soluble vitamins) of bilirubin
4. Storage of vitamins A, D, B_{12}, and iron
5. Synthesis of coagulation factors
6. Detoxification of many drugs and conjugation of sex hormones

Biliary System

Consists of the gallbladder and associated ductal system (bile ducts), see Figure 4-17.
A. Gallbladder: lies on the undersurface of the liver, functions to concentrate and store bile.
B. Ductal system: provides a route for bile to reach the intestines.

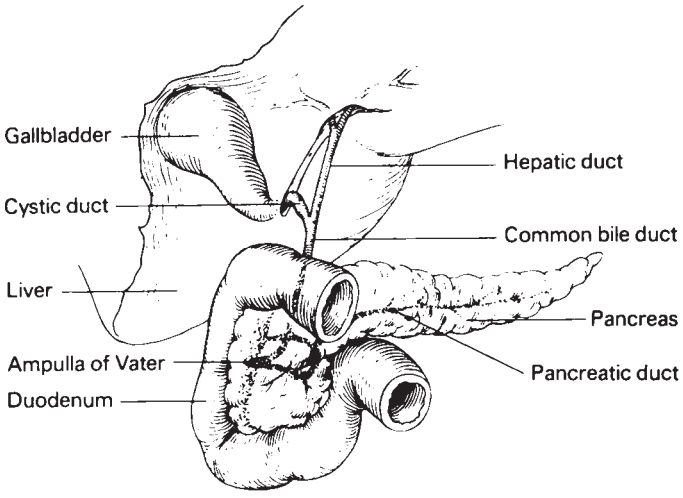


Figure 4–17 Gallbladder and ductal system

1. Bile is formed in the liver and excreted into the hepatic duct.
2. Hepatic duct joins with the cystic duct (which drains the gallbladder) to form the common bile duct.
3. If sphincter of Oddi is relaxed, bile enters the duodenum. If contracted, bile is stored in gallbladder.

Pancreas

A. Positioned transversely in the upper abdominal cavity.
B. Consists of a head, body, and tail along with a pancreatic duct, which extends along the gland and enters the duodenum via the common bile duct.
C. Has both exocrine and endocrine functions; function in GI system is exocrine.
1. Exocrine cells in the pancreas secrete trypsinogen and chymotrypsin for protein digestion, amylase to break down starch to disaccharides, and lipase for fat digestion.
2. Endocrine function is related to islets of Langerhans.

Physiology of Digestion and Absorption

A. Digestion: physical and chemical breakdown of food into absorptive substances
1. Initiated in the mouth where food mixes with saliva and starch is broken down.
2. Food then passes into the esophagus where it is propelled into the stomach.
3. In the stomach, food is processed by gastric secretions into a substance called chyme.
4. In the small intestine, carbohydrates are hydrolyzed to monosaccharides, fats to glycerol, and fatty acids and proteins to amino acids to complete the digestive process.
   a. When chyme enters the duodenum, mucus is secreted to neutralize hydrochloric acid; in response to release of secretin, pancreas releases bicarbonate to neutralize acid chyme.
   b. Cholecystokinin and pancreozymin (CCK-PZ) are also produced by the duodenal mucosa; stimulate contraction of the gallbladder along with relaxation of the sphincter of Oddi (to allow bile to flow from the common bile duct into the duodenum), and stimulate release of pancreatic enzymes.

ASSESSMENT

Health History

A. Presenting problem
- **1.** Mouth: symptoms may include dental caries, bleeding gums, dryness or increased salivation, odors, difficulty chewing (note use of dentures)
- **2.** Ingestion: symptoms may include:
  - **a.** Changes in appetite: anorexia or hyperorexia; note food preferences/dislikes.
  - **b.** Food intolerances: allergies, fluid, fatty foods.
  - **c.** Weight gain/loss: note symptoms/situations that might interfere with appetite (stress, deliberate weight reduction, dental problems); note average weight and percent gain/loss within past 2–9 months.
  - **d.** Dysphagia: note level of sensation where problem occurs, whether it occurs with foods/fluids.
  - **e.** Nausea: note onset and duration, existence of associated symptoms (weakness, headache, vomiting), occurrence before or after meals.
  - **f.** Vomiting: note onset and duration; foods/fluids that can be maintained; associated symptoms (fever, diarrhea).
  - **g.** Regurgitation (reflux): note whether occurs with ingestion of certain foods, any associated symptoms (vomiting), occurrence with certain positions (supine, recumbent).
- **3.** Digestion/absorption: symptoms may include
  - **a.** Dyspepsia (indigestion): note location of discomfort, whether associated with certain foods, time of day/night of occurrence, associated symptoms (vomiting).
  - **b.** Heartburn (pyrosis): note location, whether pain radiates, whether it occurs before or after meals, time of day when discomfort is most noticeable, foods that aggravate or eliminate symptoms.
  - **c.** Pain: character, frequency, location, duration, distribution, aggravating or alleviating factors.
- **4.** Bowel habits: symptoms may include
  - **a.** Constipation: note number of stools/day or week, changes in size or color of stool, alterations in food/fluid intake, presence of tenesmus, painful defecation, associated symptoms (abdominal pain, cramps)
  - **b.** Diarrhea: note number of stools/day, consistency, quantity, odor, interference with ADL, associated symptoms (nausea, vomiting, flatus, abdominal distension)
- **5.** Hepatic/biliary problems: symptoms may include
  - **a.** Jaundice: note location, duration, notable increase/decrease in degree.
  - **b.** Pruritus: note location, distribution, onset.
  - **c.** Urine changes: note color, onset, notable increase or decrease in color change, associated symptoms (pain).
  - **d.** Clay-colored stools: note onset, number/day, associated symptoms (pain, problems with ingestion/digestion).
  - **e.** Increased bleeding: note ecchymoses, purpura, bleeding gums, hematuria.

B. Lifestyle: eating behaviors (rapid ingestion, skipping meals, snacking), cultural/religious values (vegetarian, kosher foods), ingestion of alcohol, smoking

C. Use of medications: note use of antacids, antiemetics, antiflatulents, vitamin supplements; aspirin and anti-inflammatory agents

D. Past medical history: childhood, adult, psychiatric illness; surgery; bleeding disorders; menstrual history; exposure to infectious agents; allergies

Physical Examination

A. Mouth: inspect/palpate
- **1.** Outer/inner lips: color, texture, moisture
- **2.** Buccal mucosa: color, texture, lesions, ulcerations
- **3.** Teeth/gums: missing teeth, cavities, tenderness, swelling
- **4.** Tongue: protrusion without deviation, texture, color, moisture
- **5.** Palates (hard and soft): color

B. Abdomen: divided into regions and quadrants (see Figure 4-18); note specific location of any abnormality.
- **1.** Inspect skin: color, scars, striae, pigmentation, lesions, vascularity.
- **2.** Inspect architecture: contour, symmetry, distension, umbilicus.
- **3.** Inspect movement: peristalsis, pulsations.
- **4.** Auscultate peristaltic sounds.
  - **a.** Normal: bubbling, gurgling, 5–30 times/minute
  - **b.** Increased (hyperactive): may indicate diarrhea, gastroenteritis, early intestinal obstruction
  - **c.** Decreased (hypoactive): may indicate constipation, late intestinal obstruction, use of anticholinergics, post-op anesthesia
- **5.** Auscultate arterial sounds: note presence or absence of bruits in aorta/renal arteries.
- **6.** Percuss for tenderness/masses; determine distribution of tympany and dullness
  - **a.** Liver span: normal 6–12 cm dullness at the midclavicular line; determine shifting dullness (ascites)
  - **b.** Stomach: normal tympany

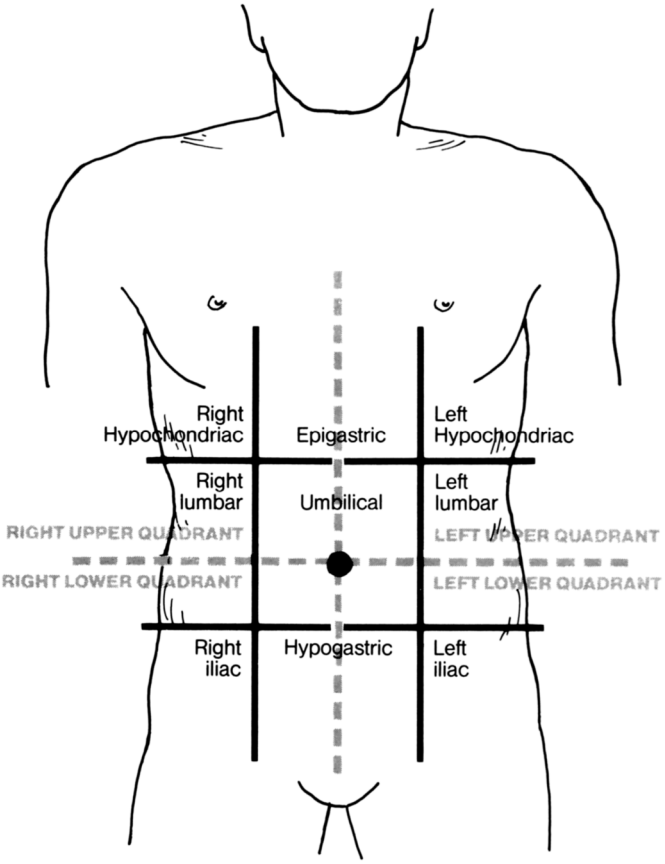


Figure 4–18 Abdominal quadrants (broken lines) and regions (solid lines)

   c. Spleen: normal tympany, dullness only if enlarged
   d. Small/large intestine: normal tympany
   e. Bladder: normal tympany, dullness if full
7. Palpate to depth of 1 cm (light palpation) to determine areas of tenderness, muscle guarding, and masses
8. Palpate to a depth of 4–8 cm (deep palpation) to identify rigidity, masses, ascites, tenderness, liver margins, spleen

Laboratory/Diagnostic Tests

A. Blood chemistry and electrolyte analysis: albumin, alkaline phosphatase, ammonia, amylase, bilirubin, chloride, LDH, lipase, potassium, SGOT or AST, serum glutamic pyruvic transaminase (SGPT or ALT), sodium
B. Hematologic studies: Hgb and HCT, PT, WBC
C. Serologic studies: carcinoembryonic antigen (CEA), hepatitis-associated antigens, *Helicobacter pylori*
D. Urine studies: amylase, bilirubin
E. Fecal studies: for blood, fat, infectious organisms
   1. A freshly passed, warm stool is the best specimen.
   2. For fat or infectious organisms collect three separate specimens and label day #1, day #2, day #3.
F. Upper GI series (barium swallow)
   1. Fluoroscopic examination of upper GI tract to determine structural problems and gastric emptying time; client must swallow barium sulfate or other contrast medium; sequential films taken as it moves through the system.
   2. Nursing care: pretest
      a. Keep NPO after midnight or 6–8 hours pretest.
      b. Explain that the barium will taste chalky.
   3. Nursing care: posttest: administer laxatives to enhance elimination of barium and prevent obstruction or impaction.
G. Lower GI series (barium enema)
   1. Barium is instilled into the colon by enema; client retains the contrast medium while X-rays are taken to identify structural abnormalities of the large intestine or colon.
   2. Nursing care: pretest
      a. Keep NPO for 8 hours pretest.
      b. Give enemas until clear the morning of test.
      c. Administer laxative or suppository.
      d. Explain that cramping may be experienced during the procedure.
   3. Nursing care: posttest: administer laxatives and fluids to assist in expelling barium.
H. Endoscopy (esophagogastroduodenoscopy)
   1. Direct visualization of the esophagus, stomach, and duodenum by insertion of a lighted fiberscope
   2. Used to observe structures, ulcerations, inflammation, tumors; may include a biopsy
   3. Nursing care: pretest
      a. Keep NPO for 6–8 hours.
      b. Ensure consent form has been signed.
      c. Explain that a local anesthetic will be used to ease discomfort and that speaking during the procedure will not be possible; the client should expect hoarseness and a sore throat for several days.
   4. Nursing care: posttest
      a. Keep NPO until return of gag reflex.
      b. Assess vital signs and for pain, dysphagia, bleeding.
      c. Administer warm normal saline gargles for relief of sore throat.
I. Colonoscopy
   1. Endoscopic visualization of the large intestine: may include biopsy and removal of foreign substances.
   2. Nursing care: pretest
      a. Keep NPO for 8 hours pretest.
      b. Administer laxatives for 1–3 days before the exam, and sometimes enemas until clear the night before the test.
      c. Ensure a consent form has been signed.

d. Explain to client that when the instrument is inserted into the rectum a feeling of pressure might be experienced.

3. Nursing care: posttest

a. Observe for rectal bleeding and signs of perforation.

b. Schedule planned rest periods for the client.

J. Sigmoidoscopy

1. Endoscopic visualization of the sigmoid colon

2. Used to identify inflammation or lesions, or remove foreign bodies.

3. Nursing care: pretest

a. Offer a light supper and light breakfast.

b. Do bowel prep.

c. Explain to client that the sensation of an urge to defecate or abdominal cramping might be experienced.

4. Nursing care: posttest: assess for signs of bowel perforation.

K. Gastric analysis

1. Insertion of a nasogastric tube to examine fasting gastric contents for acidity and volume

2. Nursing care: pretest

a. Keep NPO 6–8 hours pretest.

b. Advise client about no smoking, anticholinergic medications, antacids for 24 hours prior to test.

c. Inform client that tube will be inserted into the stomach via the nose, and instruct to expectorate saliva to prevent buffering of secretions.

3. Nursing care: posttest: provide frequent mouth care.

L. Oral cholecystogram

1. Injection of a radiopaque dye and X-ray examination to visualize the gallbladder

2. Used to determine the gallbladder's ability to concentrate and store the dye and to assess patency of the biliary duct system

3. Nursing care: pretest

a. Offer a low-fat meal the evening before the test and black coffee, tea, or water the morning of the exam.

b. Check for iodine sensitivity and administer six dye tablets (Telepaque) as ordered.

4. Nursing care: posttest: observe for side effects of the dye (nausea, vomiting, diarrhea).

M. Liver biopsy (closed needle)

1. Invasive procedure where a specially designed needle is inserted into the liver to remove a small piece of tissue for study

2. Nursing care: pretest

a. Ensure client has signed consent form.

b. Keep NPO 6–8 hours pretest.

c. Instruct client to hold breath during the biopsy.

3. Nursing care: posttest

a. Assess vital signs every hour for 8–12 hours.

b. Place client on right side for a few hours with a pillow against the abdomen to provide pressure on the liver.

c. Observe puncture site for hemorrhage.

d. Assess for complications of shock and pneumothorax.

N. Endoscopic Retrograde Cholangiopancreatography (ERCP)

1. Flexible fiber-optic endoscope permits direct visualization of biliary structures and pancreas.

2. Consent and NPO status required.

3. Moderate sedation used.

ANALYSIS

Nursing diagnoses for the client with a disorder of the digestive system may include:

A. Risk for deficient fluid volume

B. Disturbed body image

C. Imbalanced nutrition: less than body requirements

D. Diarrhea

E. Constipation

F. Pain

G. Ineffective breathing pattern

H. Impaired verbal communication

I. Impaired skin integrity

PLANNING AND IMPLEMENTATION

Goals

A. Restoration of fluid and electrolyte balance.

B. Client will express feelings of self-worth.

C. Adequate nutritional status will be maintained.

D. Client will experience decreased frequency of regular bowel habits.

E. Client will establish regular bowel habits of appropriate amount and consistency.

F. Client will be free from pain.

G. Effective breathing patterns will be maintained.

H. Effective communication methods will be established.

I. Skin integrity will be restored/maintained.

Interventions

Enemas

A. General information

1. Instillation of fluid into the rectum, usually for the purpose of stimulating defecation. The various types include:

a. Cleansing enema (tap water, normal saline, or soap): used to treat constipation or feces impaction, as bowel cleansing prior to

diagnostic procedures or surgery, to help establish regular bowel functions.
   b. Retention enema (mineral oil, olive oil, cottonseed oil): usually administered to lubricate or soften a hard fecal mass to facilitate defecation.

B. Nursing care for a cleansing enema
   1. Explain procedure and that breathing through the mouth relaxes abdominal musculature and helps to avoid cramps; explain the need to take adequate time to defecate.
   2. Assemble equipment: prepare solution at 105°–110° and have bedpan, commode, or nearby bathroom ready for use.
   3. Position client and drape adequately.
   4. Place waterproof pad under buttocks.
   5. Lubricate tube and allow solution to fill the tubing, displacing air.
   6. Insert rectal tube 4–5 inches without using force; request that client take several deep breaths.
   7. Administer 500–1000 mL of solution over 5–10 minutes; if cramping occurs slow the speed of instillation.
   8. After administration, have the client retain solution until the urge to defecate becomes strong.
   9. Document amount, color, characteristics of stool, and client's reaction during procedure.
   10. Assess for dizziness, light-headedness, abdominal cramps, nausea.
   11. Monitor electrolyte levels if client is to receive repeated enemas.

C. Nursing care for a retention enema: same as for a cleansing enema except:
   1. Oil is used instead of water (comes prepared in commercial kits and is given at body temperature).
   2. Administer 150–200 mL of prepared solution.
   3. Instruct client to retain oil for at least 30 minutes in order for it to take effect.

Gastrostomy

A. General information
   1. Insertion of a catheter through an abdominal incision into the stomach where it is secured with sutures or by balloon fixation.
   2. Used as an alternative method of feeding, either temporary or permanent, for clients who have problems with swallowing, ingestion, and digestion.

B. Nursing care
   1. Maintain skin integrity: inspect and cleanse skin around stoma frequently; keep deep area dry to avoid excoriation.
   2. Maintain patency of the gastrostomy tube.
      a. Assess for residual before each feeding (check orders concerning withholding feeding).
      b. Irrigate tube before and after meals.
      c. Measure/record any drainage.
   3. Promote adequate nutrition.
      a. Administer feeding with client in high-Fowler's and keep head of bed elevated for 30 minutes after meals to prevent regurgitation.
      b. Maintain feeding at room temperature.
      c. Ensure that prescribed amount of feeding be given within prescribed amount of time.
      d. Weigh client daily.
      e. Monitor I&O until feedings are well tolerated.
      f. Monitor for signs of dehydration.

Nasogastric (NG) Tubes

A. General information
   1. Soft rubber or plastic tube inserted through a nostril and into the stomach for gastric decompression, feeding, or obtaining specimens for analysis of stomach contents
   2. Types
      a. Levin: single-lumen, nonvented
      b. Salem: a tube within a tube; vented to provide constant inflow of atmospheric air

B. Nursing care
   1. Insertion of the tube
      a. Explain the purpose of the tube and the procedure for insertion.
      b. Measure the tube: distance on the tube from the tip of the nose to the ear lobe plus the distance from the ear lobe to the tip of the xiphoid.
      c. Instruct client to bend head forward if possible during insertion.
   2. Monitor functioning of system and ensure patency of the NG tube: abdominal discomfort/distension, nausea and vomiting, and little or no drainage in collection bottle are all signs that system is not functioning properly.
      a. Assess the position: aspirate gastric contents to confirm that tube is in stomach; inject 10 mL air through tube and auscultate for rapid influx.
      b. Check that tubing is free of kinks; irrigate as per physician order.
      c. Record amount, color, and odor of drainage.
   3. Provide measures to ensure maximal comfort.
      a. Apply water-soluble lubricant to lips to prevent dryness.
      b. Keep nares free from secretions.
      c. Provide periodic warm saline gargles to prevent dryness.
      d. Provide frequent mouth care with toothbrush/toothpaste or flavored mouthwashes.
      e. If allowed, give client hard candy or gum to stimulate the flow of saliva and prevent dryness.

f. Elevate head and chest during and for 1–2 hours after feedings to prevent reflux (most comfortable position when suction is used).

4. Monitor/maintain fluid and electrolyte balance.

a. Assess for signs of metabolic alkalosis (suctioning causes excessive loss of hydrochloric acid and potassium).

b. Administer IV fluids as ordered.

c. If suction used, irrigate NG tube with normal saline to decrease sodium loss.

d. Keep accurate I&O.

e. If suction used provide ice chips sparingly (if allowed) to avoid dilution of electrolytes.

f. Monitor lab values and electrolytes frequently.

Intestinal Tubes

A. General information

1. Tube is inserted via a nostril through the stomach and into the intestine for decompression proximal to an obstruction, relief of an obstruction, decompression of post-op edema at the surgical site.

2. Types

a. Cantor tube: single lumen

b. Harris tube: single lumen

c. Miller-Abbott: double lumen

B. Nursing care

1. Facilitate placement of the tube.

a. Position client in high-Fowler's while tube is being passed from the nose to the stomach; then place client on right side to aid in advancing the tube from the stomach to duodenum.

b. Continuously monitor tube markings.

c. Tape tube in place only after placement in duodenum is confirmed by X-ray.

2. Provide measures for maximal comfort, as for NG tube.

EVALUATION

A. Adequate urine output; stable vital signs; moist mucous membranes; adequate skin turgor and mobility; electrolyte levels within normal range.

B. Client expresses interest in personal well-being; actively participates in ADL, treatments, and care.

C. Stable weight; improved anthropometric measurements; laboratory values within normal limits; client verbalizes types of foods that should be included or eliminated from prescribed diet.

D. Client reports reduction in frequency of stools and return to more normal stool consistency; laboratory values within normal range.

E. Client reports increased frequency with improved consistency of stool.

F. Relaxed facial expression; decreased abdominal distension; healed mouth ulcers.

G. Improved respiratory rate, depth, and rhythm; lungs clear to auscultation; effective use of muscles of respiration.

H. Client effectively uses artificial means of communication (artificial larynx, sign language, or esophageal speech).

I. No redness, irritation, or breakdown; client demonstrates techniques to prevent skin breakdown.

DISORDERS OF THE GASTROINTESTINAL SYSTEM

Nausea and Vomiting

A. General information

1. Nausea: a feeling of discomfort in the epigastrium with a conscious desire to vomit; occurs in association with and prior to vomiting.

2. Vomiting: forceful ejection of stomach contents from the upper GI tract. Emetic center in medulla is stimulated (e.g., by local irritation of intestine or stomach or disturbance of equilibrium), causing the vomiting reflex.

3. Nausea and vomiting are the two most common manifestations of GI disease.

4. Contributing factors

a. GI disease

b. CNS disorders (meningitis, CNS lesions)

c. Circulatory problems (HF)

d. Metabolic disorders (uremia)

e. Side effects of certain drugs (chemotherapy, antibiotics)

f. Pain

g. Psychic trauma

h. Response to motion

B. Assessment findings

1. Weakness, fatigue, pallor, possible lethargy

2. Dry mucous membrane and poor skin turgor/mobility (if prolonged with dehydration)

3. Serum sodium, calcium, potassium decreased

4. BUN elevated (if severe vomiting and dehydration)

C. Nursing interventions

1. Maintain NPO until client able to tolerate oral intake.

2. Administer medications as ordered and monitor effects/side effects.

a. Phenothiazines: chlorpromazine (Thorazine), perphenazine (Trilafon), prochlorperazine (Compazine), Promethazine (Phenergan), trifluoperazine (Stelazine)

b. Antihistamines: benzquinamide (Emetecon), dimenhydrinate (Dramimine), diphenhydramine (Benadryl), hydroxyzine (Atarax, Vistaril), cyclizine (Marezine), meclizine (Antivert), promethazine (Phenergan)
c. Other drugs to help control nausea and vomiting: thiethylperazine (Torecan), trimethobenzamide (Tigan), metoclopramide (Reglan)

3. Notify physician if vomiting pattern changes.
4. Maintain fluid and electrolyte balance.
a. Administer IV fluids as ordered, keep accurate record of I&O.
b. Record amount/frequency of vomitus.
c. Assess skin tone/turgor for degree of hydration.
d. Monitor laboratory/electrolyte values.
e. Test NG tube drainage or vomitus for blood, bile; monitor pH.

5. Provide measures for maximum comfort.
a. Institute frequent mouth care with tepid water/saline mouthwashes.
b. Remove encrustations around nares.
c. Keep head of bed elevated and avoid sudden changes in position.
d. Eliminate noxious stimuli from environment.
e. Keep emesis basin clean.
f. Maintain quiet environment and avoid unnecessary procedures.

6. When vomiting subsides provide clear fluids (ginger ale, warm tea) in small amounts, gradually introduce solid foods (toast, crackers), and progress to bland foods (baked potato), in small amounts.
7. Provide client teaching and discharge planning concerning:
a. Avoidance of situations, foods, or liquids that precipitate nausea and vomiting
b. Need for planned, uninterrupted rest periods
c. Medication regimen, including side effects
d. Signs of dehydration
e. Need for daily weights with frequent anthropometric measurements

Anorexia/Eating Disorders

See Unit 7.

Diarrhea

A. General information
1. Increase in peristaltic motility, producing watery or loosely formed stools. Diarrhea is a symptom of other pathologic processes.
2. Causes
a. Chronic bowel disorders
b. Malabsorption problems
c. Intestinal infections
d. Biliary tract disorders
e. Hyperthyroidism
f. Saline laxatives
g. Magnesium-based antacids
h. Stress
i. Antibiotics
j. Neoplasms
k. Highly seasoned foods

B. Assessment findings
1. Abdominal cramps/distension, foul-smelling watery stools, increased peristalsis
2. Anorexia, thirst, tenesmus, anxiety
3. Decreased potassium and sodium if severe

C. Nursing interventions
1. Administer antidiarrheals: diphenoxylate with atropine (Lomotil), paregoric, loperamide (Imodium), Kaopectate as ordered; monitor effects.
2. Control fluid/food intake.
a. Avoid milk and milk products.
b. Provide liquids with gradual introduction of bland, high-protein, high-calorie, low-fat, low-bulk foods.

3. Monitor and maintain fluid and electrolyte status; record number, characteristics, and amount of each stool.
4. Prevent anal excoriation.
a. Cleanse rectal area after each bowel movement with mild soap and water and pat dry.
b. Apply A and D ointment or Desitin to promote healing.
c. Use a local anesthetic as needed.

5. Provide client teaching and discharge planning concerning
a. Medication regimen
b. Adherence to prescribed diet and avoidance of foods that are known to produce diarrhea
c. Importance of perineal hygiene and care and daily assessment of skin changes
d. Importance of good handwashing techniques after each stool
e. Need to report worsening of symptoms (increased abdominal cramps, increased frequency or amount of stool)
f. Need to assess daily weights with frequent anthropometric measurements

Constipation

A. General information
1. Lengthening of normal (for individual) time period between bowel movements; small volume of dry, hard stool; results from decreased motility of the colon or from retention of feces in the colon or rectum
2. Causes
a. Inadequate bulk/liquids in the diet
b. Lack of physical activity

c. Retention of barium after radiographic exam
d. Prolonged use of constipation medications (aluminum-based antacids, anticholinergics, antihistamines, antidepressants, phenothiazines, calcium, iron)

B. Assessment findings
1. Feeling of abdominal fullness, pressure in the rectum; abdominal distension, dyschezia; increased flatus
2. Hardened stool upon digital examination

C. Nursing interventions
1. Promote adequate intake of fluids/foods and dietary modification: increase fluid intake to at least 3000 mL/day; include high-fiber foods in diet.
2. Administer medications as ordered
   a. Cathartics: milk of magnesia, castor oil, cascara sagrada, senna (Senokot), bisacodyl (Dulcolax), psyllium (Metamucil)
   b. Stool softeners: docusate calcium (Surfak), docusate sodium (Colace)
3. Prevent accumulation of stool in the colon/rectum.
   a. Instruct client not to suppress urge to defecate.
   b. Gently massage abdomen to promote stimulation and movement of feces.
4. Provide client teaching and discharge planning concerning:
   a. Need to establish and maintain a regular time to defecate
   b. Diet modification
   c. Medication regimen
   d. Need to assume position of comfort when sitting on toilet

Cancer of the Mouth

A. General information
1. Cancer of the mouth may occur on the lips or within the mouth (tongue, floor of mouth, buccal mucosa, hard/soft palate, pharynx, tonsils).
2. Most common type of oral tumor is squamous cell carcinoma; most malignancies occur on the lower lip.
3. More common in men.
4. Caused by
   a. Excessive sun exposure
   b. Tobacco (cigar, pipe, cigarette, snuff)
   c. Excessive alcohol intake
   d. Constant irritation (dental caries)
5. Early detection is very important; most discovered by dentists in routine checkups.

B. Medical management
1. Radiation therapy: both primary lesion and affected lymph nodes; radioactive implants
2. Chemotherapy: sometimes indicated, not used as often as radiation therapy and surgery
3. Surgery: type depends on location and extent of the tumor
   a. Mandibulectomy: removal of the mandible
   b. Hemiglossectomy: removal of half the tongue
   c. Glossectomy: removal of the entire tongue
   d. Radical neck dissection

C. Assessment findings
1. Ulcerations (often painless) on the lip, tongue, or buccal mucosa
2. Pain or soreness of the tongue upon eating hot or highly seasoned foods
3. Erythroplakia, leukoplakia
4. Difficulty chewing/speaking, dysphagia
5. Positive oral exfoliative cytology
6. Positive toluidine blue test

D. Nursing interventions
1. Provide nursing care for the client receiving radiation therapy
2. Prepare client for surgery: in addition to routine pre-op care
   a. Inform client of expected changes post-op.
   b. Provide explanation of anticipated post-op suctioning, NG tube, drains.
3. In addition to routine post-op care
   a. Promote drainage.
      1) Place in side-lying position initially, then Fowler's.
      2) Suction mouth (except for lip surgery).
      3) Maintain patency of drainage tubes.
   b. Promote oral hygiene/comfort.
      1) Provide mouth irrigations with sterile water, diluted peroxide, normal saline, or sodium bicarbonate.
      2) Avoid use of commercial mouthwashes, lemon and glycerine swabs.
   c. Monitor/promote optimum nutritional status.
      1) Provide tube feedings following a hemiglossectomy.
      2) Place oral fluids in back of the throat with an asepto syringe.
      3) Provide foods/fluids that are nonirritating and facilitate swallowing (yogurt, puddings).
   d. Monitor for signs and symptoms of facial nerve damage (drooping, uneven smile, circumoral numbness or tingling).

Cancer of the Esophagus

A. General information
1. Malignant tumors of the esophagus usually appear as ulcerated lesions, most often in middle and lower portions of the esophagus.
2. Penetration of the muscular layers with extension to the outer wall of the esophagus is commonly found. Metastases may cause eventual esophageal obstruction.

3. More common in men than in women (4:1); usually between ages 50–70.
4. Cause unknown; contributing factors include cigarette smoking, excessive alcohol intake, trauma, poor oral hygiene, achalasia, diverticula, and lye burns.

B. Medical management
1. Radiation therapy: used for inoperable tumors, has been found to alleviate symptoms
2. Chemotherapy: not found effective
3. Surgery
   a. Esophagectomy: removal of part or all of the esophagus using a Dacron graft to replace the resected portion
   b. Esophagogastrostomy: resection of a portion of the esophagus (usually middle third) and anastomosis of the remaining portion of the stomach
   c. Esophagoenterostomy: resection of portion of the esophagus and anastomosis of a segment of colon to the remaining portion
   d. Palliative gastrostomy: done for the purpose of feeding the client

C. Assessment findings
1. Substernal burning after drinking hot fluids
2. Pain located in the substernal and epigastric areas; usually intensified with swallowing
3. Weight loss
4. Barium swallow reveals narrowing of the esophagus at the area of the tumor
5. Diagnostic test: esophagoscopy with a biopsy reveals malignant cells

D. Nursing interventions
1. Provide nursing care for the client receiving radiation therapy.
2. Prepare client for surgery: in addition to routine pre-op care
   a. Provide meticulous oral hygiene including teeth, gums, tongue, and mouth.
   b. Explain that client may have a chest tube if thoracic approach is used.
   c. Prepare client for feedings through a gastrostomy.
3. In addition to routine post-op care
   a. Monitor NG tube: expect bloody drainage for approximately 12 hours with gradual change to green, then to yellow.
   b. Prevent gastric reflux: place client in semi-Fowler's position; maintain upright position for 2 hours after meals when client is able to take fluids/food orally.
4. Provide emotional support to client/significant others; prognosis is grave.
5. Provide client teaching and discharge planning concerning
   a. Gastrostomy and proper dietary measures
   b. Importance of cessation of smoking and elimination of alcohol consumption
   c. Maintain good oral hygiene.
   d. Maintain a high-calorie, high-protein diet

Esophageal Varices

See Disorders of the Liver.

Hiatal Hernia

A. General information
1. Sliding hiatal hernia occurs when a portion of the stomach and vagus nerve slide upward into the thorax through an enlarged hiatus in the diaphragm.
2. Result is reflux of gastric juices and inflammation of the lower portion of the esophagus.
3. Occurs more often in women ages 40–70.
4. May be caused by congenital weakening of the muscles in the diaphragm around the esophagogastric opening; increased intra-abdominal pressure (obesity, pregnancy, ascites); trauma.

B. Medical management
1. Drug therapy: antacids to reduce acidity and relieve discomfort, cholinergics
2. Modification of diet: elimination of spicy foods and caffeine
3. Surgery: reduction of the hiatal hernia via an abdominal or thoracic approach

C. Assessment findings
1. Heartburn, especially after meals, at night, or with position changes (particularly recumbent), dysphagia, regurgitation several hours after meals without vomiting
2. Barium swallow displays protrusion of the gastric mucosa through a hiatus
3. Esophagoscopy reveals an incompetent cardiac sphincter

D. Nursing interventions
1. Provide a bland diet with six small feedings/day, as ordered.
2. Administer medications as ordered.
3. Prepare client for surgery: in addition to routine pre-op care
   a. Inform client about chest tubes (if thoracic approach to be used).
   b. Provide information regarding NG intubation.
4. In addition to routine post-op care
   a. Decrease/avoid gastric distension.
   b. Promote pulmonary expansion: chest tubes if a thoracic approach; semi-Fowler's position.
5. Provide client teaching and discharge planning concerning:
   a. Modification of diet
   b. Sitting up for meals and for 2 hours after meals will help reduce gastric acid reflux
   c. Use of antacids
   d. Eating small, frequent meals slowly to help prevent gastric distension
   e. Need to avoid carbonated beverages and anticholinergic drugs (and OTC medications that contain them)

f. Avoidance of heavy lifting (to prevent intra-abdominal pressure); bend, kneel, or stoop instead
g. Importance of treating persistent cough
h. Adherence to weight-reduction plan if obese

Gastritis

A. General information
1. An acute inflammatory condition that causes a breakdown of the normal gastric protective barriers with subsequent diffusion of hydrochloric acid into the gastric lumen
2. Results in hemorrhage, ulceration, and adhesions of the gastric mucosa
3. Present in some form (mild to severe) in 50% of all adults
4. Caused by excessive ingestion of certain drugs (salicylates, steroids, Butazolidin), alcohol; food poisoning; large quantities of spicy, irritating foods in diet

B. Assessment findings
1. Anorexia, nausea and vomiting, hematemesis, epigastric fullness/discomfort, epigastric tenderness
2. Decreased Hgb and HCT (if anemic)
3. Endoscopy: inflammation and ulceration of gastric mucosa
4. Gastric analysis: hydrochloric acid usually increased, except in atrophic gastritis

C. Nursing interventions
1. Monitor and maintain fluid and electrolyte balances.
2. Control nausea and vomiting (NPO until able to tolerate foods, then bland diet).
3. Administer medications as ordered: antiemetics, antacids, sedatives.
4. Maintain patency of NG tube.
5. Provide client teaching and discharge planning concerning avoidance of foods/medications such as coffee, spicy foods, alcohol, salicylates, ibuprofen, steroids.

Peptic Ulcer Disease

Gastric Ulcers

A. General information
1. Ulceration of the mucosal lining of the stomach; most commonly found in the antrum
2. Gastric secretions and stomach emptying rate usually normal
3. Rapid diffusion of gastric acid from the gastric lumen into gastric mucosa, however, causes an inflammatory reaction with tissue breakdown
4. Also characterized by reflux into the stomach of bile containing duodenal contents
5. Occurs more often in men, in unskilled laborers, and in lower socioeconomic groups; peak age 40–55 years
6. Predisposing factors include smoking, alcohol abuse, emotional tension, and drugs (salicylates, steroids, Butazolidin)
7. Caused by bacterial infection (*Helicobacter pylori*)

B. Medical management
1. Supportive: rest, bland diet, stress management
2. Drug therapy: antacids, histamine (H_2) receptor antagonists, anticholinergics, omeprazole (Prilosec), sucralfate (Carafate); also metronidazole and amoxacillin for ulcers caused by *H. pylori*
3. Surgery: various combinations of gastric resections and anastomosis

C. Assessment findings
1. Pain located in left epigastrium, with possible radiation to the back; usually occurs 1–2 hours after meals
2. Weight loss
3. Hgb and HCT decreased (if anemic)
4. Endoscopy reveals ulceration; differentiates ulcers from gastric cancer
5. Gastric analysis: normal gastric acidity in gastric ulcer, increased in duodenal ulcer
6. Upper GI series: presence of ulcer confirmed

D. Nursing interventions
1. Administer medications as ordered (see Table 4-23).
2. Provide nursing care for the client with ulcer surgery.
3. Provide client teaching and discharge planning concerning
a. Medical regimen
1) Take medications at prescribed times.
2) Have antacids available at all times.
3) Recognize situations that would increase the need for antacids.
4) Avoid ulcerogenic drugs (salicylates, steroids).
5) Know proper dosage, action, and side effects.
b. Proper diet
1) Bland diet consisting of six small meals/day.
2) Eat meals slowly.
3) Avoid acid-producing substances (caffeine, alcohol, highly seasoned foods).
4) Avoid stressful situations at mealtime.
5) Plan for rest periods after meals.
6) Avoid late bedtime snacks.
c. Avoidance of stress-producing situations and development of stress-reduction methods (relaxation techniques, exercises, biofeedback).

Table 4–23 Drug Therapy for Peptic Ulcer

Drug Type	Action	Side Effects	Nursing Implications
TRANQUILIZERS			
• Combination drug (Librax); chlordiazepoxide (Librium) and clidinium bromide (Quarzan)	Decrease vagal activity and reduce anxiety	Sedation, headache, mental depression, blurred vision, nausea, vomiting, diarrhea, physical/psychological dependence	Contraindicated with other CNS depressants, antidepressants; avoid alcohol use, narcotic analgesics.
ANTICHOLINERGICS			
• Belladonna tincture	Decreases acetylcholine, block cholinergic receptors	Dry mouth, constipation	Contraindicated in narrow-angle glaucoma, myasthenia gravis, paralytic ileus, urinary retention.
• Pirenzepine (Gastrozepine)	Blocks muscarinic receptors that regulate gastric acid secretion	No severe anticholinergic side effects	
• Propantheline bromine (Pro-Banthine)	Decreases gastric secretions; used in irritable bowel syndrome, pancreatitis, urinary bladder spasm	Standard anticholinergic effects: dry mouth, decreased secretions, tachycardia, urinary retention	
• Tridihexethyl chloride (Pathilon)	Decreases gastric secretions		
ANTACIDS			
• Aluminum hydroxide, aluminum carbonate (Amphogel, Alternagel)	Neutralize gastric acid and reduce pepsin activity	Prolonged use may cause hypophosphatemia	
• Magnesium hydroxide, magnesium trisilicate, magnesium phosphate (Maalox, Gaviscon)		Hypermagnesemia	Contraindicated in impaired renal function.
HISTAMINE (H_2) BLOCKERS			
• Cimetadine (Tagamet) • Rantadine (Zantac) • Famotidine (Pepcid) • Nizatidine (Axid)	Block H_2 receptor sites of parietal cells of stomach	Headaches, dizziness, constipation, pruritus, skin rash, gynecomastia, decreased libido, impotence	Do not give within 1 hour of antacids. Cimetidine may enhance effects of oral anticoagulants, theophylline, caffeine, phenytoin, diazepam, propranolol, phenobarbital, calcium channel blockers; rantadine and famotidine have fewer side effects.
PROTON PUMP INHIBITORS (PPIs)			
• Esomeprazole magnesium (Nexium) • Lansoprazole (Prevacid) • Omeprazole (Prilosec) • Pantoprazole (Protonix) • Rabeprazole (Aciphex)	Inhibit gastric secretion regardless of acetylcholine or histamine release; used in treatment of erosive esophagitis/GERD, gastric and duodenal ulcers, *H. pylori*		

(continues)

Table 4–23 Drug Therapy for Peptic Ulcer *(continued)*

Drug Type	Action	Side Effects	Nursing Implications
PEPSIN INHIBITOR • Sucralfate (Carafate)	Reacts with acid to form a paste that binds to ulcerated tissue to prevent further destruction by digestive enzyme pepsin	Dizziness, nausea, constipation, dry mouth, rash, pruritus, back pain, sleepiness	Mucosal protective drug; must be given 30 minutes before meals and at bedtime.
PROSTAGLANDIN E_1 ANALOGUE • Misoprostol (Cytotec)	Synthetic prostaglandin replacement product that blocks secretion of excess acid and protects stomach mucosa; used adjunctively with long-term NSAIDS or ASA therapy	Diarrhea, abdominal pain, flatulence, nausea, vomiting, constipation, menstrual spotting	
ANTI-INFECTIVES • Metronidazole hydrochloride (Flagyl, Protostat) • Amoxicillin (Amoxil) • Clarithromycin (Biaxin) • Tetracycline	Used in dual, triple, quadruple combination therapy for treatment of *H. pylori*		

Duodenal Ulcers

A. General information
  1. Most commonly found in the first 2 cm of the duodenum
  2. Occur more frequently than gastric ulcers
  3. Characterized by gastric hyperacidity and a significant increased rate of gastric emptying
  4. Occur more often in younger men; more women affected after menopause; peak age 35–45 years
  5. Predisposing factors include smoking, alcohol abuse, psychological stress, bacterial infection (*H. pylori*)

B. Medical management: same as for gastric ulcers

C. Assessment findings
  1. Pain located in midepigastrium and described as burning, cramping; usually occurs 2–4 hours after meals and is relieved by food.
  2. Diagnostic tests: same as for gastric ulcer.

D. Nursing interventions: same as for gastric ulcer

Gastric Surgery

A. General information
  1. Surgery is performed when peptic ulcer disease does not respond to medical management or for gastric cancer
  2. Types
    a. Vagotomy: severing of part of the vagus nerve innervating the stomach to decrease gastric acid secretion
    b. Antrectomy: removal of the antrum of the stomach to eliminate the gastric phase of digestion
    c. Pyloroplasty: enlargement of the pyloric sphincter with acceleration of gastric emptying
    d. Gastroduodenostomy (Billroth I): removal of the lower portion of the stomach with anastomosis of the remaining portion of the duodenum
    e. Gastrojejunostomy (Billroth II): removal of the antrum and distal portion of the stomach and duodenum with anastomosis of the remaining portion of the stomach to the jejunum
    f. Gastrectomy: removal of 60–80% of the stomach
    g. Esophagojejunostomy (total gastrectomy): removal of the entire stomach with a loop of jejunum anastomosed to the esophagus
  3. Dumping syndrome
    a. Abrupt emptying of stomach contents into the intestine
    b. Common complications of gastric surgery
    c. Associated with the presence of hyperosmolar chyme in the jejunum, which draws fluid by osmosis from the extracellular fluid into the bowel. Decreased plasma volume and distension

of the bowel stimulates increased intestinal motility.
    - **d.** Signs and symptoms include weakness, faintness, palpitations, diaphoresis, feeling of fullness, or discomfort, nausea, and occasionally diarrhea; appear 15–30 minutes after meals and last for 20–60 minutes.
- **B.** Nursing interventions: routine preoperative care
- **C.** Nursing interventions: postoperative
    - **1.** Provide routine post-op care.
    - **2.** Ensure adequate function of NG tube.
        - **a.** Measure drainage accurately to determine necessity for fluid and electrolyte replacement; notify physician if there is no drainage.
        - **b.** Anticipate frank, red bleeding for 12–24 hours.
    - **3.** Promote adequate pulmonary ventilation.
        - **a.** Place client in mid- or high-Fowler's position to promote chest expansion.
        - **b.** Teach client to splint high upper abdominal incision before turning, coughing, and deep breathing.
    - **4.** Promote adequate nutrition.
        - **a.** After removal of NG tube, provide clear liquids with gradual introduction of small amounts of bland food at frequent intervals.
        - **b.** Monitor weight daily.
        - **c.** Assess for regurgitation; if present, instruct client to eat smaller amounts of food at a slower pace.
    - **5.** Provide client teaching and discharge planning concerning:
        - **a.** Gradually increasing food intake until able to tolerate three meals/day
        - **b.** Daily monitoring of weight
        - **c.** Stress-reduction measures
        - **d.** Need to report signs of complications to physician immediately (hematemesis, vomiting, diarrhea, pain, melena, weakness, feeling of abdominal fullness/distension)
        - **e.** Methods of controlling symptoms associated with dumping syndrome
            - **1)** Avoidance of concentrated sweets
            - **2)** Adherence to six, small, dry meals/day
            - **3)** Maintenance of modified diet
            - **4)** Refraining from taking fluids during meals but rather 2 hours after meals
            - **5)** Assuming a recumbent position for ½ hour after meals

Cancer of the Stomach

- **A.** General information
    - **1.** Most often develops in the distal third and may spread through the walls of the stomach into adjacent tissues, lymphatics, regional lymph nodes, and other abdominal organs, or through the bloodstream to the lungs and bones.
    - **2.** Affects men twice as often as women; more frequent in African Americans and Asians; most commonly occurs between ages 50 and 70
    - **3.** Causes
        - **a.** Excessive intake of highly salted or smoked foods
        - **b.** Diet low in quantity of vegetables and fruits
        - **c.** Atrophic gastritis
        - **d.** Achlorhydria
        - **e.** *Helicobacter pylori* infection
- **B.** Medical management
    - **1.** Chemotherapy
    - **2.** Radiation therapy
    - **3.** Treatment for anemia, gastric decompression, nutritional support, fluid and electrolyte maintenance
    - **4.** Surgery: type depends on location and extent of lesion.
        - **a.** Subtotal gastrectomy (Billroth I or II)
        - **b.** Total gastrectomy
- **C.** Assessment findings
    - **1.** Fatigue, weakness, dizziness, shortness of breath, nausea and vomiting, hematemesis, weight loss, indigestion, epigastric fullness, feeling of early satiety when eating, epigastric pain (later)
    - **2.** Pallor, lethargy, poor skin turgor and mobility, palpable epigastric mass
    - **3.** Diagnostic tests
        - **a.** Stool for occult blood positive
        - **b.** CEA positive
        - **c.** Hgb and HCT decreased
        - **d.** SGOT (AST), SGPT (ALT), LDH, serum amylase elevated (if liver and pancreatic involvement)
        - **e.** Gastric analysis reveals histologic changes
- **D.** Nursing interventions
    - **1.** Give consistent nutritional assessment and support.
    - **2.** Provide care for the client receiving chemotherapy.
    - **3.** Provide care for the client with gastric surgery (see Gastric Surgery).

Hernias

- **A.** General information
    - **1.** Protrusion of a viscus from its normal cavity through an abnormal opening/weakened area
    - **2.** Occurs anywhere but most often in the abdominal cavity
    - **3.** Types
        - **a.** Reducible: can be manually placed back into the abdominal cavity.

b. Irreducible: cannot be placed back into the abdominal cavity.
c. Inguinal: occurs when there is weakness in the abdominal wall where the spermatic cord in men and round ligament in women emerge.
d. Femoral: protrusion through the femoral ring; more common in females.
e. Incisional: occurs at the site of a previous surgical incision as a result of inadequate healing postoperatively.
f. Umbilical: most commonly found in children.
g. Strangulated: irreducible, with obstruction to intestinal flow and blood supply.

B. Medical management
1. Manual reduction, use of a truss (firm support)
2. Bowel surgery if strangulated
3. Herniorrhaphy: surgical repair of the hernia by suturing the defect

C. Assessment findings
1. Vomiting, protrusion of involved area (more obvious after coughing), and discomfort at site of protrusion
2. Crampy abdominal pain and abdominal distention (if strangulated with a bowel obstruction)

D. Nursing interventions
1. Observe client for complications such as strangulation.
2. Prepare client for herniorrhaphy, provide routine pre-op care.
3. In addition to routine post-op care
a. Assess for possible distended bladder, particularly with inguinal hernia repair.
b. Discourage coughing, but deep breathing and turning should be done.
c. Assist to splint incision when coughing or sneezing.
d. Apply ice bags to scrotal area (if inguinal repair) to decrease edema.
e. Scrotal (athletic) or abdominal binder support may be ordered in some cases.
4. Provide client teaching and discharge planning concerning:
a. Need to avoid strenuous physical activities (e.g., heavy lifting, pulling, pushing) for at least 6 weeks.
b. Need to report any difficulty with urination.

Intestinal Obstructions

A. General information
1. Mechanical intestinal obstruction: physical blockage of the passage of intestinal contents with subsequent distension by fluid and gas; caused by adhesions, hernias, volvulus, intussusception, inflammatory bowel disease, foreign bodies, strictures, neoplasms, fecal impaction
2. Paralytic ileus (neurogenic or adynamic ileus): interference with the nerve supply to the intestine resulting in decreased or absent peristalsis; caused by abdominal surgery, peritonitis, pancreatic toxic conditions, shock, spinal cord injuries, electrolyte imbalances (especially hypokalemia)
3. Vascular obstructions: interference with the blood supply to a portion of the intestine, resulting in ischemia and gangrene of the bowel; caused by an embolus, atherosclerosis

B. Assessment findings
1. Small intestine: nonfecal vomiting; colicky intermittent abdominal pain
2. Large intestine: cramplike abdominal pain, occasional fecal-type vomitus; client will be unable to pass stools or flatus
3. Abdominal distension, rigidity, high-pitched bowel sounds above the level of the obstruction, decreased or absent bowel sounds distal to obstruction
4. Diagnostic tests
a. Flat-plate (X-ray) of the abdomen reveals the presence of gas/fluid
b. HCT increased
c. Serum sodium, potassium, chloride decreased
d. BUN increased

C. Nursing interventions
1. Monitor fluid and electrolyte balance, prevent further imbalance; keep client NPO and administer IV fluids as ordered.
2. Accurately measure drainage from NG/intestinal tube.
3. Place client in Fowler's position to alleviate pressure on the diaphragm and encourage nasal breathing to minimize swallowing of air and further abdominal distension.
4. Institute comfort measures associated with NG intubation and intestinal decompression.
5. Prevent complications.
a. Measure abdominal girth daily to assess for increasing abdominal distension.
b. Assess for signs and symptoms of peritonitis.
c. Monitor urinary output.

Chronic Inflammatory Bowel Disorders

Regional Enteritis (Crohn's Disease)

A. General information
1. Chronic inflammatory bowel disease that can affect both the large and small intestine; terminal ileum, cecum, and ascending colon most often affected
2. Characterized by granulomas that may affect all the bowel wall layers with resultant thickening, narrowing, and scarring of the intestinal wall

3. Both sexes affected equally; more common in the Jewish population; two age peaks: 20–30 years and 40–60 years
4. Cause unknown; contributing factors include food allergies, autoimmune reaction, psychologic disorders

B. Medical management
1. Diet: high calorie, high vitamin, high protein, low residue, milk free; supplementary iron preparations
2. Drug therapy: antimicrobials (especially sulfasalazine) to prevent or control infection, corticosteroids, antidiarrheals, anticholinergics
3. Supplemental parenteral nutrition
4. Surgery: resection of diseased portion of bowel and temporary or permanent ileostomy

C. Assessment findings
1. Right, lower quadrant tenderness and pain; abdominal distension
2. Nausea and vomiting, 3–4 semisoft stools/day with mucus and pus
3. Decreased skin turgor, dry mucus membranes
4. Increased peristalsis
5. Pallor
6. Diagnostic tests
   a. Hgb and HCT (if anemic) decreased
   b. Sigmoidoscopy negative or reveals scattered ulcers
   c. Barium enema shows narrowing with areas of strictures separated by segments of normal bowel

D. Nursing interventions
1. Provide appropriate nutrition while reducing bowel motility.
   a. Administer/monitor TPN.
   b. Provide high-protein, high-calorie, low-residue diet with no milk products (if able to tolerate oral foods/fluids).
   c. Weigh daily, monitor kcal counts, and take periodic anthropometric measurements.
   d. Record number and characteristics of stools daily.
   e. Administer antidiarrheals, antispasmodics, and anticholinergics as ordered.
   f. Provide tepid fluids to avoid stimulation of the bowel.
   g. Omit gas-producing foods/fluids from diet.
   h. Administer/monitor enteral tube feedings as ordered.
2. Promote comfort/rest: provide good perineal care with frequent washing and adequate drying after each bowel movement; apply analgesic or protective ointment as needed; provide sitz baths as needed.
3. Provide care for the client with bowel surgery.

Ulcerative Colitis

A. General information
1. Inflammatory disorder of the bowel characterized by inflammation and ulceration that starts in the rectosigmoid area and spreads upward. The mucosa of the bowel becomes edematous, thickened with eventual scar formation. The colon consequently loses its elasticity and absorptive capabilities.
2. Occurs more often in women and the Jewish population, usually between ages 15 and 40.
3. Cause unknown; contributing factors include autoimmune factors, viral infection, allergies, emotional stress, insecurity.

B. Medical management
1. Mild to moderate form
   a. Low-roughage diet with no milk products
   b. Drug therapy (antimicrobials, corticosteroids, anticholinergics, antidiarrheals, immunosuppressives, hematinic agents)
2. Severe form: client kept NPO with IVs and electrolyte replacements, NG tube with suction, blood transfusions, surgery

C. Assessment findings
1. Severe diarrhea (15–20 liquid stools/day containing blood, mucus, and pus); severe tenesmus, weight loss, anorexia, weakness, crampy discomfort
2. Decreased skin turgor, dry mucous membranes
3. Low-grade fever, abdominal tenderness over the colon
4. Diagnostic tests
   a. Sigmoidoscopy reveals mucosa that bleeds easily with ulcer development
   b. Hgb and HCT decreased

D. Nursing interventions: same as for Crohn's disease

Diverticulosis/Diverticulitis

A. General information
1. A diverticulum is an outpouching of the intestinal mucosa, most commonly found in the sigmoid colon.
2. Diverticulosis: multiple diverticula of the colon
3. Diverticulitis: inflammation of the diverticula
4. Men affected more often than women, more common in obese individuals; usually occurs between ages 40 and 45
5. Caused by stress, congenital weakening of muscular fibers of intestine, and dietary deficiency of roughage and fiber

B. Medical management
1. High-residue diet with no seeds for diverticulosis; low-residue diet for diverticulitis
2. Drug therapy: bulk laxatives, stool softeners, anticholinergics, antibiotics
3. Surgery (rare): resection of diseased portion of colon with temporary colostomy may be indicated

C. Assessment findings
1. Intermittent lower left quadrant pain and tenderness over rectosigmoid area

2. Alternating constipation and diarrhea with blood and mucus
3. Diagnostic tests
   a. Barium enema indicates an inflammatory process
   b. Hgb and HCT decreased (if anemic)

D. Nursing interventions
1. Administer medications as ordered.
2. Provide nursing care for the client with bowel surgery.
3. Provide client teaching and discharge planning concerning:
   a. Importance of adhering to dietary regimen.
   b. Prevention of increased intraabdominal pressure.
   c. Signs and symptoms of peritonitis and need to notify physician immediately if they occur.

Cancer of the Colon/Rectum

A. General information
1. Adenocarcinoma is the most common type of colon cancer and may spread by direct extension through the walls of the intestine or through the lymphatic or circulatory system. Metastasis is most often to the liver.
2. Second most common site for cancer in men and women; usually occurs between ages 50 and 60
3. May be caused by diverticulosis, chronic ulcerative colitis, familial polyposis

B. Medical management: chemotherapy, radiation therapy, bowel surgery

C. Assessment findings
1. Alternating diarrhea/constipation, lower abdominal cramps, abdominal distension
2. Weakness, anorexia, weight loss, pallor, dyspnea
3. Diagnostic tests
   a. Stool for occult blood positive
   b. Hgb and HCT decreased
   c. CEA positive
   d. Sigmoidoscopy reveals a mass
   e. Barium enema shows a colon mass
   f. Digital rectal exam indicates a palpable mass

D. Nursing interventions
1. Administer chemotherapy agents as ordered, provide care for the client receiving chemotherapy.
2. Provide care for the client receiving radiation therapy.
3. Provide care for the client with bowel surgery.

Bowel Surgery

A. General information: type of surgery varies depending on location and extent of lesion; may be indicated in Crohn's disease, ulcerative colitis, intestinal obstructions, colon/rectal cancer.

B. Types: see Table 4-24.

C. Nursing interventions common to all bowel surgery
1. In addition to routine pre-op care:
   a. Ensure adherence to dietary restrictions.
      1) Offer clear liquids only on day before surgery.
      2) Provide high-calorie, low-residue diet 3–5 days before surgery.

Table 4-24 Bowel Surgeries

Type	Procedures
Abdominoperineal resection	Distal sigmoid colon, rectum, and anus are removed through a perineal incision and a permanent colostomy is created. Surgery of choice for cancer of the colon/rectum.
Ileostomy	Opening of the ileum onto the abdominal surface; most frequently done for treatment of ulcerative colitis, but may also be done for Crohn's disease.
Continent ileostomy (Kock's pouch)	An intra-abdominal reservoir with a nipple valve is formed from the distal ileum. The pouch acts as a reservoir for fecal material and is cleaned at regular intervals by insertion of a catheter.
Cecostomy	An opening between the cecum and the abdominal base temporarily diverts the fecal flow to rest the distal portion of the colon after some types of surgery.
Temporary colostomy	Usually located in the ascending or transverse colon; most often done to rest the bowel.
Double-barreled colostomy	The colon is resected and both ends are brought through the abdominal wall creating two stomas, a proximal and a distal; done most often for an obstruction or tumor in the descending or transverse colon.
Loop colostomy	Often a temporary procedure whereby a loop of bowel is brought out above the skin surface and held in place by a glass rod. There is one stoma but two openings, a proximal and a distal.
Permanent colostomy	Consists of a single stoma made when the distal portion of the bowel is removed; most often located in the sigmoid or descending colon.
Resection with anastomosis	Diseased part of the bowel is removed and remaining portions anastomosed, allowing elimination through the rectum.

b. Assist with bowel preparation.
1) Administer antibiotics 3–5 days pre-op to decrease bacteria in intestine.
2) Administer enemas (possibly with added antibiotics) to further cleanse the bowel.
c. Administer vitamins C and K (decreased by bowel cleansing) to prevent post-op complications.

2. In addition to routine post-op care:
a. Promote elimination.
1) Assess for signs of returning peristalsis.
2) Monitor characteristics of initial stools.
b. Monitor and maintain fluid and electrolyte balance.

D. Additional nursing interventions specific to abdominoperineal resection
1. Reinforce and change perineal dressings as needed.
2. Record type, amount, color of drainage.
3. Irrigate with normal saline or hydrogen peroxide.
4. Provide warm sitz baths 4 times per day.
5. Cover wound with dry dressing.

E. Additional nursing interventions specific to colostomy
1. Prevent skin breakdown.
a. Cleanse skin around stoma with mild soap and water and pat dry.
b. Use a skin barrier to protect skin around the stoma.
c. Assess skin regularly for irritation.
d. Avoid the use of adhesives on irritated skin.

2. Control odor, maintain pleasant environment.
a. Change pouch/seal whenever necessary.
b. Empty or clean bag frequently, and provide ventilation afterwards; use deodorizer in bag/room if needed.
c. Avoid gas-producing foods.

3. Promote adequate stomal drainage.
a. Assess stoma for color and intactness.
b. Expect mucoid/serosanguinous drainage during the first 24 hours, then liquid type.
c. Assess for flatus indicating return of intestinal function.
d. Monitor for changing consistency of fecal drainage.

4. Irrigate colostomy as needed.
a. Position client on toilet or in high-Fowler's if client on bed rest.
b. Fill irrigation bag with desired amount of water (500–1000 mL) and hang bag so the bottom is at shoulder height.
c. Remove air from tubing and lubricate the tip of the catheter or cone.
d. Remove old pouch and clean skin and stoma with water.
e. Gently dilate stoma and insert the irrigation catheter or cone snugly.
f. Open tubing and allow fluid to enter the bowel.
g. Remove catheter or cone and allow fecal contents to drain.
h. Observe and record amount and character of fecal return.

5. Promote adequate nutrition.
a. Assess return of peristalsis.
b. Advance diet as tolerated, add new foods gradually.
c. Avoid constipating foods.

6. Provide at least 2500 mL liquid/day.
7. Encourage client to discuss concerns and feelings about surgery.
8. Provide client teaching and discharge planning concerning:
a. Recognition of complications and need to report immediately
1) Changes in odor, consistency, and color of stools
2) Bleeding from the stoma
3) Persistent constipation or diarrhea
4) Changes in the contour of the stoma
5) Persistent leakage around the stoma
6) Skin irritation despite treatment
b. Proper procedure for colostomy irrigation.

Peritonitis

A. General information
1. Local or generalized inflammation of part or all of the parietal and visceral surfaces of the abdominal cavity
2. Initial response: edema, vascular congestion, hypermotility of the bowel and outpouring of plasmalike fluid from the extracellular, vascular, and interstitial compartments into the peritoneal space
3. Later response: abdominal distension leading to respiratory compromise, hypovolemia results in decreased urinary output
4. Intestinal motility gradually decreases and progresses to paralytic ileus
5. Caused by trauma (blunt or penetrating), inflammation (ulcerative colitis, diverticulitis), volvulus, intestinal ischemia, or intestinal obstruction

B. Medical management
1. NPO with fluid replacement
2. Drug therapy: antibiotics to combat infection, analgesics for pain
3. Surgery
a. Laparotomy: opening made through the abdominal wall into the peritoneal cavity to determine the cause of peritonitis
b. Depending on cause, bowel resection may be necessary

C. Assessment findings
   1. Severe abdominal pain, rebound tenderness, muscle rigidity, absent bowel sounds, abdominal distension (particularly if large bowel obstruction)
   2. Anorexia, nausea, and vomiting
   3. Shallow respirations; decreased urinary output; weak, rapid pulse; elevated temperature
   4. Diagnostic tests
      a. WBC elevated
      b. HCT elevated (if hemoconcentration)

D. Nursing interventions
   1. Assess respiratory status for possible distress.
   2. Assess characteristics of abdominal pain and changes over time.
   3. Administer medications as ordered.
   4. Perform frequent abdominal assessment.
   5. Monitor and maintain fluid and electrolyte balance; monitor for signs of septic shock.
   6. Maintain patency of NG or intestinal tubes.
   7. Place client in Fowler's position to localize peritoneal contents.
   8. Provide routine pre- and post-op care if surgery ordered.

Hemorrhoids

A. General information
   1. Congestion and dilation of the veins of the rectum and anus; usually result from impairment of flow of blood through the venous plexus
   2. May be internal (above the anal sphincter) or external (outside anal sphincter)
   3. Most commonly occur between ages 20 and 50
   4. Predisposing conditions include occupations requiring long periods of standing; increased intra-abdominal pressure caused by prolonged constipation, pregnancy, heavy lifting, obesity, straining at defecation; portal hypertension

B. Medical management
   1. Stool softeners, local anesthetics, or anti-inflammatory creams
   2. Diet modification: high fiber, adequate liquids
   3. Hemorrhoidectomy: surgical excision of hemorrhoids indicated when there is prolapse, severe pain, and excessive bleeding

C. Assessment findings
   1. Bleeding with defecation, hard stools with streaks of blood
   2. Pain with defecation, sitting, or walking
   3. Protrusion of external hemorrhoids upon inspection
   4. Diagnostic tests
      a. Proctoscopy reveals presence of internal hemorrhoids
      b. Hgb and HCT decreased if bleeding excessive, prolonged

D. Nursing interventions: preoperative
   1. Prepare client for hemorrhoidectomy.
   2. In addition to routine pre-op care, provide laxatives/enemas to promote cleansing of the bowel.

E. Nursing interventions: postoperative
   1. Provide routine post-op care.
   2. Assess for rectal bleeding: inspect rectal area/dressings every 2–3 hours and report significant increases in bloody drainage.
   3. Promote comfort.
      a. Assist client to side-lying or prone position, provide flotation pad when sitting.
      b. Administer analgesics as ordered and monitor effects.
   4. Promote elimination: administer stool softeners as ordered and, if possible, administer analgesic before first post-op bowel movement.
   5. Provide client teaching and discharge planning concerning:
      a. Dietary modifications (high fiber and ingestion of at least 2000 mL/day)
      b. Need to defecate when urge is felt
      c. Use of stool softeners as needed until healing occurs
      d. Sitz baths after each bowel movement for at least 2 weeks after surgery
      e. Perineal care
      f. Recognition and reporting immediately to physician of the following signs and symptoms
         1) Rectal bleeding
         2) Continued pain on defecation
         3) Puslike drainage from rectal area

DISORDERS OF THE LIVER

Hepatitis

A. General information
   1. Widespread inflammation of the liver tissue with liver cell damage due to hepatic cell degeneration and necrosis; proliferation and enlargement of the Kupffer cells; inflammation of the periportal areas (may cause interruption of bile flow)
   2. Hepatitis A
      a. Incubation period: 15–45 days
      b. Transmitted by fecal/oral route: often occurs in crowded living conditions; with poor personal hygiene; or from contaminated food, milk, water, or shellfish
   3. Hepatitis B
      a. Incubation period: 50–180 days
      b. Transmitted by blood and body fluids (saliva, semen, vaginal secretions): often from contaminated needles among IV drug abusers; intimate/sexual contact

4. Hepatitis C
   a. Incubation period: 7–50 days
   b. Transmitted by parenteral route: through blood and blood products, needles, syringes
5. Hepatitis D
   a. Incubation period: 14–56 days
   b. Transmitted by blood and body fluids; seen in persons who have hepatitis B
6. Hepatitis E
   a. Incubation period: 15–64 days
   b. Transmitted by fecal/oral route; usually water-borne; seen in travelers returning from underdeveloped countries

B. Assessment findings
1. Preicteric stage
   a. Anorexia, nausea and vomiting, fatigue, constipation or diarrhea, weight loss
   b. Right upper quadrant discomfort, hepatomegaly, splenomegaly, lymphadenopathy
2. Icteric stage
   a. Fatigue, weight loss, light-colored stools, dark urine
   b. Continued hepatomegaly with tenderness, lymphadenopathy, splenomegaly
   c. Jaundice, pruritus
3. Posticteric stage
   a. Fatigue, but an increased sense of well-being
   b. Hepatomegaly gradually decreasing
4. Diagnostic tests
   a. Hepatitis A, B, C
      1) SGPT (ALT), SGOT (AST), alkaline phosphatase, bilirubin, ESR: all increased (preicteric)
      2) Leukocytes, lymphocytes, neutrophils: all decreased (pericteric)
      3) Prolonged PT
   b. Hepatitis A
      1) Hepatitis A virus (HAV) in stool before onset of disease
      2) Anti-HAV (IgG) appears soon after onset of jaundice; peaks in 1–2 months and persists indefinitely
      3) Anti-HAV (IgM): positive in acute infection; lasts 4–6 weeks
   c. Hepatitis B
      1) HBsAg (surface antigen): positive, develops 4–12 weeks after infection
      2) Anti-HBsAG: negative in 80% of cases
      3) Anti-HBc: associated with infectivity, develops 2–16 weeks after infection
      4) HBeAg: associated with infectivity and disappears before jaundice
      5) Anti-HBe: present in carriers, represents low infectivity
   d. Hepatitis C
      1) Initial screening test enzyme-linked immunoabsorbent assay (ELISA) test
      2) If ELISA test is positive and ALT is normal then recombinant immunoblot assay (RIBA) done
      3) Reverse transcription polymerase chain reaction (RT-PCR) test can pick up virus 2–3 weeks after exposure
   e. Hepatitis D: rise in hepatitis D virus antibodies (anti-HDV) titer
   f. Hepatitis E: testing usually done only for symptomatic persons who have traveled to high-risk areas; hepatitis E antibodies (anti-HEV) present

C. Nursing interventions
1. Promote adequate nutrition.
   a. Administer antiemetics as ordered, 30 minutes before meals to decrease occurrence of nausea and vomiting.
   b. Provide small, frequent meals of a high-carbohydrate, moderate- to high-protein, high-vitamin, high-calorie diet.
   c. Avoid very hot or very cold foods.
2. Ensure rest/relaxation: plan schedule for rest and activity periods, organize nursing care to minimize interruption.
3. Monitor/relieve pruritus (see Cirrhosis of the Liver).
4. Administer corticosteroids as ordered.
5. Institute isolation procedures as required; pay special attention to good hand-washing technique and adequate sanitation.
6. In hepatitis A administer immune serum globulin (ISG) early to exposed individuals as ordered.
7. In hepatitis B
   a. Screen blood donors for HBsAg.
   b. Use disposable needles and syringes.
   c. Instruct client/others to avoid sexual intercourse while disease is active.
   d. Administer ISG to exposed individuals as ordered.
   e. Administer hepatitis B immunoglobulin (HBIG) as ordered to provide temporary and passive immunity to exposed individuals.
   f. To produce active immunity, administer hepatitis B vaccine to those individuals at high risk.
8. In non-A, non-B: use disposable needles and syringes; ensure adequate sanitation.
9. In hepatitis C: Medications used are interferon combined with ribavirin. Side effects may include flu-like symptoms, nausea; hair loss; emotional changes.
10. Provide client teaching and discharge planning concerning:
    a. Importance of avoiding alcohol
    b. Avoidance of persons with known infections
    c. Balance of activity and rest periods
    d. Importance of not donating blood

e. Dietary modifications
f. Recognition and reporting of signs of inadequate convalescence: anorexia, jaundice, increasing liver tenderness/discomfort
g. Techniques/importance of good personal hygiene

Cirrhosis of the Liver

A. General information
1. Chronic, progressive disease characterized by inflammation, fibrosis, and degeneration of the liver parenchymal cells
2. Destroyed liver cells are replaced by scar tissue, resulting in architectural changes and malfunction of the liver
3. Types
   a. Laënnec's cirrhosis: associated with alcohol abuse and malnutrition; characterized by an accumulation of fat in the liver cells, progressing to widespread scar formation.
   b. Postnecrotic cirrhosis: results in severe inflammation with massive necrosis as a complication of viral hepatitis.
   c. Cardiac cirrhosis: occurs as a consequence of right-sided heart failure; manifested by hepatomegaly with some fibrosis.
   d. Biliary cirrhosis: associated with biliary obstruction, usually in the common bile duct; results in chronic impairment of bile excretion.
4. Occurs twice as often in men as in women; ages 40–60

B. Assessment findings
1. Fatigue, anorexia, nausea and vomiting, indigestion, weight loss, flatulence, irregular bowel habits
2. Early symptoms: hepatomegaly; pain in right upper quadrant. Late symptoms: hard nodular liver upon palpitation; atrophy of liver
3. Changes in mood, alertness, and mental ability; sensory deficits; gynecomastia, decreased axillary and pubic hair in males; amenorrhea in young females
4. Jaundice of the skin, sclera, and mucous membranes; pruritus
5. Easy bruising, spider angiomas, palmar erythema
6. Muscle atrophy
7. Diagnostic tests
   a. SGOT (AST), SGPT (ALT), LDH alkaline phosphatase increased
   b. Serum bilirubin increased
   c. PT prolonged
   d. Serum albumin decreased
   e. Hgb and HCT decreased

C. Nursing interventions
1. Provide sufficient rest and comfort.
   a. Provide bed rest with bathroom privileges.
   b. Encourage gradual, progressive, increasing activity with planned rest periods.
   c. Institute measures to relieve pruritus.
      1) Do not use soaps and detergents.
      2) Bathe in tepid water followed by application of an emollient lotion.
      3) Provide cool, light, nonrestrictive clothing.
      4) Keep nails short to avoid skin excoriation from scratching.
      5) Apply cool, moist compresses to pruritic areas.
2. Promote nutritional intake.
   a. Encourage small frequent feedings.
   b. Promote a high-calorie, low- to moderate-protein, high-carbohydrate, low-fat diet, with supplemental vitamin therapy (vitamins A, B-complex, C, D, K, and folic acid).
3. Prevent infection.
   a. Prevent skin breakdown by frequent turning and skin care.
   b. Provide reverse isolation for clients with severe leukopenia; pay special attention to handwashing technique.
   c. Monitor WBC.
4. Monitor/prevent bleeding.
5. Administer diuretics as ordered.
6. Provide client teaching and discharge planning concerning:
   a. Avoidance of agents that may be hepatotoxic (sedatives, opiates, or OTC drugs detoxified by the liver)
   b. How to assess for weight gain and increased abdominal girth
   c. Avoidance of persons with upper respiratory infections
   d. Recognition and reporting of signs of recurring illness (liver tenderness, increased jaundice, increased fatigue, anorexia)
   e. Avoidance of all alcohol
   f. Avoidance of straining at stool, vigorous blowing of nose and coughing, to decrease the incidence of bleeding

Ascites

A. General information
1. Accumulation of free fluid in the abdominal cavity
2. Most frequently caused by cirrhotic liver damage, which produces hypoalbuminemia, increased portal venous pressure, and hyperaldosteronism
3. May also be caused by HF

B. Medical management
1. Supportive: modify diet, bed rest, salt-poor albumin

2. Diuretic therapy (see Unit 2)
3. Surgery
   a. Paracentesis: insertion of a needle into the peritoneal cavity through the abdomen to remove abnormally large amounts of peritoneal fluid.
      1) Peritoneal fluid assessed for cell count, specific gravity, protein, and microorganisms.
      2) Used in clients with acute respiratory or abdominal distress secondary to ascites.
   b. LeVeen shunt (peritoneal-venous shunt): used in chronic, unmanageable ascites
      1) Permits continuous reinfusion of ascitic fluid back into the venous system through a silicone catheter with a one-way pressure-sensitive valve.
      2) One end of the catheter is implanted into the peritoneal cavity and is channeled through the subcutaneous tissue to the superior vena cava, where the other end of the catheter is implanted; the valve opens when pressure in the peritoneal cavity is 3–5 cm of water higher than in superior vena cava, thereby allowing ascitic fluid to flow into the venous system.

C. Assessment findings
1. Anorexia, nausea and vomiting, fatigue, weakness, changes in mental functioning
2. Positive fluid wave and shifting dullness on percussion, flat or protruding umbilicus, abdominal distension/tautness with striae and prominent veins, abdominal pain
3. Peripheral edema, shortness of breath
4. Diagnostic tests
   a. Potassium and serum albumin decreased
   b. PT prolonged
   c. LDH, SGOT (AST), SGPT (ALT), BUN, sodium increased

D. Nursing interventions
1. Monitor nutritional status/provide adequate nutrition with modified diet.
   a. Restrict sodium to 200–500 mg/day.
   b. Restrict fluids to 1000–1500 mL/day.
   c. Promote high-calorie foods/snacks.
2. Monitor/prevent increasing edema.
   a. Administer diuretics as ordered and monitor for effects.
   b. Measure I&O.
   c. Monitor peripheral pulses.
   d. Measure abdominal girth.
   e. Inspect/palpate extremities, sacrum.
   f. Administer salt-poor albumin to replace vascular volume.
3. Monitor/promote skin integrity.
   a. Reposition frequently.
   b. Apply lotions to stretched areas.
   c. Assess for redness, breakdown.
4. Promote comfort: place client in mid- to high-Fowler's and reposition frequently.
5. Provide nursing care for the client undergoing paracentesis.
   a. Confirm that client has signed a consent form.
   b. Instruct client to empty bladder before the procedure to prevent inadvertent puncture of the bladder during insertion of trocar.
   c. Inform client that a local anesthetic will be provided to decrease pain.
   d. Place in sitting position to facilitate the flow of fluid by gravity.
   e. Measure abdominal girth and weight before and after the procedure.
   f. Record color, amount, and consistency of fluid withdrawn and client tolerance during procedure.
   g. Assess insertion site for leakage.
6. Provide routine pre- and post-op care for the client with LeVeen shunt.

Esophageal Varices

A. General information
1. Dilation of the veins of the esophagus, caused by portal hypertension from resistance to normal venous drainage of the liver into the portal vein
2. Causes blood to be shunted to the esophagogastric veins, resulting in distension, hypertrophy, and increased fragility.
3. Caused by portal hypertension, which may be secondary to cirrhosis of the liver (alcohol abuse), swallowing poorly masticated food, increased intra-abdominal pressure

B. Medical management
1. Iced normal saline lavage
2. Transfusions with fresh whole blood
3. Vitamin K therapy
4. Sengstaken-Blakemore tube: a three-lumen tube used to control bleeding by applying pressure on the cardiac portion of the stomach and against bleeding esophageal varices. One lumen serves as NG suction, a second lumen is used to inflate the gastric balloon, the third to inflate the esophageal balloon.
5. Intra-arterial or IV vasopressin
6. Injection sclerotherapy
7. Surgery for portal hypertension (decompresses esophageal varices and helps to maintain optimal portal perfusion)
   a. Ligation of esophageal and gastric veins to stop acute bleeding
   b. Portacaval shunt: end-to-side or side-to-side anastomosis of the portal vein to the inferior vena cava
   c. Splenorenal shunt: end-to-side or side-to-side anastomosis of the splenic vein to the left renal vein

d. Mesocaval shunt: end-to-side or use of a graft to anastomose the inferior vena cava to the side of the superior mesenteric vein

C. Assessment findings
1. Anorexia, nausea and vomiting, hematemesis, fatigue, weakness
2. Splenomegaly, increased splenic dullness, ascites, caput medusae, peripheral edema, bruits
3. Diagnostic tests
a. PT prolonged
b. Hematest of vomitus positive
c. Serum albumin, RBC, Hgb, and HCT decreased
d. LDH, SGOT (AST), SGPT (ALT), BUN, increased

D. Nursing interventions
1. Monitor/provide care for client with Sengstaken-Blakemore tube.
a. Facilitate placement of the tube: check and lubricate tip and elevate head of bed.
b. Prevent dislodgment of the tube by placing client in semi-Fowler's position; maintain traction by securing the tube to a piece of sponge or foam rubber placed on the nose.
c. Keep scissors at bedside at all times.
d. Monitor respiratory status; assess for signs of distress and if respiratory distress occurs cut the tubing to deflate the balloons and remove tubing immediately.
e. Label each lumen to avoid confusion; maintain prescribed amount of pressure on esophageal balloon and deflate balloon as ordered to avoid necrosis.
f. Observe nares for skin breakdown and provide mouth and nasal care every 1–2 hours (encourage client to expectorate secretions, suction gently if unable).
2. Promote comfort: place client in semi-Fowler's position (if not in shock); provide mouth care.
3. Monitor for further bleeding and for signs and symptoms of shock; hematest all secretions.
4. Administer vasopressin as ordered and monitor effects.
5. Provide routine pre- and post-op care if the client has portasystemic or portacaval shunt.
6. Provide client teaching and discharge planning concerning:
a. Minimizing esophageal irritation (avoidance of salicylates, alcohol; use of antacids as needed; importance of chewing food thoroughly)
b. Avoidance of increased abdominal, thoracic, and portal pressure
c. Recognition and reporting of signs of hemorrhage

Hepatic Encephalopathy

A. General information
1. Frequent terminal complication in liver disease
2. Diseased liver is unable to convert ammonia to urea, so that large quantities remain in the systemic circulation and cross the blood/brain barrier, producing neurologic toxic symptoms.
3. Caused by cirrhosis, GI hemorrhage, hyperbilirubinemia, transfusions (particularly with stored blood), thiazide diuretics, uremia, dehydration

B. Assessment findings
1. Early in course of disease: changes in mental functioning (irritability); insomnia, slowed affect; slow slurred speech; impaired judgment; slight tremor; Babinski's reflex, hyperactive reflexes
2. Progressive disease: asterixis, disorientation, apraxia, tremors, fetor hepaticus, facial grimacing
3. Late in disease: coma, absent reflexes
4. Diagnostic tests
a. Serum ammonia levels increased (particularly later)
b. PT prolonged
c. Hgb and HCT decreased

C. Nursing interventions
1. Conduct ongoing neurologic assessment and report deteriorations.
2. Restrict protein in diet; provide high carbohydrate intake and vitamin K supplements.
3. Administer enemas, cathartics, intestinal antibiotics, and lactulose as ordered to reduce ammonia levels.
4. Protect client from injury: keep side rails up; provide eye care with use of artificial tears/eye patch.
5. Avoid administration of drugs detoxified in liver (phenothiazines, gold compounds, methyldopa, acetaminophen).
6. Maintain client on bed rest to decrease metabolic demands on liver.

Cancer of the Liver

A. General information
1. Primary cancer of the liver is extremely rare, but it is a common site for metastasis because of liver's large blood supply and portal drainage. Primary cancers of the colon, rectum, stomach, pancreas, esophagus, breast, lung, and melanomas frequently metastasize to the liver.
2. Enlargement, hemorrhage, and necrosis are common occurrences; primary liver tumors often metastasize to the lung.
3. Higher incidence in men.
4. Prognosis poor; disease well advanced before clinical signs evident.

B. Medical management
1. Chemotherapy and radiotherapy (palliative) to decrease tumor size and pain

2. Resection of liver segment or lobe if tumor is localized

C. Assessment findings
1. Weakness, anorexia, nausea and vomiting, weight loss, slight increase in temperature
2. Right upper quadrant discomfort/tenderness, hepatomegaly, blood-tinged ascites, friction rub over liver, peripheral edema, jaundice
3. Diagnostic tests: same as cirrhosis of the liver plus:
   a. Blood sugar decreased
   b. Alpha fetoprotein increased
   c. Abdominal X-ray, liver scan, liver biopsy all positive

D. Nursing interventions: same as for cirrhosis of the liver plus:
1. Provide emotional support for client/significant others regarding poor prognosis.
2. Provide care of the client receiving radiation therapy or chemotherapy.
3. Provide care of client with abdominal surgery plus:
   a. Preoperative
      1) Perform bowel prep to decrease ammonium intoxication.
      2) Administer vitamin K to decrease risk of bleeding.
   b. Postoperative
      1) Administer 10% glucose for first 48 hours to avoid rapid blood sugar drop.
      2) Monitor for hyper/hypoglycemia.
      3) Assess for bleeding (hemorrhage is most threatening complication).
      4) Assess for signs of hepatic encephalopathy.

DISORDERS OF THE GALLBLADDER

Cholecystitis/Cholelithiasis

A. General information
1. Cholecystitis: acute or chronic inflammation of the gallbladder, most commonly associated with gallstones. Inflammation occurs within the walls of the gallbladder and creates a thickening accompanied by edema. Consequently, there is impaired circulation, ischemia, and eventual necrosis.
2. Cholelithiasis: formation of gallstones, cholesterol stones most common variety
3. Most often occurs in women after age 40, in postmenopausal women on estrogen therapy, in women taking oral contraceptives, and in the obese; Caucasians and Native Americans are also more commonly affected.
4. Stone formation may be caused by genetic defect of bile composition, gallbladder/bile stasis, infection.
5. Acute cholecystitis usually follows stone impaction, adhesions; neoplasms may also be implicated.

B. Medical management
1. Supportive treatment: NPO with NG intubation and IV fluids
2. Diet modification with administration of fat-soluble vitamins
3. Drug therapy
   a. Narcotic analgesics (Demerol is drug of choice) for pain. Morphine sulfate is contraindicated because it causes spasms of the sphincter of Oddi.
   b. Anticholinergics (atropine) for pain. (Anticholinergics relax smooth muscle and open bile ducts.)
   c. Antiemetics
4. Surgery: cholecystectomy/choledochostomy

C. Assessment findings
1. Epigastric or right upper quadrant pain, precipitated by a heavy meal or occurring at night
2. Intolerance for fatty foods (nausea, vomiting, sensation of fullness)
3. Pruritus, easy bruising, jaundice, dark amber urine, steatorrhea
4. Diagnostic tests
   a. Direct bilirubin transaminase, alkaline phosphatase, WBC, amylase, lipase: all increased
   b. Oral cholecystogram (gallbladder series): positive for gallstone

D. Nursing interventions
1. Administer pain medications as ordered and monitor for effects.
2. Administer IV fluids as ordered.
3. Provide small, frequent meals of modified diet (if oral intake allowed).
4. Provide care to relieve pruritus.
5. Provide care for the client with a cholecystectomy or choledochostomy.

Cholecystectomy/Choledochostomy

A. General information
1. Cholecystectomy: removal of the gallbladder with insertion of a T-tube into the common bile duct if common bile duct exploration is performed
2. Choledochostomy: opening of common duct, removal of stone, and insertion of a T-tube
3. Cholecystectomy performed via laparoscopy for uncomplicated cases when client has not had previous abdominal surgery

B. Nursing interventions: routine preoperative care

C. Nursing interventions: postoperative
1. Provide routine post-op care.
2. Position client in semi-Fowler's or side-lying positions; reposition frequently.

3. Splint incision when turning, coughing, and deep breathing.
4. Maintain/monitor functioning of T-tube.
   a. Ensure that T-tube is connected to closed gravity drainage.
   b. Avoid kinks, clamping, or pulling of the tube.
   c. Measure and record drainage every shift.
   d. Expect 300–500 mL bile-colored drainage first 24 hours, then 200 mL/24 hours for 3–4 days.
   e. Monitor color of urine and stools (stools will be light colored if bile is flowing through T-tube but normal color should reappear as drainage diminishes).
   f. Assess for signs of peritonitis.
   g. Assess skin around T-tube; cleanse frequently and keep dry.
5. Provide client teaching and discharge planning concerning
   a. Adherence to dietary restrictions
   b. Resumption of ADL (avoid heavy lifting for at least 6 weeks; resume sexual activity as desired unless ordered otherwise by physician); clients having laparoscopy cholecystectomy usually resume normal activity within 2 weeks.
   c. Recognition and reporting of signs of complications (fever, jaundice, pain, dark urine, pale stools, pruritus)

Appendicitis

See Unit 5.

DISORDERS OF THE PANCREAS

Pancreatitis

A. General information
   1. An inflammatory process with varying degrees of pancreatic edema, fat necrosis, or hemorrhage
   2. Proteolytic and lipolytic pancreatic enzymes are activated in the pancreas rather than in the duodenum, resulting in tissue damage and autodigestion of the pancreas
   3. Occurs most often in the middle aged
   4. Caused by alcoholism, biliary tract disease, trauma, viral infection, penetrating duodenal ulcer, abscesses, drugs (steroids, thiazide diuretics, and oral contraceptives), metabolic disorders (hyperparathyroidism, hyperlipidemia)
B. Medical management
   1. Drug therapy
      a. Analgesics to relieve pain. Note: Morphine is contraindicated due to the spasmodic effects of opiates on the sphincter of Oddi, which will cause exacerbation of symptoms.
      b. Smooth-muscle relaxants (papaverine, nitroglycerin) to relieve pain
      c. Anticholinergics (atropine, propantheline bromide [Pro-Banthine]) to decrease pancreatic stimulation
      d. Antacids to decrease pancreatic stimulation
      e. H_2 antagonists, vasodilators, calcium gluconate
   2. Diet modification
   3. NPO (usually)
   4. Peritoneal lavage
   5. Dialysis
C. Assessment findings
   1. Pain located in left upper quadrant with radiation to back, flank, or substernal area; may be accompanied by difficulty breathing and is aggravated by eating
   2. Vomiting, shallow respirations (with pain), tachycardia, decreased or absent bowel sounds, abdominal tenderness with muscle guarding, positive Grey Turner's spots (ecchymoses on flanks) and positive Cullen's sign (ecchymoses of periumbilical area)
   3. Diagnostic tests
      a. Serum amylase and lipase, urinary amylase, blood sugar, lipid levels: all increased
      b. Serum calcium decreased
      c. CT scan shows enlargement of the pancreas
D. Nursing interventions
   1. Administer analgesics, antacids, anticholinergics as ordered, monitor effects.
   2. Withhold food/fluid and eliminate odor and sight of food from environment to decrease pancreatic stimulations.
   3. Maintain NG tube and assess for drainage.
   4. Institute nonpharmacologic measures to decrease pain.
      a. Assist client to positions of comfort (knee-chest; fetal position).
      b. Teach relaxation techniques and provide a quiet, restful environment.
   5. Provide client teaching and discharge planning concerning
      a. Dietary regimen when oral intake permitted
         1) High-carbohydrate, high-protein, low-fat diet
         2) Eating small, frequent meals instead of three large ones
         3) Avoiding caffeine products
         4) Eliminating alcohol consumption
         5) Maintaining relaxed atmosphere after meals
      b. Recognition and reporting of signs of complications
         1) Continued nausea and vomiting
         2) Abdominal distension with increasing fullness

3) Persistent weight loss
4) Severe epigastric or back pain
5) Frothy/foul-smelling bowel movements
6) Irritability, confusion, persistent elevation of temperature (2 days)

Cancer of the Pancreas

A. General information
- **1.** Most pancreatic tumors are adenocarcinomas and half occur in the head of the pancreas
- **2.** Tumor growth results in common bile duct obstruction with jaundice
- **3.** Occurs more often in men and in the African-American and Jewish populations; ages 45–65
- **4.** Contributing factors: chemical carcinogens, cigarette smoking, high-fat diet, diabetes mellitus
- **5.** Prognosis generally poor

B. Medical management
- **1.** Radiation therapy
- **2.** Whipple's procedure (pancreatoduodenectomy): resection of the proximal pancreas, adjoining duodenum, distal portion of the stomach, and distal segment of the common bile duct
- **3.** Drug therapy
  - **a.** Pancreatic enzymes; oral hypoglycemic agents or insulin, bile salts necessary after surgery
  - **b.** Chemotherapy may also be used

C. Assessment findings
- **1.** Anorexia; rapid, progressive weight loss; dull abdominal pain located in upper abdomen or left hypochondriacal region with radiation to the back, related to eating; jaundice
- **2.** Diagnostic tests
  - **a.** Increased serum lipase (early)
  - **b.** Increased bilirubin (conjugated)
  - **c.** Increased serum amylase

D. Nursing interventions
- **1.** See Pancreatitis.
- **2.** Provide care for the client receiving radiation therapy or chemotherapy.
- **3.** Routine pre- and post-op care (for clients undergoing Whipple's procedure).
- **4.** Provide emotional support to client/significant others.
- **5.** Provide client teaching and discharge planning concerning
  - **a.** Need to eat small frequent meals of a low-fat, high-calorie diet with vitamin supplements.
  - **b.** Importance of adhering to medication regimen after surgery.

Sample Questions

290. An adult client has a nasogastric tube in place to maintain gastric decompression. Which nursing action will relieve discomfort in the nostril with the NG tube?
1. Remove any tape and loosely pin the tube to his gown.
2. Lubricate the NG tube with viscous xylocaine.
3. Loop the NG tube to avoid pressure on the nares.
4. Replace the NG tube with a smaller diameter tube.

291. An adult client has just returned to his room following a bowel resection and end-to-end anastomosis. What type of drainage will the nurse expect in the early post-op period?
1. Clear.
2. Mucoid.
3. Scant.
4. Discolored.

292. A client with a long history of ulcerative colitis is experiencing an exacerbation of the disease and is admitted with severe diarrhea, electrolyte disturbances, and severe abdominal pain. He questions the nurse about his prognosis. What is the nurse's best response?
1. "You should ask your physician about this."
2. "Don't worry, colitis is rarely fatal."
3. "It depends on the form of the disease."
4. "Tell me what you know about this disease."

293. The nurse questions a client with hepatitis B. How long ago could the client have been exposed to hepatitis B?
a. 3–7 days.
b. 7–14 days.
c. 40–50 days.
d. 60–160 days.

294. A client has a history of peptic ulcer disease. He has had numerous bleeding episodes in the past and is admitted to the hospital for evaluation. His physician has prescribed cimetidine (Tagamet). What is the primary reason for the client to take Tagamet?
1. Blocks the secretion of gastric hydrochloric acid.
2. Coats the gastric mucosa with a protective membrane.

3. Increases the sensitivity of H_2 receptors.
4. Releases basal gastric acid.

295. An adult has a Billroth II procedure and does well postoperatively. The nurse knows the client understands discharge teaching when the client recognizes that symptoms of dizziness, sweating, and weakness in the weeks following the surgery are usually associated with what condition?
1. Afferent loop syndrome.
2. Dumping syndrome.
3. Pernicious anemia.
4. Marginal ulcers.

296. A client has had a significant problem with alcohol abuse for the past 15 years. His wife brings him to the emergency department because he is increasingly confused and is coughing blood. His medical diagnosis is cirrhosis of the liver. He has ascites and esophageal varices. Which symptom is the client least likely to have?
1. Bulging flanks.
2. Protruding umbilicus.
3. Abdominal distension.
4. Bluish discoloration of the umbilicus.

297. What is the major dietary treatment for ascites?
1. High protein.
2. Increased potassium.
3. Restricted fluids.
4. Restricted sodium.

298. Which laboratory value would the nurse expect to find in a client as a result of liver failure?
1. Decreased serum creatinine.
2. Decreased sodium.
3. Increased ammonia.
4. Increased calcium.

299. A man is admitted with bleeding esophageal varices. A Sengstaken-Blakemore tube is inserted in an effort to stop the bleeding. After the Sengstaken-Blakemore tube is inserted, the client has difficulty breathing. Based on this information, what is the first action the nurse should take?
1. Deflate the esophageal balloon.
2. Encourage him to take deep breaths.
3. Monitor his vital signs.
4. Notify the physician.

300. A client is scheduled for a esophagoduodenoscopy. In planning for the post-procedural care, what is the most effective nursing action to prevent respiratory complications?
1. Keep the client positioned on his left side for 8–10 hours.
2. Assess for a gag reflex before offering the client anything to eat or drink.
3. Provide throat lozenges for complaints of a sore throat.
4. Position the client in high Fowler's until he is fully awake and alert.

301. A client is being evaluated for cancer of the colon. In preparing the client for a barium enema, which intervention will be included that pertains to the procedure?
1. Placement on a low-residue diet 1 to 2 days before the study.
2. Given an oil retention enema the morning of the study.
3. Instruction to swallow six radiopaque tablets the evening before the study.
4. Positioning in a high Fowler's position immediately following the procedure.

302. A client complains of excessive weight loss and anorexia. Laboratory studies show that he is anemic. Hepatocellular carcinoma is suspected. A liver biopsy is performed at the bedside. What intervention will be expected after the procedure?
1. Encourage to ambulate to prevent the formation of venous thrombosis.
2. Ask to turn, cough, and deep breathe every 2 hours for the next 8 hours.
3. Place in a high Fowler's position to maximize thoracic expansion.
4. Position on his right side with a pillow under the costal margin, and immobile for several hours.

303. A client has a fecal impaction. The physician orders an oil-retention enema followed by a cleansing enema. What is the reason for administering an oil-retention enema to the client?
1. Lubricate the walls of the intestinal tract.
2. Soften the fecal mass and lubricate the walls of the rectum and colon.
3. Reduce bacterial content of the fecal mass.
4. Coat the walls of the intestines to prevent irritation by the hardened fecal mass.

304. A client has amyotrophic lateral sclerosis. His neurologic status has continued to deteriorate. He is receiving enteral feedings through a gastrostomy tube. What priority assessment

should be performed before administering a bolus feeding?

1. Check the expiration date of the prepared enteral feeding.
2. Confirm the presence of a gag reflex.
3. Check placement of feeding tube.
4. Review laboratory studies for indications of electrolyte imbalances.

305. An adult is 8 hours post-op a Billroth II (gastric resection) for an intractable gastric ulcer. The drainage from his nasogastric decompression tube is thickened and the volume of secretions has dramatically reduced in the last 2 hours. The client complains that he feels like he is going to vomit. What is the most appropriate nursing action?

1. Reposition the nasogastric tube by advancing it gently.
2. Notify the physician of your findings.
3. Irrigate the nasogastric tube with 50 mL of sterile normal saline.
4. Discontinue the low-intermittent suctioning.

306. A client is receiving chemotherapy for cancer of the liver. Her physician has prescribed metoclopramide for the nausea and vomiting associated with the chemotherapy. Metoclopramide has anticholinergic and extrapyramidal side effects. Due to the side effects of this mediation, which nursing diagnosis is the client at high risk for?

1. Hyperglycemia related to increased gastric emptying.
2. Injury related to decreased visual acuity and ataxia.
3. Decreased cardiac output related to reduced heart rate.
4. Fluid volume deficit related to frequent episodes of diarrhea.

307. An adult develops diarrhea secondary to hyperosmolar enteral therapy. The care plan now includes giving the client water every 4 to 6 hours and after feedings. Which of the following findings would indicate that fluid therapy was effective?

1. Dry mucous membranes.
2. Hyperactive bowel sounds.
3. Increased urinary output.
4. Hypokalemia.

308. An elderly client complains of frequent episodes of constipation. What is an effective strategy for preventing constipation?

1. Reducing fluid intake to encourage bulk formation in the intestinal lumen.
2. Use of laxatives daily to establish a regular elimination pattern.
3. A regimen of exercises directed at toning the abdominal muscles.
4. Setting a routine for bowel elimination just before bedtime.

309. A client is scheduled for a resection of the lower thoracic esophagus to remove a malignant tumor. What intervention would be included in the postoperative care?

1. Keep the client in a supine position to encourage thoracic expansion.
2. Carefully advance the nasogastric tube past the anastomosis site.
3. Frequently assess the client's breath sounds.
4. Provide a regular diet high in protein.

310. A client has been experiencing frequent episodes of "heartburn" and regurgitation of acrid, sour-tasting fluid. These episodes tend to occur especially after a heavy meal. The client is diagnosed with a hiatal hernia. Which statement by the client shows a good understanding of her treatment regimen?

1. "I will elevate my legs when sleeping."
2. "I will increase the roughage in my diet."
3. "I will drink more fluid with my meals."
4. "I will avoid caffeine, alcohol, and chocolate."

311. A client stockbroker has recently been diagnosed with peptic ulcer disease. Diagnostic studies confirm the presence of the gram-negative bacteria *Helicobacter pylori* in his gastrointestinal tract. If the client has a duodenal ulceration, how would the nurse expect the "ulcer pain" to be described by the client?

1. Located in the upper right epigastric area radiating to his right shoulder or back.
2. Relieved by vomiting.
3. Occurring 2 to 3 hours after a meal, often awakening him between 1:00 and 2:00 A.M.
4. Worsening with the ingestion of food.

312. A client has been diagnosed with peptic ulcer disease. Her medication regimen includes misoprostol. What therapeutic effect will be performed by misoprostol?

1. Neutralizing excess gastric acid.
2. Inhibiting gastric acid production.
3. Increasing mucous production and bicarbonate levels.
4. Increasing gastric emptying time.

313. A client has Billroth II (gastrojejunostomy) for intractable peptic ulcer disease. The nurse is instructing the client concerning the potential complication of dumping syndrome. What would be included in the client's dietary and activity instructions?

1. A high-carbohydrate diet.
2. Exercise after mealtime to promote the digestive process.
3. Limit drinking fluids with meals.
4. A protein-restricted diet.

314. A client underwent a total gastrectomy for gastric cancer. The nurse has been giving the client post-op instructions about his diet, activities, and medications. Which of the following statements indicates that he understands his post-op care?

1. "I should take a walk after meals to aid my digestion."
2. "Drinking more water with my meals will prevent indigestion."
3. "I need more carbohydrates in my diet for an extra energy source."
4. "The visiting nurse will come monthly to give an injection of vitamin B_{12}."

315. A client has a direct inguinal hernia. For what symptoms should the nurse be on alert for?

1. Hypoactive bowel sounds.
2. Passage of semi-liquid, brown stools.
3. Vomiting of bile-stained gastric contents.
4. Complaints of constant, localized abdominal pain.

316. An adult has developed peritonitis related to a perforated duodenal ulceration. What would the nurse expect to find during the assessment?

1. Decreased or absent bowel sounds.
2. Colicky abdominal pain.
3. High-pitched bowel sounds.
4. Alternating episodes of constipation and diarrhea.

317. What would be an appropriate nursing diagnosis for a client with ulcerative colitis?

1. Abdominal pain, related to decreased peristalsis.
2. Diarrhea related to hyperosmolar intestinal contents.
3. Excess fluid volume related to increased water absorption by intestinal mucosa.
4. Activity intolerance related to fatigue.

318. The nurse is caring for a client recently diagnosed with ulcerative colitis. The nurse has been giving dietary instructions to help prevent exacerbation of his inflammatory bowel disease. Which dietary choice indicates that the client understands the dietary instructions?

1. Apple.
2. Celery.
3. Refined cereals.
4. Hard cheeses.

319. When a client is diagnosed with ulcerative colitis, What complication would the nurse be on alert for?

1. Intestinal obstruction.
2. Toxic megacolon.
3. Malnutrition from malabsorption.
4. Fistula formation.

320. A client with diverticulosis is admitted to the hospital. What type of diet would be ordered for this client?

1. A bland, low residue diet.
2. A low protein, high carbohydrate diet.
3. A soft, but high fiber diet.
4. Saline cathartics to increase intestinal peristalsis.

321. An adult has been diagnosed with colon cancer. What would the nursing assessment most likely reveal?

1. Epigastric pain that intensifies when the stomach is empty.
2. Stools that are fatty and foul-smelling.
3. Alternating episodes of diarrhea and constipation.
4. A rigid, board-like abdomen.

322. The nurse has been instructing a client regarding identifying and alleviating the risk factors associated with colon cancer. Which statement by the client demonstrates a good understanding of the means to reduce the chances of colon cancer?

1. "I will exercise daily."
2. "I will include more red meat in my diet."
3. "I will have an annual chest X-ray."
4. "I will include more fresh fruits and vegetables in my diet."

323. An adult has a sigmoid colostomy. The nurse is performing peristomal skin care and changing the stoma pouch. What is the most appropriate nursing action?

1. Empty the ostomy pouch when it is full.
2. Pull flange and pouch off together to prevent spillage of stomach pouch contents.

3. Leave ¼ inch of skin exposed around stoma when determining size to cut new skin barrier.
4. Apply liquid deodorant to mucous membrane of protruding stoma.

324. An adult has a double-barreled, transverse colostomy. The nurse has formulated the nursing diagnosis: risk for impaired skin integrity related to irritation of the peristomal skin by the effluent. What is the most appropriate nursing action relevant to this nursing diagnosis?

1. Strict measurement and recording of I&O.
2. Assessing for bowel sounds when changing ostomy appliance.
3. Wash peristomal skin with an astringent solution to reduce bacterial contamination.
4. Apply skin barrier before applying flange and ostomy pouch.

325. An adult is brought to the emergency room with severe, constant, localized abdominal pain. Abdominal muscles are rigid and rebound tenderness is present. Peritonitis is suspected. The client is hypotensive and tachycardiac. What is the nursing diagnosis most appropriate to the signs/symptoms presented?

1. Deficient fluid volume related to depletion of intravascular volume.
2. Disturbed thought process related to toxic effects of elevated ammonia levels.
3. Abdominal pain related to increased intestinal peristalsis.
4. Imbalanced nutrition, less than body requirements, related to malabsorption.

326. A client has had a hemorrhoidectomy. Which activity by the client will demonstrate the client has good understanding of post-op discharge instruction?

1. Reduce her fluid intake for several weeks after her surgery.
2. Include more fresh fruits and vegetables in her diet.
3. Vigorously clean her perianal area with soap and water after every bowel movement.
4. Limit her activities to bed rest for at least 6 hours a day.

327. The client with hepatitis may be anicteric and symptomless. What sign/symptom is most likely present in the early presentation of hepatic inflammatory disorder?

1. Dark urine.
2. Ascites.
3. Occult blood in stools.
4. Anorexia.

328. A client visits her physician with flu-like symptoms that have persisted for nearly a month. She complains of headaches, malaise, anorexia, and fever. She is a childcare worker at a local daycare center with children ranging in ages from 6 months to 5 years. Based on the associated risk factors and mode of transmission, which condition is the client most likely experiencing?

1. Hepatitis A.
2. Hepatitis B.
3. Hepatitis C.
4. Hepatitis D.

329. A client that works in a community health clinic has been experiencing fatigue, headaches, diminished appetite, and a yellowish discoloration of sclera for the past 2 months. He is diagnosed with hepatitis B and asks the nurse how he contracted hepatitis. What is the nurse's most appropriate response?

1. Airborne droplets carry the infectious hepatitis B virus.
2. The hepatitis B virus is transmitted parenterally and through intimate contact.
3. An individual may contract hepatitis B by using contaminated eating utensils.
4. Hepatitis B may be transmitted through eating shellfish from contaminated water sources.

330. A client with hepatic cirrhosis related to 10-year history of alcohol abuse is at risk for injury related to portal hypertension. What is the most appropriate nursing action to decrease his risk of injury?

1. Keep his fingernails short.
2. Offer small, frequent feedings.
3. Observe stools for color and consistency.
4. Assess for jaundice of skin and sclera.

331. A client is diagnosed with Laënnec's cirrhosis. He has massive ascites formation. His respirations are rapid and shallow. The physician decides to perform a paracentesis. Which activity does the nurse give the highest priority to during the procedure?

1. Gathering the appropriate sterile equipment.
2. Labeling samples of abdominal fluid and sending them to the laboratory.
3. Positioning the client upright on the edge of the bed.
4. Measuring and recording blood pressure and pulse frequently during the procedure.

332. An adult who has a 7-year history of hepatic cirrhosis was brought to the emergency room

because he began vomiting large amounts of dark-red blood. A Sengstaken-Blakemore tube was inserted to tamponade the bleeding esophageal varices. While the balloon tamponade is in place, what is given the highest priority?

1. Assessing his stools for occult blood.
2. Evaluating capillary refill in extremities.
3. Performing frequent mouth care.
4. Auscultating breath sounds.

333. A client is experiencing advanced hepatic cirrhosis complicated by hepatic encephalopathy. He is confused, restless, and demonstrating asterixis. In developing a two-part nursing diagnosis for this condition, what would be the second part following *Disturbed Thought Processes*?

1. Massive ascites formation.
2. Increased serum ammonia levels.
3. Fluid volume excess.
4. Altered clotting mechanism.

334. A client has choledocholithiasis. During the nursing admission, the nurse notes that the client's sclera and skin are jaundiced. When complaining of abdominal distention and pain, how is the client most likely to describe this condition?

1. An intermittent, colicky pain in his left flank.
2. Pain which awakens him during the night, and is relieved by eating.
3. A vise-like pressure over his sternum.
4. Right upper quadrant pain that often radiates to his right shoulder.

335. A client is admitted to the hospital for acute cholecystitis. She is now 6 hours post-op abdominal cholecystectomy with a choledochostomy and has a T-tube in place. What is the proper management of the T-tube?

1. Hanging the T-tube drainage below the bed.
2. Notifying the physician if T-tube drainage is 75 mL for the first 24 hours after surgery.
3. Irrigating the T-tube with sterile normal saline q 2 h to prevent obstruction.
4. Clamping the T-tube if the client develops sudden, severe abdominal pain.

336. A client has experienced repeated episodes of acute pancreatitis. He has continued to consume alcohol. The nurse observes that he is doubled-over, rocking back-and-forth in pain. Why is morphine derivative contraindicated for the pain associated with acute pancreatitis?

1. It causes severe respiratory depression.
2. Depression of GI peristalsis may cause constipation.
3. Spasms of the sphincter of Oddi may occur.
4. It is rapidly metabolized by the liver.

337. A client has a 5-year history of alcohol abuse. He appears acutely ill. He is vomiting bile-stained emesis. What would be documented as signs of severe, hemorrhagic pancreatitis?

1. The presence of a positive fluid wave in the abdominal area.
2. A yellowish color of the sclera and skin.
3. Ecchymosis in the flank and around the umbilical area.
4. Bloody, foul-smelling stools.

338. A client with a 10-year history of alcohol abuse has recently been diagnosed with chronic pancreatitis. The physician has prescribed pancrelipase, a pancreatic enzyme replacement. Which statement by the client demonstrates understanding of his medication regimen?

1. "I will take this medication with a glass of milk."
2. "If my stools appear yellowish with a foul odor, I will call my doctor."
3. "I will take my medication with some antacid so it will not bother my stomach."
4. "I will be sure to thoroughly chew the capsule contents before swallowing the medication."

339. A client has been diagnosed with a malignant tumor of the head of the pancreas. A pancreatoduodenectomy (Whipple's procedure) was done to resect the tumor. The nurse recognizes that hemorrhage is a potentially major complication of a Whipple procedure. Which of the following assessment findings suggest this complication?

1. Jaundice of the skin and sclera.
2. Hyperglycemia.
3. Oliguria.
4. Bradycardia.

Answers and Rationales

290. 3. Looping the NG tube will prevent pressure on the nares that can cause pain and eventual necrosis.

291. 4. The drainage following abdominal surgery is discolored as it is evacuating stomach and intestinal contents, not mucoid material.

292. 4. The nurse should explore the client's motivation for posing the question and establish this current knowledge.

293. 4. The onset of hepatitis B is long and insidious, lasting from 60 to 160 days.

294. 1. Cimetidine (Tagemet) is a histamine antagonist that blocks the secretion of hydrochloric acid.

295. 2. Signs of dumping syndrome include vertigo, pallor, sweating, palpitations, and weakness. Dumping syndrome occurs after a gastric resection because ingested foods rapidly enter the jejunum without proper mixing and without the normal duodenal processing. It subsides in 6–12 months.

296. 4. Bluish discoloration of the umbilicus (Cullen's sign) is present in massive gastrointestinal hemorrhage resulting from free blood present in the abdomen. This is not consistent with cirrhosis of the liver.

297. 4. Sodium restriction is most important for a client with cirrhosis because fluid retention contributes to ascites.

298. 3. Increased ammonia levels could be seen because ammonia is a by-product of protein metabolism, and a diseased liver is unable to convert ammonia into urea to be excreted in the urine.

299. 1. If the client's airway is obstructed by the Sengstaken-Blakemore tube, the esophageal balloon must be deflated so the client can breathe.

300. 2. The client's throat is sprayed with a local anesthetic agent. Until the anesthetic agent wears off, the client is at high risk for aspiration.

301. 1. A low-residue diet 1 to 2 days before the study aids in evacuating the lower intestinal tract of all fecal matter.

302. 4. The client experiencing a liver biopsy is at risk for bleeding or hemorrhage related to penetration of the liver capsule. Positioning on the right side acts as a tamponade against the puncture site discouraging bleeding from the site.

303. 2. Oil retention enemas are given to soften the hardened fecal mass and lubricate the walls of the rectum and colon. Cleansing enemas stimulate intestinal peristalsis, thus eliminating the softened fecal mass.

304. 3. A client with altered central nervous system functioning is at high risk for aspiration. Checking for the placement of the feeding tube using several different methods, i.e., aspiration of gastric contents for residual volume, determining pH of aspirated gastric contents, and auscultating for gurgling sounds with injection of air bolus, is the priority nursing assessment to ensure client safety.

305. 2. The nasogastric tube for gastric decompression after a gastric resection is never irrigated without a specific order from the physician. Irrigating the nasogastric tube may rupture the suture line and hemorrhaging may occur.

306. 2. Metoclopramide blocks dopamine receptors in the chemoreceptor trigger zone (CTZ). This action results in the extrapyramidal and anticholinergic side effects that include sedation, dilated pupils and parkinsonian effects.

307. 3. Increased urinary output is related to the resolved dehydration state. Adding fluid to the enteral feedings reduced the osmolarity of the gastrointestinal contents.

308. 3. Exercises to strengthen the abdominal muscles are appropriate to aiding the defecation process.

309. 3. Surgical resection of the esophagus has a relatively high mortality rate related to pulmonary complications.

310. 4. These substances aggravate the episodes of heartburn (pyrosis) and gastroesophageal reflux.

311. 3. Duodenal ulcer pain characteristically occurs 2 to 3 hours after a meal, often awakening the client in the very early morning hours.

312. 3. Misoprostol, a synthetic prostaglandin, is a cytoprotective agent. By increasing mucous production and bicarbonate levels, the mucosal barrier better resists the erosive action of the gastric acid-pepsin complex.

313. 3. Fluids with meals cause rapid emptying of the gastric contents. Fluids with meals should be limited.

314. 4. A total gastrectomy results in a loss of intrinsic factor, which is necessary for the absorption of vitamin B_{12}.

315. 3. A direct inguinal hernia is most likely to cause a small bowel obstruction. Therefore, the nurse must monitor closely for the

signs/symptoms of a small bowel mechanical obstruction, including vomiting of bile-stained gastric contents from reverse peristalsis.

316. 1. A paralytic ileus is related to disturbance of the neural stimulation of the bowel. There is decreased or absence of bowel sounds.

317. 4. Anorexia, weight loss, fever, vomiting, and blood loss are conditions that will cause the client to become easily fatigued. Activities are planned or restricted to conserve energy.

318. 3. When grain is refined, most of the original fiber is removed, then vitamins and additives are added to compensate, thus producing a low-residue product.

319. 2. Toxic megacolon is a serious complication of ulcerative colitis. Excessive dilation of the colon may lead to intestinal perforation and death.

320. 3. A soft, high-fiber diet is indicated to increase the bulk of the stool, thereby promoting defecation. Fluid intake of 2 liters/day is recommended unless otherwise contraindicated. Seeds are not allowed.

321. 3. A change in bowel habits such as alternating episodes of diarrhea and constipation is a common manifestation of colon cancer.

322. 4. A diet low in fiber is a major risk factor for colon cancer. Fresh fruits and vegetables increase the fiber content of the diet, thereby reducing the risk of colon cancer.

323. 3. Leaving ¼ inch of skin exposed around stoma when determining size to cut skin barrier prevents trauma to stoma.

324. 4. A skin barrier applied helps prevent enzymatic activity, which is a risk for peristomal skin breakdown.

325. 1. Hypovolemia occurs because massive amounts of fluid and electrolytes move from intestinal lumen into peritoneal cavity and deplete intravascular volume. Hypotension and tachycardia are manifestations of this massive fluid shift.

326. 2. Post-hemorrhoidectomy diet is modified to include increased fluid and fiber intake. This promotes regular bowel elimination and reduces the occurrence of constipation.

327. 4. Anorexia is often an early and severe symptom of hepatitis.

328. 1. Hepatitis A is transmitted through the fecal-oral route. Childcare workers are in a high risk group because of potentially poor hygiene/sanitation practices.

329. 2. Hepatitis B is transmitted parenterally or through intimate sexual contact with a carrier.

330. 3. Portal hypertension puts the client at risk for injury related to bleeding/hemorrhaging esophageal varices. Monitoring stools permits early detection of bleeding in the GI tract.

331. 4. A serious complication of a paracentesis is hypovolemic shock or vascular collapse. Early detection of this cardiovascular complication through monitoring blood pressure and pulse is a nursing priority intervention.

332. 4. Airway obstruction and aspiration of gastric contents are potential serious complications of balloon tamponade. Frequent assessment of the client's respiratory status is the priority.

333. 2. Hepatic cirrhosis leads to elevated serum ammonia levels, which have an adverse toxic effect on cerebral metabolism.

334. 4. Pain related to gallstones in the common duct is located in the right upper quadrant and often radiates to the right shoulder or back.

335. 2. The T-tube usually drains 200–500 mL in the first 24 hours. Decreased bile drainage may indicate an obstruction to bile flow or bile may be leaking into the peritoneum.

336. 3. Morphine sulfate causes spasms of the sphincter of Oddi, which will exacerbate the episode of acute pancreatitis.

337. 3. Cullen's sign and Turner's sign reveal discoloration and occur with intra-abdominal bleeding.

338. 2. The presence of steatorrhea indicates that the dosage of pancrelipase needs to be adjusted.

339. 3. Oliguria is a primary sign of hypovolemic shock related to hemorrhage.

The Genitourinary System

OVERVIEW OF ANATOMY AND PHYSIOLOGY

The genitourinary system includes the kidneys, ureters, urinary bladder, urethra, and the male and female genitalia. This section discusses only the male genitalia; the female reproductive system is covered in Unit 6.

Urinary System

Kidneys

See Figure 4-19.

A. Two bean-shaped organs that lie in the retroperitoneal space on either side of the vertebral column; adrenal glands located on top of each kidney

B. Renal parenchyma
- **1.** Cortex: outermost layer; site of glomeruli and proximal and distal tubules of nephron
- **2.** Medulla: middle layer; formed by collecting tubules and ducts

C. Renal sinus and pelvis
- **1.** Papillae: projections of renal tissues located at the tips of the renal pyramids
- **2.** Calices
  - **a.** Minor calyx: collects urine flow from collecting duct
  - **b.** Major calyx: directs urine from renal sinus to renal pelvis
- **3.** Urine flows from renal pelvis to ureters

D. Nephron: the functional unit of the kidney (see Figure 4-20)
- **1.** Renal corpuscle (vascular system of nephron)
  - **a.** Bowman's capsule: a portion of the proximal tubule, surrounds the glomerulus
  - **b.** Glomerulus: a capillary network permeable to water, electrolytes, nutrients, and wastes; impermeable to large protein molecules
- **2.** Renal tubule: divided into proximal convoluted tubule, descending loop of Henle, ascending loop of Henle, distal convoluted tubule, and collecting duct

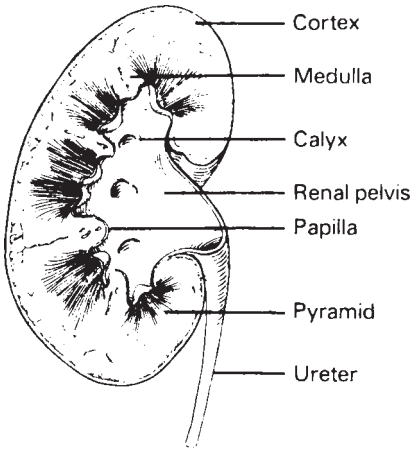


Figure 4–19 Anatomy of the kidney

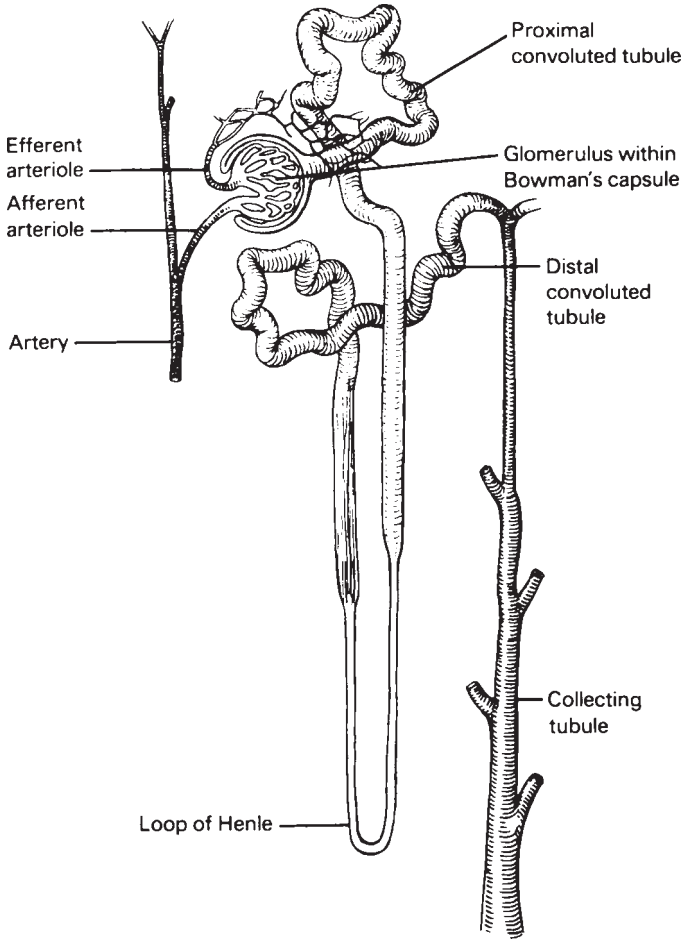


Figure 4–20 The nephron

Ureters

A. Two tubes approximately 25–35 cm long
B. Extend from the renal pelvis to the pelvic cavity, where they enter the bladder, convey urine from the kidneys to the bladder
C. Ureterovesical valve prevents backflow of urine into ureters

Bladder

A. Located behind the symphysis pubis; composed of muscular, elastic tissue that makes it distensible
B. Serves as a reservoir of urine (capable of holding 1000–1800 mL; moderately full bladder usually holds about 500 mL)
C. Internal and external urethral sphincters control the flow of urine; urge to void stimulated by passage of urine past the internal sphincter (involuntary) to the upper part of the urethra. Relaxation of external sphincter (voluntary) produces emptying of the bladder (voiding, micturition).

Urethra

A. A small tube that extends from the bladder to the exterior of the body
B. In females, located behind the symphysis pubis and anterior to the vagina; approximately 3–5 cm long
C. In males, extends the entire length of the penis; approximately 20 cm long

Regulatory Functions of Kidney

Kidneys and urinary system play a major role in maintenance of homeostatic control of the body. Kidneys remove nitrogenous wastes and regulate fluid and electrolyte balance and acid-base balance. Urine is the end product of these mechanisms.

Formation of Urine

A. Glomerular filtration
  1. Ultrafiltration of blood by the glomerulus; beginning of urine formation
    a. Requires hydrostatic pressure (supplied by the heart and assisted by vascular resistance [glomerular hydrostatic pressure]) and sufficient circulating volume.
    b. Pressure in Bowman's capsule opposes hydrostatic pressure and filtration; if glomerular pressure insufficient to force substances out of the blood into the tubules, filtrate formation stops.
  2. Glomerular filtration rate (GFR): amount of blood filtrated by the glomeruli in a given time; normal is 125 mL/min
  3. Filtrate formed has essentially same composition as blood plasma without the proteins; blood cells and proteins are usually too large to pass the glomerular membrane.
B. Tubular function: the tubules and collecting ducts carry out the functions of reabsorption, secretion, and excretion. Reabsorption of water and electrolytes is controlled by antidiuretic hormone (ADH), released by the pituitary, and aldosterone, secreted by the adrenal glands (see Table 4-25).
  1. Proximal convoluted tubule: reabsorption of certain constituents of the glomerular filtrate: 80% of electrolytes and H_2O, all glucose and amino acids, and bicarbonate; secretes organic substances and wastes.
  2. Loop of Henle: reabsorption of sodium and chloride in the ascending limb; reabsorption of water in the descending limb; concentrates/dilutes urine.
  3. Distal convoluted tubule: secretes potassium, hydrogen ions, and ammonia; reabsorbs H_2O (regulated by ADH) and bicarbonate; regulates calcium and phosphate concentrations.
  4. Collecting ducts: receive urine from distal convoluted tubules and reabsorb water (regulated by ADH).
C. Normal adult produces 1 liter/day of urine.

Blood Pressure Control

A. Kidneys regulate blood pressure partly through maintenance of volume (formation/excretion of urine).
B. The renin-angiotensin system is the other kidney-controlled mechanism that can contribute to rise in blood pressure. When blood pressure drops, the cells of the glomerulus release renin, which then activates angiotensin to cause vasoconstriction.

Male Reproductive System

See Figure 4-21.

Penis

A. An external structure that serves as a passageway for urine and semen
B. Capable of distension during sexual excitement
C. Distal portion, glans penis, is covered by a prepuce or foreskin that may or may not be removed (circumcised)

Scrotum

A. Saclike structure that hangs from the root of the penis
B. Contains the testes and epididymis, and helps to regulate temperature conducive to sperm production

Testes

A. Small oval structures suspended in the scrotum
B. Produce sperm (exocrine function) and male hormones (endocrine function, see Table 4-25).

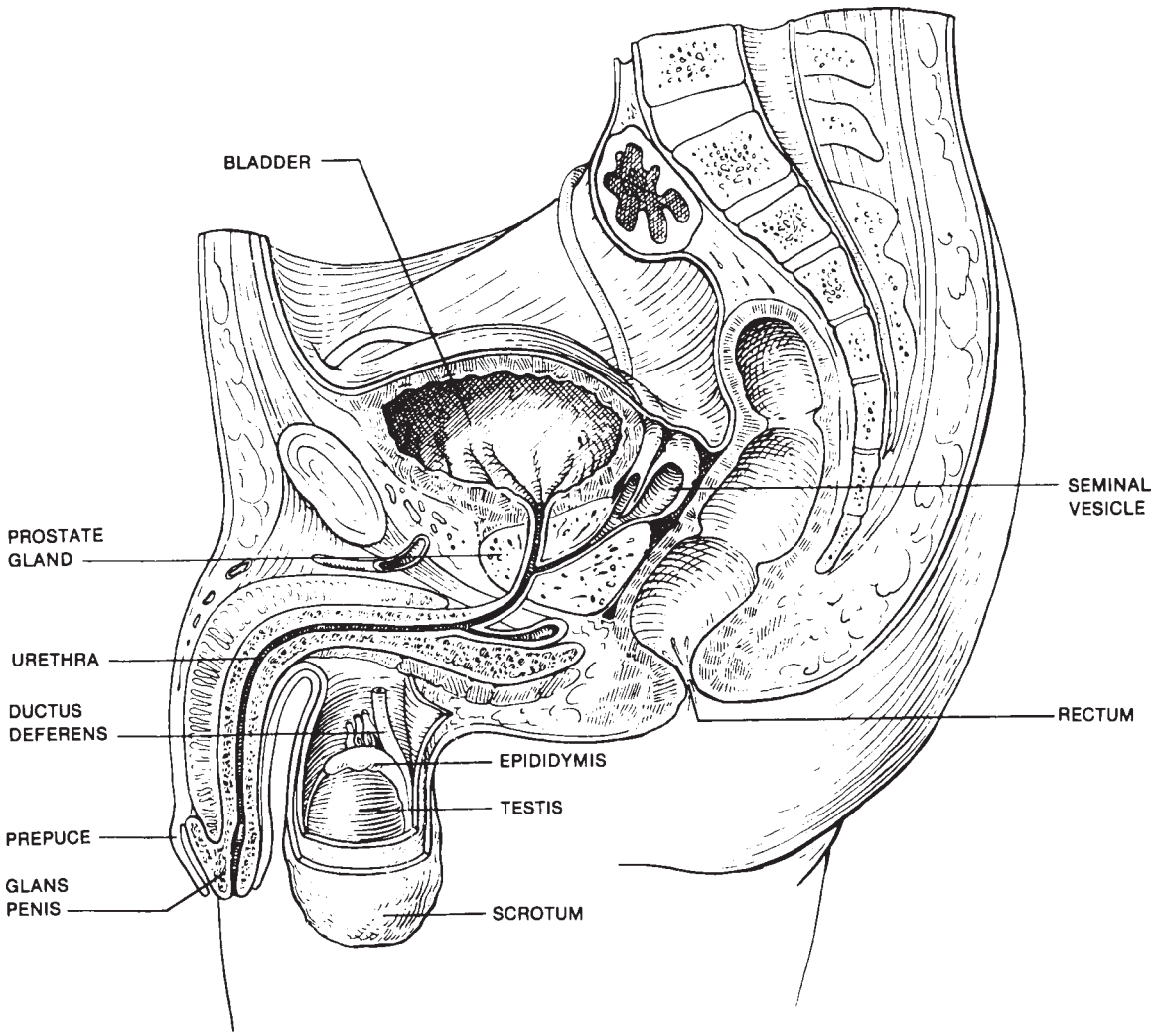


Figure 4–21 The male reproductive system

Ductal System

A. Epididymis: first part of ductal system
  1. Soft cordlike structure that lies along the posterolateral surface of each testis
  2. Head is attached to the top of the testis, tail is continuous with vas deferens; stores spermatozoa while they mature.

B. Spermatic cord: consists of vas deferens, arteries, veins, nerves, and lymphatic vessels. Vas deferens joins the duct of the seminal vesicles to become the ejaculatory duct.

Accessory Glands

A. Prostate: located below the bladder and in front of the rectum; approximately 4–6 cm long
  1. Enclosed in firm, fibrous capsule; connected to the urethra and ejaculatory ducts
  2. Secretes a milky fluid that aids in the passage of spermatozoa and helps keep them viable

B. Cowper's glands: lie on each side of the urethra and just below the prostate; secrete a small amount of lubricating fluid.

C. Seminal vesicles: paired structures parallel to the bladder; secrete a portion of the ejaculate and may contribute to nutrition and activation of sperm.

ASSESSMENT

Health History

A. Presenting problem: symptoms may include:
  1. Pain in flank, groin; dysuria
  2. Changes in urination patterns: frequency, nocturia, hesitancy of stream, urgency, dribbling, incontinence, retention

3. Changes in urinary output: polyuria, oliguria, anuria
4. Changes in color/consistency of urine: dilute, concentrated, malodorous; hematuria, pyuria

B. Lifestyle: occupation (type of employment, exposure to chemicals such as carbon tetrachloride, ethylene glycol); level of activity, exercise

C. Nutrition/diet: water, calcium, dairy product intake

D. Past medical history: hypertension; diabetes mellitus; gout; cystitis; kidney infections; connective tissue diseases (systemic lupus erythematosus); infectious diseases; drug use (prescribed/OTC); previous catheterizations, hospitalizations, or surgery for renal problems

E. Family history: hypertension, diabetes mellitus, renal disease, gout, connective tissue disorders, urinary tract infections (UTIs), renal calculi

Physical Examination

A. Inspect skin for color, turgor, and mobility; purpuric lesions; integrity.

B. Inspect mouth for color, moisture, odor, ulcerations.

C. Inspect face for edema, particularly periorbital edema.

D. Inspect abdomen and palpate bladder for distension; percuss bladder for tympany or dullness (if full).

E. Inspect extremities for edema.

F. Determine rate, rhythm, and depth of respirations.

G. Inspect muscles for tremors, atrophy.

H. Palpate right and left kidneys for tenderness, pain, enlargement; percuss costovertebral angles for tenderness/pain; fist percuss kidneys for tenderness/pain.

I. Palpate flank area for pain and prostate for size, shape, consistency.

J. Auscultate aorta and renal arteries for bruits.

Laboratory/Diagnostic Tests

A. Urine studies
1. Urinalysis: examination to assess the nature of the urine produced
   a. Evaluates color, pH, and specific gravity.
   b. Determines presence of glucose (glycosuria), protein, blood (hematuria), ketones (ketonuria).
   c. Analyzes sediment for cells (presence of WBC called pyuria), casts, bacteria, crystals.
2. Urine culture and sensitivity: diagnoses bacterial infections of the urinary tract
3. Residual urine: amount of urine left in bladder after voiding measured via catheter (permanent or temporary) in bladder
4. Creatinine clearance: determines amount of creatinine (waste product of protein breakdown) in the urine over 24 hours, measures overall renal function

B. Urine collection methods: nursing care
1. Routine urinalysis: wash perineal area if soiled, obtain first voided morning specimen; send to lab immediately (should be examined within 1 hour of voiding).
2. Clean catch (midstream) specimen for urine culture.
   a. Cleanse perineal area.
      1) Females: spread labia and cleanse meatus front to back using antiseptic sponges.
      2) Males: retract foreskin (if uncircumsized) and cleanse glans with antiseptic sponges.
   b. Have client initiate urine stream then stop.
   c. Collect specimen in a sterile container.
   d. Have client complete urination but not in specimen container.
3. 24-hour specimen (preferred method for creatinine clearance test)
   a. Have client void and discard specimen; note time.
   b. Collect all subsequent urine specimens for 24 hours.
   c. If specimen is accidentally discarded, the test must be restarted.
   d. Record exact start and finish of collection; include date and times.

C. Blood studies
1. Bicarbonate
2. BUN: measures renal ability to excrete urea nitrogen
3. Calcium
4. Serum creatinine: specific test for renal disorders; reflects ability of kidneys to excrete creatinine
5. Phosphorus
6. Potassium
7. Sodium
8. Prostate-specific antigen (PSA)

D. KUB/plain film: an abdominal flat-plate X-ray showing the kidneys, ureters, and bladder; may identify the number and size of kidneys with tumors, malformations, and calculi

E. Intravenous pyelogram (IVP)
1. Fluoroscopic visualization of the urinary tract after injection with a radiopaque dye
2. Nursing care: pretest
   a. Assess for iodine sensitivity.
   b. Inform client he will lie on a table throughout procedure.
   c. Administer cathartic or enema the night before.
   d. Keep client NPO for 8 hours pretest.
3. Nursing care: posttest: force fluids

F. Cystoscopy
1. Use of a lighted scope (cystoscope) to inspect the bladder
   a. Inserted into the bladder via the urethra
   b. May be used to remove tumors, stones, or other foreign material (use of electrical

current to remove tumors is called fulguration); or to implant radium, place catheters in ureters

2. Nursing care: pretest
   a. Explain to client that procedure will be done under general or local anesthesia.
   b. Confirm consent form is signed.
   c. Administer sedatives 1 hour before test, as ordered.
   d. General anesthesia: keep client NPO.
   e. Local anesthesia: offer liquid breakfast.
   f. Give enemas as ordered.
3. Nursing care: posttest
   a. Provide warm sitz baths, mild analgesics to relieve discomfort after test.
   b. Monitor I&O and vital signs (especially temperature, as elevation may indicate infection).
   c. Expect mild hematuria at first; urine will be pink tinged, subsiding over 24–48 hours; monitor for large clots.
   d. Advise client that burning on urination is normal and will subside.
   e. Force fluids.

ANALYSIS

Nursing diagnoses for the client with a disorder of the genitourinary system may include:

A. Deficient fluid volume
B. Fluid volume excess
C. Fatigue
D. Risk for injury
E. Disturbed thought processes
F. Impaired oral mucous membrane
G. Imbalanced nutrition: less than body requirements
H. Risk for infection
I. Impaired skin integrity
J. Urinary retention
K. Sexual dysfunction

PLANNING AND IMPLEMENTATION

Goals

A. Fluid imbalance will be resolved.
B. Client will exhibit improved sense of energy.
C. Client will not exhibit unusual bleeding.
D. Thought processes will improve.
E. Integrity of mucous membranes will be maintained.
F. Adequate nutritional status will be maintained.
G. Client will remain free from infection.
H. Adequate skin integrity will be maintained.
I. Client will demonstrate restored urinary flow.
J. Changes in sexual functioning will be accepted.

Interventions

Urinary Catheterization

A. General information
   1. Insertion of a catheter through the external meatus and the urethra into the bladder
   2. Purposes include relief from urinary retention, bladder decompression, prevention of bladder obstruction, instillation of medications into the bladder, splinting the bladder, and output monitoring.
B. Nursing care: insertion
   1. Explain procedure to client and collect necessary equipment (catheter set).
   2. Wash hands and position client.
   3. Use sterile technique while inserting catheter.
   4. Observe for urine return and obtain specimen.
   5. Connect drainage tubing to catheter (indwelling) and tape.
C. Nursing care: indwelling catheter
   1. Maintain catheter patency: place drainage tubing properly to avoid kinking or pinching.
   2. Observe for signs of obstruction (e.g., decreased urine in collection bag, voiding around the catheter, abdominal discomfort, bladder distension).
   3. Irrigate catheter as necessary.
   4. Ensure comfort and safety: relieve bladder spasms by administering belladonna suppositories (if ordered); ensure adequate fluid intake and provide perineal care.
   5. Prevent infection: maintain a closed drainage system and prevent backflow of urine by keeping drainage system below level of bladder.
   6. Empty collection bag at least every 8 hours.
   7. Promote acidification of the urine with acid-ash diet and ascorbic acid.
   8. Change catheter/drainage system only when necessary.

Dialysis

A. General information
   1. Removal by artificial means of metabolic wastes, excess electrolytes, and excess fluid from clients with renal failure
   2. Principles
      a. Diffusion: movement of particles from an area of high concentration to one of low concentration across a semipermeable membrane
      b. Osmosis: movement of water through a semipermeable membrane from an area of lesser concentration of particles to one of greater concentration
B. Purposes
   1. Remove the endproducts of protein metabolism from blood
   2. Maintain safe levels of electrolytes

3. Correct acidosis and replenish blood bicarbonate system
4. Remove excess fluid from the blood

C. Types: hemodialysis and peritoneal dialysis

Hemodialysis

A. General information
1. Shunting of blood from the client's vascular system through an artificial dialyzing system, and return of dialyzed blood to the client's circulation
2. Dialysis coil acts as the semipermeable membrane; the dialysate is a specially prepared solution.
3. Access routes (see Figure 4-22)
   - **a.** External AV shunt: one cannula inserted into an artery and the other into a vein; both are brought out to the skin surface and connected by a U-shaped shunt.
   - **b.** AV fistula: internal anastomosis of an artery to an adjacent vein in a sideways position; fistula is accessed for hemodialysis by venipuncture; takes 4–6 weeks to be ready for use.
   - **c.** Femoral/subclavian cannulation: insertion of a catheter into one of these large veins for easy access to circulation; procedure is similar to insertion of a CVP line; temporary, but can be used immediately; associated with more clotting problems.
   - **d.** Graft: piece of bovine artery or vein, Gore-Tex material, or saphenous vein sutured to client's own vessel; used for clients with compromised vascular systems; provides a segment in which to place dialysis needles; ready for use in 2–3 weeks.

B. Nursing care: external AV shunt
1. Auscultate for a bruit and palpate for a thrill to ensure patency.
2. Assess for clotting (color change of blood, absence of pulsations in tubing).
3. Change sterile dressing over shunt daily.
4. Avoid performing venipuncture, administering IV infusions, giving injections, or taking a blood pressure with a cuff on the shunt arm.

C. Nursing care: AV fistula.
1. Auscultate for a bruit and palpate for a thrill to ensure patency.
2. Report bleeding, skin discoloration, drainage, and pain.
3. Avoid restrictive clothing/dressings over site.
4. Avoid administration of IV infusions, giving injections, or taking blood pressure with a cuff on the fistula extremity.

D. Nursing care: femoral/subclavian cannulation
1. Palpate peripheral pulses in cannulized extremity.
2. Observe for bleeding/hematoma formation.
3. Position catheter properly to avoid dislodgment during dialysis.

E. Nursing care: before and during hemodialysis
1. Have client void.
2. Chart client's weight.

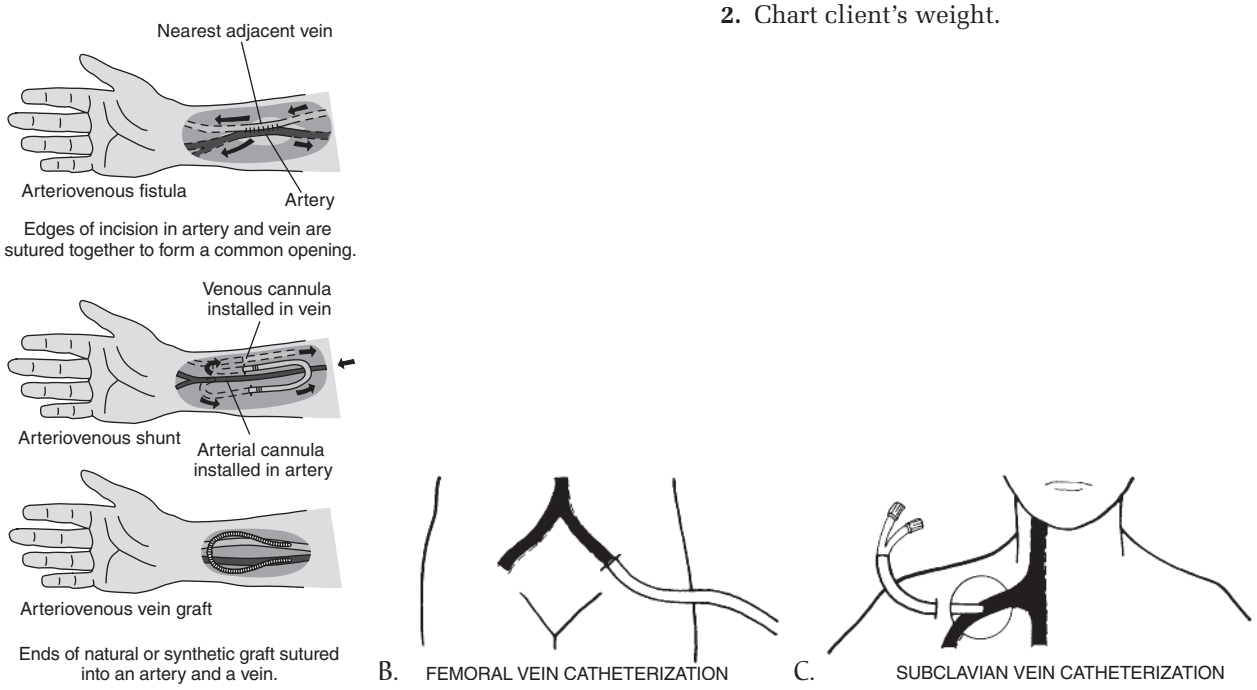


Figure 4-22 Dialysis vascular access sites. (A) Arteriovenous access; (B) femoral access; (C) subclavian access catheter

3. Assess vital signs before and every 30 minutes during procedure.
4. Withhold antihypertensives, sedatives, and vasodilators to prevent hypotensive episode (unless ordered otherwise).
5. Ensure bed rest with frequent position changes for comfort.
6. Inform client that headache and nausea may occur.
7. Monitor closely for signs of bleeding because blood has been heparinized for procedure.

F. Nursing care: postdialysis
1. Chart client's weight.
2. Assess for complications.
   a. Hypovolemic shock: may occur as a result of rapid removal or ultrafiltration of fluid from the intravascular compartment.

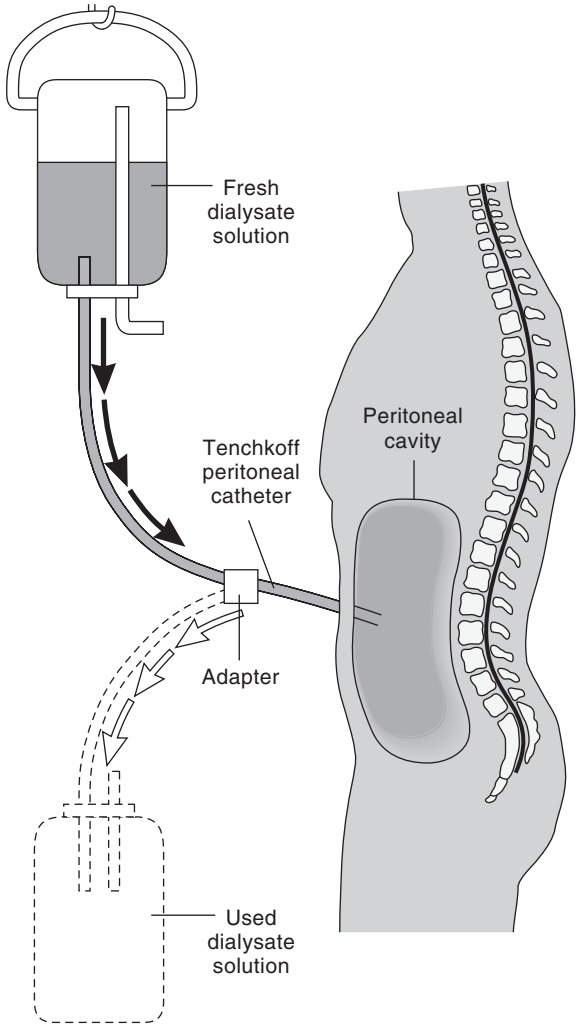


Figure 4-23 Peritoneal dialysis removes wastes through a fluid exchange in the peritoneal cavity

   b. Dialysis disequilibrium syndrome (urea is removed more rapidly from the blood than from the brain): assess for nausea, vomiting, elevated blood pressure, disorientation, leg cramps, and peripheral paresthesias.

Peritoneal Dialysis

A. General information: introduction of a specially prepared dialysate solution into the abdominal cavity, where the peritoneum acts as a semipermeable membrane between the dialysate and blood in the abdominal vessels (see Figure 4-23).

B. Nursing care
1. Chart client's weight.
2. Assess vital signs before, every 15 minutes during first exchange, and every hour thereafter.
3. Assemble specially prepared dialysate solution with added medications.
4. Have client void.
5. Warm dialysate solution to body temperature.
6. Assist physician with trocar insertion.
7. Inflow: allow dialysate to flow unrestricted into peritoneal cavity (10–20 minutes).
8. Dwell: allow fluid to remain in peritoneal cavity for prescribed period (30–45 minutes).
9. Drain: unclamp outflow tube and allow to flow by gravity.
10. Observe characteristics of dialysate outflow.
    a. Clear pale yellow: normal
    b. Cloudy: infection, peritonitis
    c. Brownish: bowel perforation
    d. Bloody: common during first few exchanges; abnormal if continues
11. Monitor total I&O and maintain records.
12. Assess for complications.
    a. Peritonitis resulting from contamination of solution or tubing during exchange
    b. Respiratory difficulty: may occur from upward displacement of diaphragm due to increased pressure in the peritoneal cavity; assess for signs and symptoms of atelectasis, pneumonia, and bronchitis
    c. Protein loss: most serum proteins pass through the peritoneal membrane and are lost in the dialysate fluid; monitor serum protein levels closely

Continuous Ambulatory Peritoneal Dialysis

A. General information
1. A continuous type of peritoneal dialysis performed at home by the client or significant others.
2. Dialysate is delivered from flexible plastic containers through a permanent peritoneal catheter.
3. Following infusion of the dialysate into the peritoneal cavity, the bag is folded and tucked away during the dwell period.

B. Provide client teaching and discharge planning concerning:
  1. Need to assess the permanent peritoneal catheter for complications
    a. Dialysate leak
    b. Exit site infection
    c. Bacterial/fungal contamination
    d. Obstruction
  2. Adherence to high-protein (if indicated), well-balanced diet
  3. Importance of periodic blood chemistries
  4. Daily weights

EVALUATION

A. Adequate urinary output with specific gravity/laboratory studies within client's normal range; stable weight; absence of edema; pulmonary congestion.
B. Client verbalizes increased tolerance for activities.
C. Skin and mucous membranes free from ecchymoses/bleeding; improved laboratory values (CBC, platelet count; clotting factors); no signs of bleeding.
D. Client identifies ways to compensate for cognitive impairment; demonstrates improved problem-solving skills.
E. Oral mucosa pink, moist, and intact; no ulcerations; saliva consistency normal; verbalizes interventions to promote/maintain healthy oral mucosa.
F. Stable weight gain; laboratory values within client's normal range; improved anthropometric measurements.
G. Vital signs within normal range; client identifies measures to prevent/reduce the risk of infection.
H. Skin warm and dry; absence of redness and irritation.
I. Voiding in adequate amounts with no palpable bladder distention; postvoid residuals less than 50 mL; absence of dribbling/overflow.
J. Client identifies acceptable sexual practices and explores alternate methods.
K. Client integrates treatment regimens into ADL; shows increased interest in appearance; actively participates in treatments.

DISORDERS OF THE GENITOURINARY SYSTEM

Disorders of the Urinary Tract

Cystitis

A. General information
  1. Inflammation of the bladder due to bacterial invasion
  2. More common in women
  3. Predisposing factors include stagnation of urine, obstruction, sexual intercourse, high estrogen levels
B. Assessment
  1. Abdominal or flank pain/tenderness, frequency and urgency of urination, pain on voiding, nocturia
  2. Fever
  3. Diagnostic tests: urine culture and sensitivity reveals specific organism (80% *E. coli*)
C. Nursing interventions
  1. Force fluids (3000 mL/day).
  2. Provide warm sitz baths for comfort.
  3. Assess urine for odor, hematuria, sediment.
  4. Administer medications as ordered and monitor effects.
    a. Systemic antibiotics: ampicillin, cephalosporins, aminoglycosides
    b. Sulfonamides: sulfisoxazole (Gantrisin), sulfamethoxazole (Gantanol), trimethoprim-sulfamethoxazole (Bactrim)
    c. Antibacterials: nitrofurantoin (Macrodantin), methenamine mandelate (Mandelamine), nalidixic acid (NegGram)
    d. Urinary tract analgesic: pyridium
  5. Provide client teaching and discharge planning concerning:
    a. Importance of adequate hydration
    b. Frequent voiding to avoid stagnation
    c. Proper personal hygiene; women to cleanse from front to back
    d. Voiding after sexual intercourse
    e. Acidification of the urine to decrease bacterial multiplication (acid-ash diet, vitamin C)
    f. Need for follow-up urine cultures

Bladder Cancer

A. General information
  1. Most common site of cancer of the urinary tract
  2. Occurs in men 3 times more often than women; peak age 50–70 years
  3. Predisposing factors include exposure to chemicals (especially aniline dyes), cigarette smoking, chronic bladder infections
B. Medical management: dependent on the staging of cell type; includes:
  1. Radiation therapy, usually in combination with surgery
  2. Chemotherapy: considerable research on both agents and methods of administration
    a. Methods include direct bladder instillations, intra-arterial infusions, IV infusion, oral ingestion
    b. Agents include 5-fluorouracil, methotrexate, bleomycin, mitomycin-C, hydroxyurea, doxorubicin, cyclophosphamide, cisplatin; results variable
  3. Surgery: see Bladder Surgery.

C. Assessment findings
  1. Intermittent painless hematuria, dysuria, frequent urination
  2. Diagnostic tests
    a. Cytoscopy with biopsy reveals malignancy
    b. Cytologic exam of the urine reveals malignant cells

D. Nursing interventions: provide care for the client receiving radiation therapy or chemotherapy, and for the client with bladder surgery.

Bladder Surgery

A. General information
  1. Cystectomy (removal of the urinary bladder) with one of the various types of urinary diversions is the surgical procedure done for bladder cancer
  2. Types of urinary diversions
    a. Ureterosigmoidostomy: ureters are excised from the bladder and implanted into sigmoid colon; urine flows through the colon and is excreted via the rectum
    b. Ileal conduit: ureters are implanted into a segment of the ileum that has been resected from the intestinal tract with formation of an abdominal stoma; most common type of urinary diversion
    c. Cutaneous ureterostomy: ureters are excised from the bladder and brought through abdominal wall with creation of a stoma
    d. Nephrostomy: insertion of a catheter into the renal pelvis via an incision into the flank or by percutaneous catheter placement into the kidney

B. Nursing interventions: preoperative
  1. Provide routine pre-op care.
  2. Assess client's ability to learn prior to starting a teaching program.
  3. Discuss social aspects of living with a stoma (sexuality, changes in body image).
  4. Assess understanding and emotional response of client/significant others.
  5. Perform pre-op bowel preparation for procedures involving the ileum or colon.
  6. Inform client of post-op procedures.

C. Nursing interventions: postoperative
  1. Provide routine post-op care.
  2. Maintain integrity of the stoma.
    a. Monitor for and report signs of impaired stomal healing (pale, dark red, or blue-black color; increased stomal height, edema, bleeding).
    b. Maintain stomal circulation by using properly fitted faceplate.
    c. Monitor for signs and symptoms of stomal obstruction (sudden decrease in urine output, increased abdominal tenderness and distension).
  3. Prevent skin irritation and breakdown.
    a. Inspect skin areas for signs of breakdown daily.
    b. Patch test all adhesives, sprays, and skin barriers before use.
    c. Change appliance only when necessary and when production of urine is slowest (early morning).
    d. Place wick (rolled gauze pad) on stomal opening when appliance is off.
    e. Cleanse peristomal skin with mild soap and water.
    f. Remove alkaline encrustations by applying vinegar and water solution to peristomal area.
    g. Implement measures to maintain urine acidity (acid-ash foods, vitamin C therapy, omission of milk/dairy products).
  4. Provide care for the client with an NG tube; will be in place until bowel motility returns.
  5. Assist client to identify strengths and qualities that have a positive effect on self-concept.
  6. Provide client teaching and discharge planning concerning
    a. Maintenance of stomal/peristomal skin integrity
    b. Proper application of appliance
    c. Recommended method of cleaning reusable ostomy equipment (manufacturer's recommendations)
    d. Information regarding prevention of UTIs (adequate fluids; empty pouch when half full; change to bedside collection bag at night)
    e. Control of odor (adequate fluids; avoid foods with strong odor; place small amount of vinegar or deodorizer in pouch)
    f. Reporting signs and symptoms of UTIs (see Cystitis).

Nephrolithiasis/Urolithiasis

A. General information
  1. Presence of stones anywhere in the urinary tract; frequent composition of stones: calcium, oxalate, and uric acid
  2. Most often occurs in men age 20–55; more common in the summer
  3. Predisposing factors
    a. Diet: large amounts of calcium, oxalate
    b. Increased uric acid levels
    c. Sedentary lifestyle, immobility
    d. Family history of gout or calculi; hyperparathyroidism

B. Medical management
  1. Surgery
    a. Cystoscopic stone removal: basket extraction is invasive but effective for stones even in kidney.
    b. Percutaneous nephrostomy: tube is inserted through skin and underlying tissues into renal pelvis to remove calculi.
    c. Percutaneous nephrostolithotomy: delivers ultrasound waves through a probe placed on the calculus.

2. Extracorporeal shock-wave lithotripsy: delivers shock waves from outside the body to the stone, causing pulverization
3. Pain management and diet modification

C. Assessment findings
1. Abdominal or flank pain; renal colic; hematuria
2. Cool, moist skin
3. Diagnostic tests
a. KUB: pinpoints location, number, and size of stones
b. IVP: identifies site of obstruction and presence of nonradiopaque stones
c. Urinalysis: indicates presence of bacteria, increased protein, increased WBC and RBC

D. Nursing interventions
1. Strain all urine through gauze to detect stones and crush all clots.
2. Force fluids (3000–4000 mL/day).
3. Encourage ambulation to prevent stasis.
4. Relieve pain by administration of analgesics as ordered and application of moist heat to flank area.
5. Monitor I&O.
6. Provide modified diet, depending upon stone consistency.
a. Calcium stones: limit milk/dairy products; provide acid-ash diet to acidify urine (cranberry or prune juice, meat, eggs, poultry, fish, grapes, whole grains); take vitamin C.
b. Oxalate stones: avoid excess intake of foods/fluids high in oxalate (tea, chocolate, rhubarb, spinach); maintain alkaline-ash diet to alkalinize urine (milk; vegetables; fruits except prunes, cranberries, and plums).
c. Uric acid stones: reduce foods high in purine (liver, brains, kidneys, venison, shellfish, meat soups, gravies, legumes); maintain alkaline urine.
7. Administer allopurinol (Zyloprim) as ordered, to decrease uric acid production; push fluids when giving allopurinol.
8. Provide client teaching and discharge planning concerning:
a. Prevention of urinary stasis by maintaining increased fluid intake especially in hot weather and during illness; mobility; voiding whenever the urge is felt and at least twice during the night
b. Adherence to prescribed diet
c. Need for routine urinalysis (at least every 3–4 months)
d. Need to recognize and report signs/symptoms of recurrence (hematuria, flank pain)

Pyelonephritis

A. General information
1. Inflammation of the renal pelvis; may be unilateral or bilateral, acute or chronic
2. Acute: infection usually ascends from lower urinary tract
3. Chronic: thought to be a combination of structural alterations along with infection, major cause is ureterovesical reflux, with infected urine backing up into ureters and renal pelvises; result of recurrent infections is eventual renal parenchymal deterioration and possible renal failure

B. Medical management
1. Acute: antibiotics, antispasmodics, surgical removal of any obstruction
2. Chronic: antibiotics and urinary antiseptics (sulfanomides, nitrofurantoin); surgical correction of structural abnormality if possible

C. Assessment findings
1. Acute: fever, chills, nausea and vomiting; severe flank pain or dull ache
2. Chronic: client usually unaware of disease; may have bladder irritability, chronic fatigue, or slight dull ache over kidneys; eventually develops hypertension, atrophy of kidneys

D. Nursing interventions: acute pyelonephritis
1. Provide adequate comfort and rest.
2. Monitor I&O.
3. Administer antibiotics as ordered.
4. Provide client teaching and discharge planning concerning:
a. Medication regimen
b. Follow-up cultures
c. Signs and symptoms of recurrence and need to report

E. Nursing interventions: chronic pyelonephritis
1. Administer medications as ordered.
2. Provide adequate fluid intake and nutrition.
3. Support client/significant others and explain possibility of dialysis, transplant options if significant renal deterioration.

Glomerulonephritis

See Unit 5.

Nephrosis

See Unit 5.

Acute Renal Failure

A. General information
1. Sudden inability of the kidneys to regulate fluid and electrolyte balance and remove toxic products from the body
2. Causes
a. Prerenal: factors interfering with perfusion and resulting in decreased blood flow and glomerular filtrate, ischemia, and oliguria; include CHF, cardiogenic shock, acute vasoconstriction, hemorrhage, burns, septicemia, hypotension

b. Intrarenal: conditions that cause damage to the nephrons; include acute tubular necrosis (ATN), endocarditis, diabetes mellitus, malignant hypertension, acute glomerulonephritis, tumors, blood transfusion reactions, hypercalcemia, nephrotoxins (certain antibiotics, X-ray dyes, pesticides, anesthetics)

c. Postrenal: mechanical obstruction anywhere from the tubules to the urethra; include calculi, BPH, tumors, strictures, blood clots, trauma, anatomic malformation

B. Assessment findings

1. Oliguric phase (caused by reduction in glomerular filtration rate)

a. Urine output less than 400 mL/24 hours; duration 1–2 weeks

b. Manifested by hypernatremia, hyperkalemia, hyperphosphatemia, hypocalcemia, hypermagnesemia, and metabolic acidosis

c. Diagnostic tests: BUN and creatinine elevated

2. Diuretic phase (slow, gradual increase in daily urine output)

a. Diuresis may occur (output 3–5 liters/day) due to partially regenerated tubule's inability to concentrate urine

b. Duration: 2–3 weeks; manifested by hyponatremia, hypokalemia, and hypovolemia

c. Diagnostic tests: BUN and creatinine elevated

3. Recovery or convalescent phase: renal function stabilizes with gradual improvement over next 3–12 months

C. Nursing interventions

1. Monitor/maintain fluid and electrolyte balance.

a. Obtain baseline data on usual appearance and amount of client's urine.

b. Measure I&O every hour; note excessive losses.

c. Administer IV fluids and electrolyte supplements as ordered.

d. Weigh daily and report gains.

e. Monitor lab values; assess/treat fluid and electrolyte and acid-base imbalances as needed.

2. Monitor alteration in fluid volume.

a. Monitor vital signs, PAP, PCWP, CVP as needed.

b. Weigh client daily.

c. Maintain strict I&O records.

d. Assess every hour for hypervolemia; provide nursing care as needed.

1) Maintain adequate ventilation.

2) Decrease fluid intake as ordered.

3) Administer diuretics, cardiac glycosides, and antihypertensives as ordered; monitor effects.

e. Assess every hour for hypovolemia; replace fluids as ordered.

f. Monitor ECG and auscultate heart as needed.

g. Check urine, serum osmolality/osmolarity, and urine specific gravity as ordered.

3. Promote optimal nutritional status.

a. Weigh daily.

b. Maintain strict I&O.

c. Administer TPN as ordered.

d. With enteral feedings, check for residual and notify physician if residual volume increases.

e. Restrict protein intake.

4. Prevent complications from impaired mobility (pulmonary embolism, skin breakdown, contractures, atelectasis).

5. Prevent fever/infection.

a. Take rectal temperature and obtain orders for cooling blanket/antipyretics as needed.

b. Assess for signs of infection.

c. Use strict aseptic technique for wound and catheter care.

6. Support client/significant others and reduce/relieve anxiety.

a. Explain pathophysiology and relationship to symptoms.

b. Explain all procedures and answer all questions in easy-to-understand terms.

c. Refer to counseling services as needed.

7. Provide care for the client receiving dialysis if used.

8. Provide client teaching and discharge planning concerning:

a. Adherence to prescribed dietary regime

b. Signs and symptoms of recurrent renal disease

c. Importance of planned rest periods

d. Use of prescribed drugs only

e. Signs and symptoms of UTI or respiratory infection, need to report to physician immediately

Chronic Renal Failure

A. General information

1. Progressive, irreversible destruction of the kidneys that continues until nephrons are replaced by scar tissue; loss of renal function gradual

2. Predisposing factors: recurrent infections, exacerbations of nephritis, urinary tract obstructions, diabetes mellitus, hypertension

B. Medical management

1. Diet restrictions

2. Multivitamins

3. Hematinics

4. Aluminum hydroxide gels

5. Antihypertensives

C. Assessment findings
  1. Nausea, vomiting; diarrhea or constipation; decreased urinary output; dyspnea
  2. Stomatitis, hypotension (early), hypertension (later), lethargy, convulsions, memory impairment, pericardial friction rub, HF
  3. Diagnostic tests: urinalysis
    a. Protein, sodium, and WBC elevated
    b. Specific gravity, platelets, and calcium decreased

D. Nursing interventions
  1. Prevent neurologic complications.
    a. Assess every hour for signs of uremia (fatigue, loss of appetite, decreased urine output, apathy, confusion, elevated blood pressure, edema of face and feet, itchy skin, restlessness, seizures).
    b. Assess for changes in mental functioning.
    c. Orient confused client to time, place, date, and persons; institute safety measures to protect client from falling out of bed.
    d. Monitor serum electrolytes, BUN, and creatinine as ordered.
  2. Promote optimal GI function.
    a. Assess/provide care for stomatitis
    b. Monitor nausea, vomiting, anorexia; administer antiemetics as ordered.
    c. Assess for signs of GI bleeding.
  3. Monitor/prevent alteration in fluid and electrolyte balance.
  4. Assess for hyperphosphatemia (paresthesias, muscle cramps, seizures, abnormal reflexes), and administer aluminum hydroxide gels (Amphojel, AlternaGEL) as ordered.
  5. Promote maintenance of skin integrity.
    a. Assess/provide care for pruritus.
    b. Assess for uremic frost (urea crystallization on the skin) and bathe in plain water.
  6. Monitor for bleeding complications, prevent injury to client.
    a. Monitor Hgb, HCT, platelets, RBC.
    b. Hematest all secretions.
    c. Administer hematinics as ordered.
    d. Avoid IM injections.
  7. Promote/maintain maximal cardiovascular function.
    a. Monitor blood pressure and report significant changes.
    b. Auscultate for pericardial friction rub.
    c. Perform circulation checks routinely.
    d. Administer diuretics as ordered and monitor output.
    e. Modify digitalis dose as ordered (digitalis is excreted in kidneys).
  8. Provide care for client receiving dialysis.

Kidney Transplantation

A. General information
  1. Transplantation of a kidney from a donor to recipient to prolong the life of person with renal failure
  2. Sources of donor selection
    a. Living relative or potential with compatible serum and tissue studies, free from systemic infection, and emotionally stable
    b. Cadavers with good serum and tissue crossmatching; free from renal disease, neoplasms, and sepsis; absence of ischemia/trauma

B. Nursing interventions: preoperative
  1. Provide routine pre-op care.
  2. Discuss the possibility of post-op dialysis/immunosuppressive drug therapy with client and significant others.

C. Nursing interventions: postoperative
  1. Provide routine post-op care.
  2. Monitor fluid and electrolyte balance carefully.
    a. Monitor I&O hourly and adjust IV fluid administration accordingly.
    b. Anticipate possible massive diuresis.
  3. Encourage frequent and early ambulation.
  4. Monitor vital signs, especially temperature; report significant changes.
  5. Provide mouth care and nystatin (Mycostatin) mouthwashes for candidiasis.
  6. Administer immunosuppressive agents as ordered.
    a. Cyclosporine (Sandimmune): does not cause significant bone marrow depression. Assess for hypertension; blood chemistry alterations (hypermagnesemia, hyperkalemia, decreased sodium bicarbonate); neurologic functioning.
    b. Azathioprine (Imuran): assess for manifestations of anemia, leukopenia, thrombocytopenia, oral lesions.
    c. Cyclophosphamide (Cytoxan): assess for alopecia, hypertension, kidney/liver toxicity, leukopenia.
    d. Antilymphocytic globulin (ALG), antithymocytic globulin (ATG): assess for fever, chills, anaphylactic shock, hypertension, rash, headache.
    e. Corticosteroids (prednisone, methylprednisolone sodium succinate [Solu-Medrol]): assess for peptic ulcer and GI bleeding, sodium/water retention, muscle weakness, delayed healing, mood alterations, hyperglycemia, acne.
  7. Assess for signs of rejection. Include decreased urinary output, fever, pain/tenderness over transplant site, edema, sudden weight gain, increasing blood pressure, generalized malaise, rise in serum creatinine, and decrease in creatinine clearance.

8. Provide client teaching and discharge planning concerning:
   a. Medication regimen: names, dosages, frequency, and side effects
   b. Signs and symptoms of rejection and the need to report immediately
   c. Dietary restrictions: restricted sodium and calories, increased protein
   d. Daily weights
   e. Daily measurement of I&O
   f. Resumption of activity and avoidance of contact sports in which the transplanted kidney may be injured

Nephrectomy

A. General information
   1. Surgical removal of an entire kidney
   2. Indications include renal tumor, massive trauma, removal for a donor, polycystic kidneys

B. Nursing interventions: preoperative care
   1. Provide routine pre-op care.
   2. Ensure adequate fluid intake.
   3. Assess electrolyte values and correct any imbalances before surgery.
   4. Avoid nephrotoxic agents in any diagnostic tests.
   5. Advise client to expect flank pain after surgery if retroperitoneal approach (flank incision) is used.
   6. Explain that client will have chest tube if a thoracic approach is used.

C. Nursing interventions: postoperative
   1. Provide routine post-op care.
   2. Assess urine output every hour; should be 30–50 mL/hour.
   3. Observe urinary drainage on dressing and estimate amount.
   4. Weigh daily.
   5. Maintain adequate functioning of chest drainage system; ensure adequate oxygenation and prevent pulmonary complications.
   6. Administer analgesics as ordered.
   7. Encourage early ambulation.
   8. Teach client to splint incision while turning, coughing, deep breathing.
   9. Provide client teaching and discharge planning concerning:
      a. Prevention of urinary stasis
      b. Maintenance of acidic urine
      c. Avoidance of activities that might cause trauma to the remaining kidney (contact sports, horseback riding)
      d. No lifting heavy objects for at least 6 months
      e. Need to report unexplained weight gain, decreased urine output, flank pain on unoperative side, hematuria
      f. Need to notify physician if cold or other infection present for more than 3 days
      g. Medication regimen and avoidance of OTC drugs that may be nephrotoxic (except with physician approval)

Disorders of the Male Reproductive System

Epididymitis

A. General information
   1. Inflammation of epididymis, one of the most common intrascrotal infections
   2. May be sexually transmitted, usually caused by *N. gonorrhoeae, C. trachomatis;* also caused by GU instrumentation, urinary reflux

B. Assessment findings
   1. Sudden scrotal pain, scrotal edema, tenderness over the spermatic cord
   2. Diagnostic test: urine culture reveals specific organism

C. Nursing interventions
   1. Administer antibiotics and analgesics as ordered.
   2. Provide bed rest with elevation of the scrotum.
   3. Apply ice packs to scrotal area to decrease edema.

Prostatitis

A. General information
   1. Inflammatory condition that affects the prostate gland
   2. Several forms: acute bacterial prostatitis, chronic bacterial prostatitis, or abacterial chronic prostatitis
   3. Acute and chronic bacterial prostatitis usually caused by *E. coli, N. gonorrhoeae, Enterobacter* or *Proteus* species, and group D streptococci
   4. Most important predisposing factor: lower UTIs

B. Assessment findings
   1. Acute: fever, chills, dysuria, urethral discharge, prostatic tenderness, copious purulent urethral discharge upon palpation
   2. Chronic: backache; perineal pain; mild dysuria; frequency; enlarged, firm, and slightly tender prostate upon palpation
   3. Diagnostic tests
      a. WBC elevated
      b. Bacteria in initial urinalysis specimens

C. Nursing interventions
   1. Administer antibiotics, analgesics, and stool softeners as ordered.
   2. Provide increased fluid intake.
   3. Provide sitz baths/rest to relieve discomfort.
   4. Provide client teaching and discharge planning concerning:
      a. Importance of maintaining adequate hydration

b. Antibiotic therapy regimen (may need to remain on medication for several months)
c. Activities that drain the prostate (masturbation, sexual intercourse, prostatic massage)

Benign Prostatic Hypertrophy (BPH)

A. General information
1. Mild to moderate glandular enlargement, hyperplasia, and overgrowth of the smooth muscles and connective tissue
2. As the gland enlarges, it compresses the urethra, resulting in urinary retention.
3. Most common problem of the male reproductive system; occurs in 50% of men over age 50; 75% of men over age 75
4. Cause unknown; may be related to hormonal mechanism

B. Assessment findings
1. Nocturia, frequency, decreased force and amount of urinary stream, hesitancy (more difficult to start voiding), hematuria
2. Enlargement of prostate gland upon palpation by digital rectal exam
3. Diagnostic tests
a. Urinalysis: alkalinity increased; specific gravity normal or elevated
b. BUN and creatinine elevated (if longstanding BPH)
c. Prostate-specific antigen (PSA) elevated (normal is 4 ng/mL)
d. Cystoscopy reveals enlargement of gland and obstruction of urine flow

C. Nursing interventions
1. Administer antibiotics as ordered.
2. Provide client teaching concerning medications
a. Terazosin (Hytrin) relaxes bladder sphincter and makes it easier to urinate. May cause hypotension and dizziness.
b. Finasteride (Proscar) shrinks enlarged prostate.
3. Force fluids.
4. Provide care for the catheterized client.
5. Provide care for the client with prostatic surgery.

Cancer of the Prostate

A. General information
1. Second most common cause of cancer deaths in American males over age 55
2. Usually an adenocarcinoma; growth related to the presence of androgens
3. Spreads from the prostate to the seminal vesicles, urethral mucosa, bladder wall, external sphincter, and lymphatic system
4. Highest incidence is in African-American men age 60 or over
5. Cause is unknown

B. Medical management
1. Drug therapy: estrogens, chemotherapeutic agents
2. Radiation therapy
3. Surgery: radical prostatectomy
4. "Watchful waiting": tumor is small and slow-growing without symptoms; decide with physician to monitor condition without surgery.

C. Assessment findings: same as for BPH but diagnostic test results are:
1. Elevated acid phosphatase (distant metastasis) and alkaline phosphatase (bone metastasis)
2. Bone scan: abnormal in metastatic areas

D. Nursing interventions
1. Administer medications as ordered and provide care for the client receiving chemotherapy.
2. Provide care for the client receiving radiation therapy.
3. Provide care for the client with a prostatectomy.

Prostatic Surgery

A. General information
1. Indicated for benign prostatic hypertrophy and prostatic cancer.
2. Types
a. Transurethral resection (TUR or TURP): insertion of a resectoscope into the urethra to excise prostatic tissue; good for poor surgical risks, does not require an incision; most common type of surgery or BPH
b. Suprapubic prostatectomy: the prostate is approached by a low abdominal incision into the bladder to the anterior aspect of the prostate; for large tumors obstructing the urethra
c. Retropubic prostatectomy: to remove a large mass high in the pelvic area; involves a low midline incision below the bladder and into the prostatic capsule
d. Perineal prostatectomy: often used for prostatic cancer; the incision is made through the perineum, which facilitates radical surgery if a malignancy is found
e. *da vinci* Prostatectomy: removal of prostate using robotic system with few small incisions and great precision; more benefits than traditional surgery (less pain, nerve damage, scarring, blood loss, hospital stay).

B. Nursing interventions: preoperative
1. Provide routine pre-op care.
2. Institute and maintain urinary drainage.
3. Force fluids; administer antibiotics, acid-ash diet to eradicate UTI.
4. Reinforce what surgeon has told client/significant others regarding effects of surgery on sexual function.

C. Nursing interventions: postoperative

1. Provide routine post-op care.
2. Ensure patency of 3-way Foley.
3. Monitor continuous bladder irrigations with sterile saline solution (removes clotted blood from bladder), and control rate to keep urine light pink changing to clear.
4. Expect hematuria for 2–3 days.
5. Irrigate catheter with normal saline as ordered.
6. Control/treat bladder spasms; encourage short, frequent walks; decrease rate of continuous bladder irrigations (if urine is not red and is without clots); administer anticholinergics (propantheline bromide [Pro-Banthine]) or antispasmodics (B&O suppositories) as ordered.
7. Prevent hemorrhage: administer stool softeners to discourage straining at stool; avoid rectal temperatures and enemas; monitor Hgb and HCT.
8. Report bright red, thick blood in the catheter; persistent clots, persistent drainage on dressings.
9. Provide for bladder retraining after Foley removal.
  a. Instruct client to perform perineal exercises (stopping and starting stream during voiding; pressing buttocks together then relaxing muscles) to improve sphincter control.
  b. Limit liquid intake in evening.
  c. Restrict caffeine-containing beverages.
  d. Withhold anticholinergics and antispasmodics (these drugs relax bladder and increase chance of incontinence) if permitted.
10. Provide client teaching and discharge planning concerning:
  a. Client and/or family education on going home with a smaller leg-bag catheter until physician office visit.
  b. Continued increased fluid intake
  c. Signs of UTI and need to report them
  d. Continued perineal exercises
  e. Avoidance of heavy lifting, straining during defecation, and prolonged travel (at least 8–12 weeks)
  f. Measures that promote urinary continence
  g. Possible impotence (more common after perineal resection)
    1) Discuss ways of expressing sexuality (massage, cuddling)
    2) Suggest alternative methods of sexual gratification and use of assistive aids
    3) Discuss possibility of penile prosthesis with physician
  h. Need for annual and self-exams

Sample Questions

340. A client is hospitalized for bladder cancer. He is scheduled for ileal loop surgery to create a urostomy. Which information is most important for the nurse to include in a teaching plan for this client when learning to change his urostomy appliance?

1. Change the appliance before going to bed.
2. Cut the wafer one inch larger than the stoma.
3. Cleanse the peristomal skin with mild soap and water.
4. Use firm pressure to attach the wafer to the skin.

341. Which nursing intervention best prevents urinary tract infections in a person who has an ileal conduit?

1. Allowing the bag to fill completely.
2. Attaching a larger bag at night.
3. Restricting fluids to less than 1000 mL daily.
4. Changing the appliance every 8 hours.

342. An elderly client has just returned to the nursing unit after a transurethral resection. He has a 3-way indwelling urinary catheter for continuous bladder irrigation connected to straight drainage. Immediately after surgery, what color of urine does the nurse expect in the catheter bag?

1. Clear.
2. Light yellow.
3. Pink or dark red.
4. Bright red.

343. An elderly man has just returned to the nursing care unit following a transurethral resection. He has a three-way indwelling catheter with continuous bladder irrigation. He tells the nurse he has to void. What is the most appropriate nursing action?

1. Allow him to void around the catheter.
2. Irrigate the catheter.
3. Notify the physician.
4. Remove the catheter.

344. A young adult is admitted to the hospital with a diagnosis of acute renal failure. She is oliguric and has proteinuria. She asks the nurse, "How long will it be until I start to make urine again?"

1. 1–2 days.
2. 3–7 days.
3. 1–2 weeks.
4. 3–4 weeks.

345. A client who is in acute renal failure develops pulmonary edema. Nursing interventions for this person should include which of the following? Check all that apply.

____ Administering oxygen.
____ Encouraging coughing and deep breathing.
____ Placing the client in a semi-sitting position.
____ Replacing lost fluids.

346. A client is admitted to the floor from PACU with continuous bladder irrigation after undergoing a TURP. The nurse knows to increase the rate of flow of the irrigation if what condition of the urine return is present?

1. There is no return.
2. The return is slow.
3. The return is yellow and cloudy.
4. The return becomes brighter red.

347. A young man is admitted in chronic renal failure and placed on hemodialysis three times a week. Which is an attainable short-term goal for this person when he is placed on hemodialysis?

1. Understanding the treatment and its implications.
2. Independence in the care of the AV shunt.
3. Self-monitoring during dialysis.
4. Recording dialysate composition and temperature.

348. The nurse is caring for a client who is on hemodialysis and has an arteriovenous fistula. Which finding is expected when assessing the fistula?

1. Ecchymotic area.
2. Enlarged veins.
3. Pulselessness.
4. Redness.

349. A female client is to have a urine culture collected. What are the correct instructions the nurse will give the client for collecting a clean catch urine specimen?

1. Separate the labia, clean from front to back with the three wipes impregnated with the cleaning solution, and then start to void in the toilet. Stop, and finally continue to void into the sterile container.
2. Retract the foreskin, cleanse with the three cleansing sponges, and start to void. Stop, and finally continue to void into the sterile container.
3. Separate the labia, clean from back to front with the three wipes impregnated with the cleaning solution, and then start to void in the toilet. Stop, and finally continue to void into the sterile container.
4. Retract the foreskin, clean with soap and water, and then start to void. Stop, and finally continue to void into the sterile container.

350. The nurse is to collect a urine culture specimen from a catheterized client. Which one of the following statements describes the nurse's actions for this procedure?

1. With a sterile syringe the nurse aspirates 50 mL of urine from the silicone catheter tubing.
2. With a sterile syringe, the nurse aspirates 1–3 mL from the sampling port of the catheter after first cleaning with alcohol.
3. With a sterile syringe, the nurse aspirates 1–3 mL from the distal end of the catheter after first cleaning the sampling port with soap and water.
4. The nurse disconnects the catheter from the tubing and allows a small volume of urine to drain into a sterile container.

351. The nurse is ordered to perform a urinary catheterization for post-void residual volume (PVR) on a client with urinary incontinence. Several minutes after the client voids, the nurse obtains a residual urine of 30 mL. How does the nurse interpret this result?

1. Adequate bladder emptying.
2. Inadequate bladder emptying.
3. Decreased urethral pressure.
4. Increased urethral pressure.

352. Post cystoscopy, which one of the following assessment findings would the nurse expect to find?

1. Gross hematuria and pain.
2. Pink-tinged urine and burning on voiding.
3. Colicky pain and bladder distention.
4. Flank pain and bladder distention.

353. A post-op client is unable to void and is ordered to have an indwelling catheter inserted immediately. What is the nurse's greatest concern?

1. Teaching the client deep breathing techniques to decrease post-op pain, preprocedure.
2. Maintaining strict aseptic technique.
3. Medicating the client for pain, before the procedure.
4. Teaching the client the signs and symptoms of urinary tract infection.

354. The nurse is assessing a client with an indwelling catheter and finds the catheter is not draining and the client's bladder is distended. What is the nurse's first best action?

1. Notify the physician.
2. Assess the catheter tubing for kinks and position so downhill flow is initiated.
3. Change the catheter.
4. Aspirate urine for culture.

355. The nurse is teaching a client about the concept of dialysis and how it works for the body. What statement best describes the nurse's understanding of dialysis?

1. It will move blood through a semipermeable membrane into a dialysate that is used to remove waste products as well as correct fluid and electrolyte imbalances.
2. It will add electrolytes and water to the blood when passing through a semipermeable membrane to correct electrolyte imbalances.
3. It will increase potassium to the blood when passing through a semipermeable membrane to correct electrolyte imbalances.
4. It allows the nurse to choose to use either diffusion osmosis or ultrafiltration to correct the client's fluid and electrolyte imbalance.

356. A client with end-stage renal disease (ESRD) receives hemodialysis three times a week. Which statement demonstrates that dialysis is effective?

1. The client does not have a large weight gain.
2. The client has no signs and symptoms of infection.
3. The client expresses he or she can catch up on rest while on dialysis.
4. The client is able to return to employment.

357. The nurse is caring for a client going to hemodialysis three times a week. The client receives the following medications every morning: hydrochlorothiazide (Hydrodiuril), nitroglycerin patch (Minitran), vancomycin, and allopurinol (Zyloprim). The nurse expects to withhold which of the above medications until after hemodialysis?

1. Hydrochlorothiazide (Hydrodiuril) and vancomycin.
2. Hydrochlorothiazide (Hydrodiuril) and nitroglycerin patch (Minitran).
3. Nitroglycerin (Minitran) and allopurinol (Zyloprim).
4. Vancomycin and allopurinol (Zyloprim).

358. The nurse is caring for a client receiving peritoneal dialysis. The nurse is completing the exchange by draining the dialysate and notices the dialysate is cloudy. What is the nurse's interpretation of this finding?

1. The normal appearance of draining dialysate.
2. A sign of infection.
3. An indication of an impending lower back problem.
4. A sign of a vascular access occlusion.

359. A client is on continuous ambulatory peritoneal dialysis (CAPD). Which statement by the client demonstrates understanding of the treatment?

1. "I must increase my carbohydrate intake daily."
2. "I must maintain a positive nitrogen balance by decreasing proteins."
3. "I must take prophylactic antibiotics to prevent infection."
4. "I must be aware of the signs and symptoms of peritonitis."

360. A woman presents to the urgent care center with dysuria and hematuria. The woman reveals that she has a history of cystitis. The nurse should also assess for which of the following clinical manifestations suggesting cystitis?

1. Frequency and urgency of urination, flank pain, nausea, and vomiting.
2. Abscess formation and flank pain.
3. Frequency and urgency of urination, suprapubic pain, and foul smelling urine.
4. Fever, nausea, vomiting, and flank pain.

361. A 3-day post-op client for a ureterosigmoidostomy is complaining of cramping in lower extremities and occasional dizziness. What intervention should be given the highest priority?

1. Assessing for electrolyte imbalance.
2. Assessing for cardiac dysrhythmias.
3. Observing the client's response to surgery.
4. Verifying the temperature of the client's lower extremities.

362. What teaching by the nurse should be given to the client with a Kock's pouch?

1. Decreasing the client's sexual encounters.
2. Adhering to catheterization schedules.
3. Decreasing food intake to avoid embarrassing situations.
4. Decreasing fluid intake to manage the urinary diversion.

363. A 35-year-old male presents to the ER with hematuria, flank pain, fever, nausea, and vomiting. He is admitted and passes a "stone." The stone is sent to the laboratory and is found to be composed

of uric acid. The client is placed on allopurinol (Zyloprim). What is the action for this medication?

1. Decrease the client's serum creatinine.
2. Reduce the urinary concentration of uric acid.
3. Acidify the urine.
4. Bind oxalate in the gastrointestinal tract.

364. The nurse is caring for a client who has just been given discharge instruction for kidney stones. Which statement by the client indicates a need for further instruction?

1. "I will decrease my intake of all foods on the list you gave me that are high in purine, calcium, or oxalate."
2. "I will decrease my fluid intake."
3. "I will take my medication daily."
4. "I will return to my doctor in one week for follow-up."

365. Medication will be used in the management of a client with urolithiasis. Based on knowledge of urolithiasis, the nurse should include which of the following in planning nursing care for the client?

1. Place the client in bed with upper rails up, call bell within reach, and instructions to call to get out of bed.
2. Keep the client NPO so there will be no experience of nausea with medication administration.
3. Increase intake of purine-, calcium-, and oxalate-rich food.
4. Add Probenecid to the narcotic to prevent renal tubular excretion of the narcotic.

366. The nurse is performing discharge teaching for a client who was admitted with pyelonephritis. The client asks the nurse, "What is pyelonephritis?" What is the nurse's best response?

1. "Pyelonephritis is an inflammation of the bladder."
2. "Pyelonephritis is a rupture of the bladder."
3. "Pyelonephritis is an infection of the kidney."
4. "Pyelonephritis is an infection of the lower urinary tract."

367. On a medical-surgical unit, a client is admitted with acute renal failure. What problem must the nurse assess for continually?

1. Hyponatremia and hyperkalemia.
2. Decreased BUN and creatinine.
3. Alkalosis.
4. Hypercalcemia.

368. The client with chronic renal failure complains of irritating white crystals on his skin. The nurse recognizes this finding as uremic frost and takes which of the following nursing actions?

1. Administers an antihistamine because the doctor would prescribe one to relieve itching.
2. Increases fluids to prevent crystal formation and decrease itching.
3. Provides skin care with tepid water and applies lotion on the skin to relieve itching.
4. Permits the client to soak in a bathtub to remove crystals.

369. The nurse has been working with a client with chronic renal failure. Which of the following behaviors would indicate to the nurse that the client understands his dietary regimen?

1. He reports eating two bananas for breakfast, rice and beans for lunch, and fruit salad, green beans, and an 8 oz. T-bone steak for dinner.
2. He reports eating bacon and eggs for breakfast, hot dogs and sauerkraut for lunch, and baked canned ham with green beans for dinner.
3. He reports eating an apple and oatmeal for breakfast, homemade tomato soup for lunch, and pasta with fish for dinner.
4. He reports eating half a honeydew melon and three eggs for breakfast, a baked potato with processed cheese spread and broccoli for lunch, and chicken, yams, pinto beans, squash, and 8 oz. of pecans for dinner.

370. A client who has been in intensive care, for cardiogenic shock related to a myocardial infarction, is recovering. He is transferred to the renal unit in renal failure. The client's spouse asks the nurse "Is this acute or chronic renal failure?" What is the nurse's best response?

1. "Don't worry; this is an excellent renal unit, so we can treat either acute or chronic failure."
2. "Acute renal failure always progresses to chronic renal failure."
3. "Acute renal failure is glomerular degeneration whereas chronic renal failure is the result of cardiovascular collapse."
4. "Acute renal failure generally results from decreased blood to the kidneys, nephrotoxicity, or muscle injury. The myocardial infarction caused extensive heart muscle damage decreasing blood to the kidneys."

371. What should be assessed immediately post kidney transplant?

1. Fluid and electrolyte imbalances.
2. Infection.
3. Hepatotoxicity.
4. Cardiomegaly.

372. An adult had a renal transplant, as a result of glomerulonephritis, and is at the physician's office for a follow-up visit. The client tells the office nurse "I am not worried about rejection. I am not going to come here weekly." What defense mechanism is the client expressing?

1. Projection.
2. Intellectualization.
3. Denial.
4. Regression.

373. The nurse will complete which one of the following initial assessments on the client immediately post-op nephrectomy?

1. Performing cardiovascular assessment.
2. Ordering laboratory studies monitoring renal functions and electrolytes.
3. Inspecting the incision site for bleeding.
4. Obtaining a urine culture.

374. The nurse is completing an admission assessment on a client with benign prostatic hyperplasia (BPH). What in-depth assessment should the nurse obtain?

1. Laboratory studies.
2. Urinary patterns.
3. Electrocardiograms.
4. Internal bleeding.

375. A client with BPH is at the clinic for follow-up. Which of the following statements indicates to the nurse his understanding of management of his condition?

1. "As soon as I finish this visit I won't ever have to worry about BPH again."
2. "I don't know how I am going to get used to voiding every 2 to 3 hours."
3. "I will wear an athletic supporter while I am awake."
4. "I am going to avoid fluids while at work to prevent dribbling."

376. A client who is 8 hours post-transurethral resection prostatectomy (TURP) asks the nurse "Why are there blood clots in my bag?" How does the nurse interpret this occurrence?

1. After all surgery bleeding is normal.
2. It is common for blood clots to be irrigated from the bladder for a day or so.
3. The physician needs to be called as the client is hemorrhaging.
4. The client is tugging on the catheter causing irritation to the bladder mucosa.

377. A 68-year-old client, 48 hours post-transurethral resection prostatectomy asks "How will my sex life be affected?" The nurse's best response would be,

1. "I will get the physician to determine if your sex life was affected during surgery."
2. "Only your doctor can answer that. Why don't you ask him prior to discharge."
3. "A transurethral prostatectomy does not usually result in erectile dysfunction."
4. "Don't you remember, before surgery you were told that you would not be able to engage in sexual intercourse but you can express your love for your spouse by alternate acts such as cuddling."

378. Following a prostatectomy, the client has a 3-way, indwelling catheter for continuous bladder irrigation. During evening shift, 2400 mL of irrigant was instilled. At the end of the shift, the drainage bag was drained of 2900 mL of fluid. What is the total urine output for the shift?

1. 5300 mL.
2. 2900 mL.
3. 240 mL.
4. 500 mL.

Answers and Rationales

340. **3.** Cleansing the peristomal skin is critical to maintenance of skin integrity.

341. **2.** Attaching a larger bag at night helps to prevent reflux of urine into the stoma during a period when the bag is emptied less frequently.

342. **3.** The urine is expected to be pink or dark red for up to 36 hours after a transurethral resection.

343. **2.** Blood clots obstructing the catheter can produce the sensation of needing to void. Irrigating the catheter will remove any blood clots, allowing the urine to drain freely.

344. **3.** The oliguric period in acute renal failure is usually 1–2 weeks.

345. *Administered oxygen* should be checked. Oxygenation is seriously compromised in pulmonary edema.

Encouraging coughing and deep breathing should be checked. Coughing and deep breathing may help with oxygenation.

Placing the client in a semi-sitting position should be checked. This position facilitates breathing.

346. 4. If return becomes brighter red, the solution rate should be increased to flush the irrigation tube of clots.

347. 1. Prior to the start of dialysis the client should fully comprehend its meaning and the changes in lifestyle required.

348. 2. Leaking of arterial blood into an AV fistula causes the veins to enlarge so they are easier to access for hemodialysis.

349. 1. Women should separate the labia, clean from front to back, and then proceed to void into the toilet. Stop, and finally continue to void into the sterile container.

350. 2. Several milliliters of urine for culture can be aspirated with a 21-gauge needle and 3-mL syringe after the sampling port or the distal catheter has been swabbed with alcohol or iodine swabs. The urinary catheter and drainage system should remain a closed system to prevent infection.

351. 1. Measurement of post-void residual volume (PVR) should be performed for all clients with urinary incontinence. Catheterization is performed several minutes after the client voids. A residual of less than 50 mL signifies adequate bladder emptying.

352. 2. Pink-tinged urine and burning on voiding for a day or two following the procedure are expected.

353. 2. Strict aseptic technique is vital to prevent urinary tract infection. The client is positioned on the back with heels flat on the bed with legs separated. The meatus is cleansed with an iodine solution. The catheter is lubricated with a water-soluble jelly and is inserted through the urethra into the bladder until urine starts to flow. The balloon is inflated and the catheter is taped securely to the leg.

354. 2. Possible signs of indwelling catheter obstruction can be pain, distention, and no urinary output. Possible causes of obstruction include blood clots, mineral sediment, or mucous plugs in the catheter or tubing. The most effective strategies to promote drainage are to place the tubing so downhill flow is unobstructed and to empty the collection system regularly. Irrigation and catheter changes should be performed when all other means fail as they are associated with a high potential for infection.

355. 1. Dialysis allows substances to move from the blood through a semipermeable membrane into a dialysis solution (dialysate) to correct fluid and electrolyte imbalances as well as remove waste products that accumulate when the client is in renal failure. The principles of dialysis include diffusion, osmosis, and ultrafiltration.

356. 4. By the client returning to employment, it helps to maintain a positive self-image and to continue to be a productive member of society. It will be an ongoing assessment of the client's fluid status and sign/symptoms of infection.

357. 2. The morning of dialysis antihypertensives, nitrates, and sedatives are usually withheld as they may precipitate hypotensive episodes.

358. 2. Peritonitis is usually caused by *Staphylococcus*. The first indication of peritonitis is cloudy dialysate.

359. 4. Peritonitis is a life-threatening complication of CAPD, which is manifested by abdominal pain and distention, diarrhea, vomiting, and fever. Clients are given antibiotics orally or parenterally as necessary, not prophylactically.

360. 3. The signs and symptoms of cystitis are frequency and urgency of urination, suprapubic pain, dysuria, foul-smelling urination, and sometimes pyuria. Some clients with cystitis may be asymptomatic.

361. 1. In this surgical procedure, the client's ureters are anastomosed to the sigmoid colon. This results in the client having drainage from the rectum, which often leads to acidosis and electrolyte imbalance involving potassium, chloride, and magnesium.

362. 2. The client with a Kock's pouch should be taught about living with a stoma, how to self-catheterize and irrigate the appliance, increasing fluid intake to dilute urine to prevent irritation of the stoma, and lastly, stoma care. The client will need to self-catheterize at regular intervals.

363. 2. Allopurinol (Zyloprim) reduces the urinary concentration of uric acid to decrease the recurrence of uric acid stones.

364. 2. A high fluid intake of at least 3000 mL/day is needed to remove minerals prior to precipitation.

365. 1. Nursing care priorities for the client with urolithiasis include pain relief and prevention of urinary tract obstruction and recurrence of stones. The nurse can expect to administer narcotics and maintain client safety.

366. 3. Pyelonephritis is an inflammation or infection of the kidney or kidney pelvis.

367. 1. The most common findings in acute renal failure include elevations in BUN and creatinine, metabolic acidosis, hyponatremia, hyperkalemia, hypocalcemia, and hypophosphatemia.

368. 3. Skin care should be provided for the client by bathing with tepid water and oils to reduce dryness and itching.

369. 3. A client with chronic renal failure needs to adhere to a low-protein, low-sodium, and low-potassium diet. This meal plan would fall into these restrictions.

370. 4. A myocardial infarction causes decreased cardiac output, which may cause acute renal failure. The other mechanisms responsible for acute renal failure are nephrotoxicity, trauma, burns, sepsis, and mismatched blood. Chronic renal failure results from irreversible damage to the nephrons and glomeruli. Diseases commonly responsible for chronic renal failure are diabetes, hypertension, and kidney infections.

371. 1. The immediate assessments to be performed for a kidney recipient are fluid and electrolyte status, intake and output, and blood pressure.

372. 3. Denial is disowning intolerable thoughts. The client is denying feelings of anxiety and the seriousness of potential rejection of the organ.

373. 3. The renal system is highly vascular; the client is at risk for post-op bleeding.

374. 2. Benign prostatic hyperplasia (BPH) is the growth of new cells in the prostate gland, resulting in urinary obstruction; therefore, assessment of the obstructive symptoms are: decrease in the force of the urinary stream; hesitancy in initiation of urine; dribbling; urinary retention; incomplete bladder emptying; nocturia; dysuria; and urgency.

375. 2. Clients with BPH should void every 2 to 3 hours to flush the urinary tract.

376. 2. Blood clots are normal after a prostatectomy for the first 36 hours. Large quantities of bright red blood may indicate hemorrhage.

377. 3. Prior to surgery, the client should be informed that his sexual functioning will not be hampered other than retrograde ejaculation, which is not physically harmful.

378. 4. Urine output is calculated by subtracting the amount of irrigant instilled from the total fluid removed from the drainage bag (2900 mL drainage – 2400 mL irrigant = 500 mL urine).

The Musculoskeletal System

OVERVIEW OF ANATOMY AND PHYSIOLOGY

The musculoskeletal system consists of the bones, muscles, joints, cartilage, tendons, ligaments, and bursae. Its major function is to provide a structural framework for the body and to provide a means for movement.

Bones

A. Functions
1. Provide support to skeletal framework
2. Assist in movement by acting as levers for muscles
3. Protect vital organs and soft tissues
4. Manufacture RBCs in the red bone marrow (hematopoiesis)
5. Provide site for storage of calcium and phosphorus

B. Types of bones
1. Long: central shaft (diaphysis) made of compact bone and two ends (epiphyses) composed of cancellous bone (e.g., femur and humerus)
2. Short: cancellous bone covered by thin layer of compact bone (e.g., carpals and tarsals)
3. Flat: two layers of compact bones separated by a layer of cancellous bone (e.g., skull and ribs)
4. Irregular: sizes and shapes vary (e.g., vertebrae and mandible)

Joints

A. Articulation of bones occurs at joints; movable joints provide stabilization and permit a variety of movements
B. Classification (according to degree of movement)
  1. Synarthroses: immovable joints
  2. Amphiarthroses: partially movable joints
  3. Diarthroses (synovial): freely movable joints
    a. Have a joint cavity (synovial cavity) between the articulating bone surfaces
    b. Articular cartilage covers the ends of the bones
    c. A fibrous capsule encloses the joint
    d. Capsule is lined with synovial membrane that secretes synovial fluid to lubricate the joint and reduce friction

Muscles

A. Functions
  1. Provide shape to the body
  2. Protect the bones
  3. Maintain posture
  4. Cause movement of body parts by contraction
B. Types of muscles
  1. Cardiac: involuntary; found only in heart
  2. Smooth: involuntary; found in walls of hollow structures (e.g., intestines)
  3. Striated (skeletal): voluntary
C. Characteristics of skeletal muscles
  1. Muscles are attached to the skeleton at the point of origin and to bones at the point of insertion.
  2. Have properties of contraction and extension, as well as elasticity, to permit isotonic (shortening and thickening of the muscle) and isometric (increased muscle tension) movement.
  3. Contraction is innervated by nerve stimulation.

Cartilage

A. A form of connective tissue
B. Major functions are to cushion bony prominences and offer protection where resiliency is required

Tendons and Ligaments

A. Composed of dense, fibrous connective tissue
B. Functions
  1. Ligaments attach bone to bone
  2. Tendons attach muscle to bone

ASSESSMENT

Health History

A. Presenting problem
  1. Muscles: symptoms may include pain, cramping, weakness
  2. Bones and joints: symptoms may include stiffness, swelling, pain, redness, heat, limitation of movement
B. Lifestyle: usual patterns of activity and exercise (limitations in ADL, use of assistive devices such as canes or walkers), nutrition (obesity) and diet, occupation (sedentary, heavy lifting, or pushing)
C. Use of medications: drugs taken for musculoskeletal problems
D. Past medical history: congenital defects, trauma, inflammations, fractures, back pain
E. Family history: arthritis, gout

Physical Examination

A. Inspect for overall body build, posture, and gait.
B. Inspect and palpate joints for swelling, deformity, masses, movement, tenderness, crepitations.
C. Inspect and palpate muscles for size, symmetry, tone, strength.

Laboratory/Diagnostic Tests

A. Hematologic studies
  1. Muscle enzymes: CPK, aldolase, SGOT (AST)
  2. Erythrocyte sedimentation rate (ESR)
  3. Rheumatoid factor
  4. Complement fixation
  5. Lupus erythematosus cells (LE prep)
  6. Antinuclear antibodies (ANA)
  7. Anti-DNA
  8. C-reactive protein
  9. Uric acid
B. X-rays: detect injury to or tumors of bone or soft tissue
C. Bone scan
  1. Measures radioactivity in bones 2 hours after IV injection of a radioisotope; detects bone tumors, osteomyelitis.
  2. Nursing care
    a. Have client void immediately before the procedure.
    b. Explain that client must remain still during the scan itself.
D. Arthroscopy
  1. Insertion of fiber-optic endoscope (arthroscope) into a joint to visualize it, perform biopsies, or remove loose bodies from the joint
  2. Performed in OR using aseptic technique
  3. Nursing care
    a. Maintain pressure dressing for 24 hours.
    b. Advise client to limit activity for several days.
E. Arthrocentesis: insertion of a needle into the joint to aspirate synovial fluid for diagnostic purposes or to remove excess fluid
F. Myelography
  1. Lumbar puncture used to withdraw a small amount of CSF, which is replaced with a

radiopaque dye; used to detect tumors or herniated intravertebral discs

2. Nursing care: pretest
   a. Keep NPO after liquid breakfast.
   b. Check for iodine allergy.
   c. Confirm that consent form has been signed and explain procedure to client.
3. Nursing care: posttest (see also Lumbar Puncture)
   a. If oil-based dye (e.g., iophendylate [Pantopaque]) was used, keep client flat for 12 hours.
   b. If water-based dye (e.g., metrizamide [Amipaque]) was used
      1) Elevate head of bed 30–45°; to prevent upward displacement of dye, which may cause meningeal irritation and possibly seizures.
      2) Institute seizure precautions and do not administer any phenothiazine drugs to client, e.g., prochlorperazine (Compazine).

G. Electromyography
1. Measures and records activity of contracting muscles in response to electrical stimulation; helps differentiate muscle disease from motor neuron dysfunction
2. Nursing care: explain procedure to the client and advise that some discomfort may occur due to needle insertion

ANALYSIS

Nursing diagnoses for clients with disorders of the musculoskeletal system may include:
A. Risk for injury
B. Risk for disuse syndrome
C. Impaired physical mobility
D. Bathing/hygiene self-care deficit
E. Dressing/grooming self-care deficit
F. Toileting self-care deficit
G. Body-image disturbance
H. Pain

PLANNING AND IMPLEMENTATION

Goals

Client will:
A. Be free from injury.
B. Be free from complications of immobility.
C. Attain optimal level of mobility.
D. Perform self-care activities at optimal level.
E. Adapt to alterations in body image.
F. Achieve maximum comfort level.

Interventions

Preventing Complications of Immobility

Range-of-Motion (ROM) Exercises

A. Movement of joint through its full ROM to prevent contractures and increase or maintain muscle tone/strength
B. Types
1. Active: carried out by client; increases and maintains muscle tone; maintains joint mobility
2. Passive: carried out by nurse without assistance from client; maintains joint mobility only; body part not to be moved beyond its existing ROM
3. Active assistive: client moves body part as far as possible and nurse completes remainder of movement
4. Active resistive: contraction of muscles against an opposing force; increases muscle size and strength

Isometric Exercises

A. Active exercise through contraction/relaxation of muscle; no joint movement; length of muscle does not change.
B. Client increases tension in muscle for several seconds and then relaxes.
C. Maintains muscle strength and size.

Assistive Devices for Walking

A. Cane
1. Types: single, straight-legged cane; tripod cane; quad cane.
2. Nursing care: teach client to hold cane in hand opposite affected extremity and to advance cane at the same time the affected leg is moved forward.

B. Walker
1. Mechanical device with four legs for support.
2. Nursing care: teach client to hold upper bars of walker at each side, then to move the walker forward and step into it.

C. Crutches: teaching the client proper use of crutches is an important nursing responsibility.
1. Ensure proper length
   a. When client assumes erect position the top of crutch is 2 inches below the axilla, and the tip of each crutch is 6 inches in front and to the side of the feet.
   b. Client's elbows should be slightly flexed when hand is on hand grip.
   c. Weight should not be borne by the axillae.
2. Crutch gaits
   a. Four-point gait: used when weight bearing is allowed on both extremities
      1) Advance right crutch.

2) Step forward with left foot.
3) Advance left crutch.
4) Step forward with right foot.

b. Two-point gait: typical walking pattern, an acceleration of four-point gait
1) Step forward moving both right crutch and left leg simultaneously.
2) Step forward moving both left crutch and right leg simultaneously.

c. Three-point gait: used when weight bearing is permitted on one extremity only
1) Advance both crutches and affected extremity several inches, maintaining good balance.
2) Advance the unaffected leg to the crutches, supporting the weight of the body on the hands.

d. Swing-to gait: used for clients with paralysis of both lower extremities who are unable to lift feet from floor
1) Both crutches are placed forward.
2) Client swings forward to the crutches.

e. Swing-through gait: same indications as for swing-to gait
1) Both crutches are placed forward.
2) Client swings body through the crutches.

Care of the Client with a Cast

A. Types of casts: long arm, short arm, long leg, short leg, walking cast with rubber heel, body cast, shoulder spica, hip spica

B. Casting materials
1. Plaster of paris—traditional cast
   a. Takes 24–72 hours to dry.
   b. Precautions must be taken until cast is dry to prevent dents, which may cause pressure areas.
   c. Signs of a dry cast: shiny white, hard, resistant.
   d. Must be kept dry because water can ruin a plaster cast.
2. Synthetic casts, e.g., fiberglass
   a. Strong, lightweight; sets in about 20 minutes.
   b. Can be dried using cast dryer or hair blow-dryer on cool setting; some synthetic casts need special lamp to harden.
   c. Water-resistant; however, if cast becomes wet, must be dried thoroughly to prevent skin problems under cast.

C. Cast drying—plaster cast
1. Use palms of hands, not fingertips, to support cast when moving or lifting client.
2. Support cast on rubber- or plastic-protected pillows with cloth pillowcase along length of cast until dry.
3. Turn client every 2 hours to reduce pressure and promote drying.
4. Do not cover the cast until it is dry (may use fan to facilitate drying).
5. Do not use heat lamp or hair dryer on plaster cast.

D. Assessment
1. Perform neurovascular checks to area distal to cast.
   a. Report absent or diminished pulse, cyanosis or blanching, coldness, lack of sensation, inability to move fingers or toes, excessive swelling.
   b. Report complaints of burning, tingling, or numbness.
2. Note any odor from the cast that may indicate infection.
3. Note any bleeding on cast in a surgical client.
4. Check for "hot spots" that may indicate inflammation under cast.
5. Compartment syndrome: report of pain due to inadequate space for tissue swelling; treatment may include removing case and fasciotomy (surgical opening of the fascia); non-treatment could result in permanent nerve damage and deformity.

E. General care
1. Instruct client to wiggle toes or fingers to improve circulation.
2. Elevate affected extremity above heart level to reduce swelling.
3. Apply ice bags to each side of the cast if ordered.

F. Provide client teaching and discharge planning concerning:
1. Isometric exercises when cleared with physician
2. Reinforcement of instructions given on crutch walking
3. Do not get cast wet; wrap cast in plastic bag when bathing or take sponge bath
4. If a cast that has already dried and hardened does become wet, may use blow-dryer on low setting over wet spot; if large area of plaster cast becomes wet, call physician
5. Do not scratch or insert foreign bodies under cast; may direct cool air from blow-dryer under cast for itching
6. Recognize and report signs of impaired circulation or of infection
7. Cast cleaning
   a. Clean surface soil on plaster cast with a slightly damp cloth; mild soap may be used for synthetic cast
   b. To brighten a plaster cast, apply white shoe polish sparingly

Care of the Client in Traction

A. A pulling force exerted on bones to reduce and/or immobilize fractures, reduce muscle spasm, correct or prevent deformities

B. Types

1. Skin traction: weights are attached to a moleskin or adhesive strip secured by elastic bandage or other special device (e.g., foam rubber boot) used to cover the affected limb.

a. Buck's extension (See Figure 4-24).

1) Exerts straight pull on affected extremity

2) Generally used to temporarily immobilize the leg in a client with a fractured hip

3) Shock blocks at the foot of the bed produce countertraction and prevent the client from sliding down in bed

b. Russell traction (See Figure 4-24).

1) Knee is suspended in a sling attached to a rope and pulley on a Balkan frame, creating upward pull from the knee; weights are attached to foot of bed (as in Buck's extension) creating a horizontal force exerted on the tibia and fibula

2) Generally used to stabilize fractures of the femoral shaft while client is awaiting surgery

3) Elevating foot of bed slightly provides countertraction

4) Head of bed should remain flat

5) Foot of bed usually elevated by shock blocks to provide countertraction

c. Cervical traction (See Figure 4-24).

1) Cervical head halter attached to weights that hang over head of bed

2) Used for soft tissue damage or degenerative disc disease of cervical spine to reduce muscle spasm and maintain alignment

3) Usually intermittent traction

4) Elevate head of bed to provide countertraction

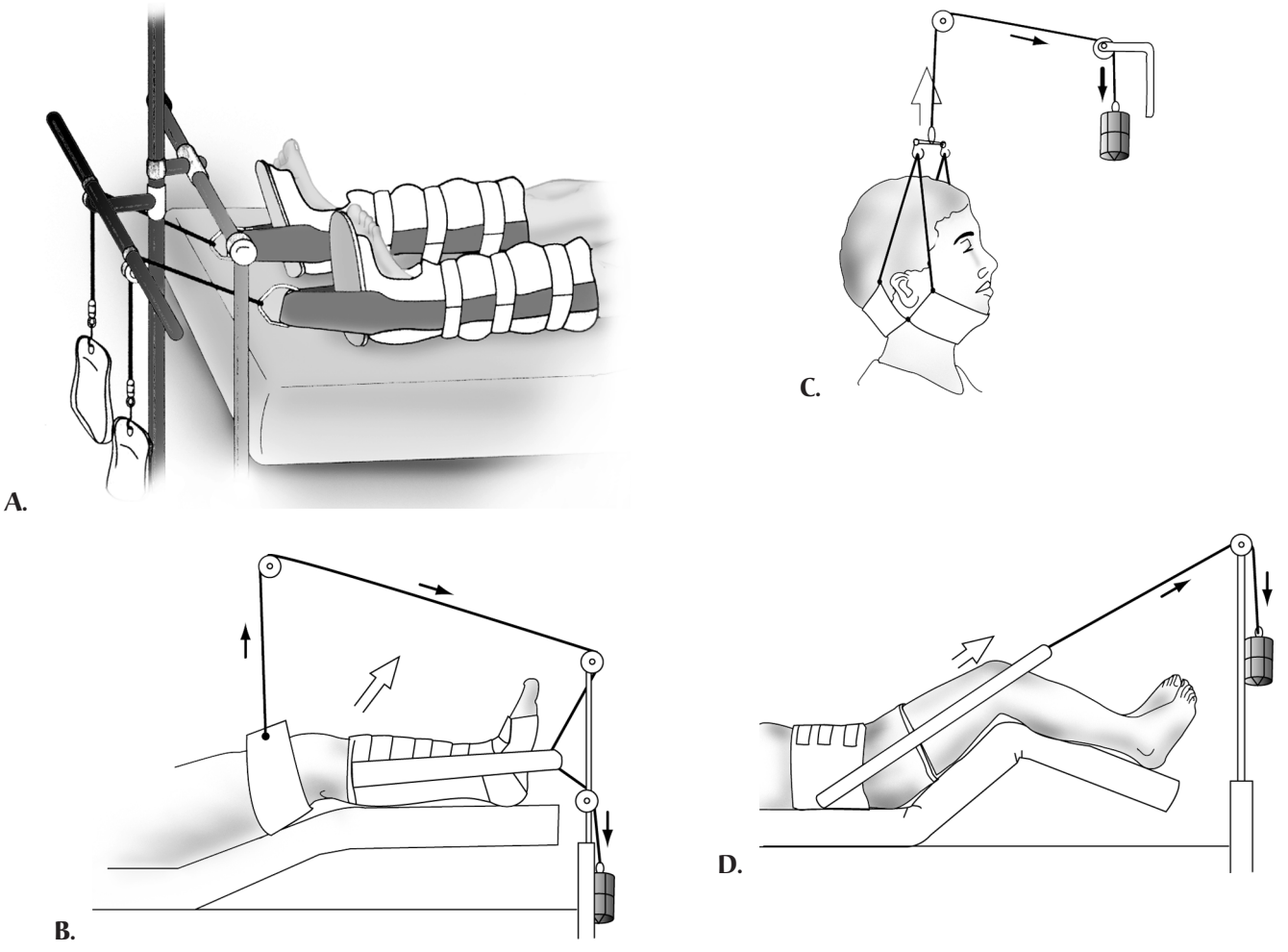


Figure 4–24 Types of traction. (**A**) Buck's extension traction; (**B**) Russell's traction; (**C**) Cervical traction; (**D**) Pelvic traction

d. Pelvic traction (See Figure 4-24).
1) Pelvic girdle with extension straps attached to ropes and weights
2) Used for low back pain to reduce muscle spasm and maintain alignment
3) Usually intermittent traction
4) Client in semi-Fowler's position with knee bent
5) Secure pelvic girdle around iliac crests

2. Skeletal traction: traction applied directly to the bones using pins, wires, or tongs (e.g., Crutchfield tongs) that are surgically inserted; used for fractured femur, tibia, humerus, cervical spine

3. Balanced suspension traction: produced by a counterforce other than the client's weight; extremity floats or balances in the traction apparatus; client may change position without disturbing the line of traction

4. Thomas splint and Pearson attachment (usually used with skeletal traction in fractures of the femur)
a. Hip should be flexed at 20°
b. Use footplate to prevent foot drop

C. Nursing care

1. Check traction apparatus frequently to ensure that:
a. Ropes are aligned and weights are hanging freely.
b. Bed is in proper position.
c. Line of traction is within the long axis of the bone.

2. Maintain client in proper alignment.
a. Align in center of bed.
b. Do not rest affected limb against foot of bed.

3. Perform neurovascular checks to affected extremity.

4. Observe for and prevent foot drop.
a. Provide footplate.
b. Encourage plantarflexion and dorsiflexion exercises.

5. Observe for and prevent deep venous thrombosis (especially in Russell traction due to pressure on popliteal space).

6. Observe for and prevent skin irritation and breakdown (especially over bony prominences and traction application sites).
a. Russell traction: check popliteal area frequently and pad the sling with felt covered by stockinette or ABDs.
b. Thomas splint: pad top of splint with same material as in Russell traction.
c. Cervical traction: pad chin area and protect ears.

7. Provide pin care for clients in skeletal traction.
a. Usually consists of cleansing and applying antibiotic ointment, but individual agency policies may vary.
b. Observe for any redness, drainage, odor.

8. Assist with ADL; provide overhead trapeze to facilitate moving, using bedpan, etc.

9. Prevent complications of immobility.

10. Encourage active ROM exercises to unaffected extremities.

11. Check carefully for orders about turning.
a. Buck's extension: client may turn to unaffected side (place pillows between legs before turning).
b. Russell traction and balanced suspension traction: client may turn slightly from side to side without turning body below the waist.
c. May need to make bed from head to foot.

EVALUATION

A. Client remains free from injury.

B. Client is free from complications of immobility.
1. Maintains clear, intact skin.
2. Has regular bowel movements.
3. Is free from urinary tract infection/retention/calculi.
4. Has clear breath sounds; normal rate, rhythm, and depth of respiration.
5. Demonstrates adequate peripheral circulation.
6. Maintains joint mobility and muscle tone.
7. Remains oriented to time, place, and person.
8. Is active in decision making regarding own care.

C. Optimum level of mobility is attained.

D. Client attains independence in self-care activities; uses assistive devices as necessary.

E. Client successfully adjusts to alterations in body image; exhibits increased self-esteem.

F. Pain is relieved or is more manageable.

DISORDERS OF THE MUSCULOSKELETAL SYSTEM

Rheumatoid Arthritis (RA)

A. General information
1. Chronic systemic disease characterized by inflammatory changes in joints and related structures.
2. Occurs in women more often than men (3:1); peak incidence between ages 35–45.
3. Cause unknown, but may be an autoimmune process; genetic factors may also play a role.
4. Predisposing factors include fatigue, cold, emotional stress, infection.
5. Joint distribution is symmetric (bilateral); most commonly affects smaller peripheral joints of hands and also commonly involves wrists, elbows, shoulders, knees, hips, ankles, and jaw.
6. If unarrested, affected joints progress through four stages of deterioration: synovitis, pannus formation, fibrous ankylosis, and bony ankylosis.

B. Medical management
  1. Drug therapy
    a. Aspirin: mainstay of treatment, has both analgesic and anti-inflammatory effect.
    b. Nonsteroidal anti-inflammatory drugs (NSAIDs): ibuprofen (Motrin), indomethacin (Indocin), fenoprofen (Nalfon), mefenamic acid (Ponstel), phenylbutazone (Butazolidin), piroxicam (Feldene), naproxen (Naprosyn), sulindac (Clinoril); relieve pain and inflammation by inhibiting the synthesis of prostaglandins
    c. Gold compounds (chrysotherapy)
      1) Injectable form: sodium thiomalate (Myochrysine); aurothioglucose (Solganal); given IM once a week; take 3–6 months to become effective; side effects include proteinuria, mouth ulcers, skin rash, aplastic anemia; monitor blood studies and urinalysis frequently.
      2) Oral form: auranofin (Ridaura); smaller doses are effective; take 3–6 months to become effective; diarrhea also a side effect with oral form; blood and urine studies should also be monitored.
    d. Corticosteroids
      1) Intra-articular injections temporarily suppress inflammation in specific joints.
      2) Systemic administration used only when client does not respond to less potent anti-inflammatory drugs.
    e. Methotrexate, Cytoxan given to suppress immune response; side effects include bone marrow suppression
  2. Physical therapy to minimize joint deformities
  3. Surgery to remove severely damaged joints (e.g., total hip replacement; knee replacement)

C. Assessment findings
  1. Fatigue, anorexia, malaise, weight loss, slight elevation in temperature.
  2. Joints are painful, warm, swollen, limited in motion, stiff in morning and after periods of inactivity, and may show crippling deformity in long-standing disease.
  3. Muscle weakness secondary to inactivity.
  4. History of remissions and exacerbations.
  5. Some clients have additional extra-articular manifestations: subcutaneous nodules; eye, vascular, lung, or cardiac problems.
  6. Diagnostic tests
    a. X-rays show various stages of joint disease
    b. CBC: anemia is common
    c. ESR elevated
    d. Rheumatoid factor positive
    e. ANA may be positive
    f. C-reactive protein elevated

D. Nursing interventions
  1. Assess joints for pain, swelling, tenderness, limitation of motion.
  2. Promote maintenance of joint mobility and muscle strength.
    a. Perform ROM exercises several times a day; use of heat prior to exercise may decrease discomfort; stop exercise at the point of pain.
    b. Use isometric or other exercise to strengthen muscles.
  3. Change position frequently; alternate sitting, standing, lying.
  4. Promote comfort and relief/control of pain.
    a. Ensure balance between activity and rest.
    b. Provide 1–2 scheduled rest periods throughout day.
    c. Rest and support inflamed joints; if splints used, remove 1–2 times per day for gentle ROM exercises.
  5. Ensure bed rest if ordered for acute exacerbations.
    a. Provide firm mattress.
    b. Maintain proper body alignment.
    c. Have client lie prone for ½ hour twice a day.
    d. Avoid pillows under knees.
    e. Keep joints mainly in extension, not flexion.
    f. Prevent complications of immobility.
  6. Provide heat treatments (warm bath, shower, or whirlpool; warm, moist compresses; paraffin dips) as ordered.
    a. May be more effective in chronic pain.
    b. Reduce stiffness, pain, and muscle spasm.
  7. Provide cold treatments as ordered; most effective during acute episodes.
  8. Provide psychologic support and encourage client to express feelings.
  9. Assist client in setting realistic goals; focus on client strengths.
  10. Provide client teaching and discharge planning concerning
    a. Use of prescribed medications and side effects
    b. Self-help devices to assist in ADL and to increase independence
    c. Importance of maintaining a balance between activity and rest
    d. Energy conservation methods
    e. Performance of ROM, isometric, and prescribed exercises
    f. Maintenance of well-balanced diet
    g. Application of resting splints as ordered
    h. Avoidance of undue physical or emotional stress
    i. Importance of follow-up care

Osteoarthritis

A. General information
  1. Chronic, nonsystemic disorder of joints characterized by degeneration of articular cartilage
  2. Women and men affected equally; incidence increases with age

3. Cause unknown; most important factor in development is aging (wear and tear on joints); others include obesity, joint trauma
4. Weight-bearing joints (spine, knees, hips) and terminal interphalangeal joints of fingers most commonly affected

B. Assessment findings
1. Pain (aggravated by use and relieved by rest) and stiffness of joints
2. Heberden's nodes: bony overgrowths at terminal interphalangeal joints
3. Decreased ROM, possible crepitation (grating sound when moving joint)
4. Diagnostic tests
   a. X-rays show joint deformity as disease progresses
   b. ESR may be slightly elevated when disease is inflammatory

C. Nursing interventions
1. Assess joints for pain and ROM.
2. Relieve strain and prevent further trauma to joints.
   a. Encourage rest periods throughout day.
   b. Use cane or walker when indicated.
   c. Ensure proper posture and body mechanics.
   d. Promote weight reduction if obese.
   e. Avoid excessive weight-bearing activities and continuous standing.
3. Maintain joint mobility and muscle strength.
   a. Provide ROM and isometric exercises.
   b. Ensure proper body alignment.
   c. Change client's position frequently.
4. Promote comfort/relief of pain.
   a. Administer medications as ordered: aspirin and NSAIDs most commonly used; intra-articular injections of corticosteroids relieve pain and improve mobility; calcitonin (Miacalcin) PO or nasal spray to help preservation of bone mass in lumbar spine
   b. Apply heat as ordered (e.g., warm baths, compresses, hot packs) or ice to reduce pain.
5. Prepare client for joint replacement surgery if necessary.
6. Provide client teaching and discharge planning concerning:
   a. Use of prescribed medications and side effects
   b. Importance of rest periods
   c. Measures to relieve strain on joints
   d. ROM and isometric exercises
   e. Maintenance of a well-balanced diet
   f. Use of heat/ice as ordered

Gout

A. General information
1. A disorder of purine metabolism; causes high levels of uric acid in the blood and the precipitation of urate crystals in the joints
2. Inflammation of the joints caused by deposition of urate crystals in articular tissue
3. Occurs most often in males
4. Familial tendency

B. Medical management
1. Drug therapy
   a. Acute attack: Colchicine IV or PO (discontinue if diarrhea occurs); NSAIDs such as indomethacin (Indocin), naproxen (Naprosyn), phenylbutazone (Butazolidin)
   b. Prevention of attacks
      1) Uricosuric agents (probenecid [Benemid], sulfinpyrazone [Anturane]) increase renal excretion of uric acid
      2) Allopurinal (Zyloprim) inhibits uric acid formation
2. Low-purine diet may be recommended
3. Joint rest and protection
4. Heat or cold therapy

C. Assessment findings
1. Joint pain, redness, heat, swelling; joints of foot (especially great toe) and ankle most commonly affected (acute gouty arthritis stage)
2. Headache, malaise, anorexia
3. Tachycardia; fever; tophi in outer ear, hands, and feet (chronic tophaceous stage)
4. Diagnostic test: uric acid elevated

D. Nursing interventions
1. Assess joints for pain, motion, appearance.
2. Provide bed rest and joint immobilization as ordered.
3. Administer antigout medications as ordered.
4. Administer analgesics for pain as ordered.
5. Increase fluid intake to 2000–3000 mL/day to prevent formation of renal calculi.
6. Apply local heat or cold as ordered.
7. Apply bed cradle to keep pressure of sheets off joints.
8. Provide client teaching and discharge planning concerning:
   a. Medications and their side effects
   b. Modifications for low-purine diet: avoidance of shellfish, liver, kidney, brains, sweetbreads, sardines, anchovies
   c. Limitation of alcohol use
   d. Increase in fluid intake
   e. Weight reduction if necessary
   f. Importance of regular exercise

Systemic Lupus Erythematosus (SLE)

A. General information
1. Chronic connective tissue disease involving multiple organ systems
2. Occurs most frequently in young women
3. Cause unknown; immune, genetic, and viral factors have all been suggested
4. Pathophysiology
   a. A defect in body's immunologic mechanisms produces autoantibodies in

the serum directed against components of the client's own cell nuclei.
    - **b.** Affects cells throughout the body resulting in involvement of many organs, including joints, skin, kidney, CNS, and cardiopulmonary system.

B. Medical management
1. Drug therapy
    - **a.** Aspirin and NSAIDs to relieve mild symptoms such as fever and arthritis
    - **b.** Corticosteroids to suppress the inflammatory response in acute exacerbations or severe disease
    - **c.** Immunosuppressive agents such as azathioprine (Imuran), cyclophosphamide (Cytoxan) to suppress the immune response when client unresponsive to more conservative therapy
2. Plasma exchange to provide temporary reduction in amount of circulating antibodies
3. Supportive therapy as organ systems become involved

C. Assessment findings
1. Fatigue, fever, anorexia, weight loss, malaise, history of remissions and exacerbations
2. Joint pain, morning stiffness
3. Skin lesions
    - **a.** Erythematous rash on face, neck, or extremities may occur
    - **b.** Butterfly rash over bridge of nose and cheeks
    - **c.** Photosensitivity with rash in areas exposed to sun
4. Oral or nasopharyngeal ulcerations
5. Alopecia
6. Renal system involvement (proteinuria, hematuria, renal failure)
7. CNS involvement (peripheral neuritis, seizures, organic brain syndrome, psychosis)
8. Cardiopulmonary system involvement (pericarditis, pleurisy)
9. Increase susceptibility to infection
10. Diagnostic tests
    - **a.** ESR elevated
    - **b.** CBC; anemia; WBC and platelet counts decreased
    - **c.** ANA positive
    - **d.** LE prep positive
    - **e.** Anti-DNA positive
    - **f.** Chronic false-positive test for syphilis

D. Nursing interventions
1. Assess symptoms to determine systems involved.
2. Monitor vital signs, I&O, daily weights.
3. Administer medications as ordered.
4. Institute seizure precautions and safety measures with CNS involvement.
5. Provide psychologic support to client/significant others.
6. Provide client teaching and discharge planning concerning:
    - **a.** Disease process and relationship to symptoms
    - **b.** Medication regimen and side effects
    - **c.** Importance of adequate rest
    - **d.** Use of daily heat and exercises as prescribed for arthritis
    - **e.** Need to avoid physical or emotional stress
    - **f.** Maintenance of a well-balanced diet
    - **g.** Need to avoid direct exposure to sunlight (wear hat and other protective clothing)
    - **h.** Need to avoid exposure to persons with infections
    - **i.** Importance of regular medical follow-up
    - **j.** Availability of community agencies

Osteomyelitis

A. General information
1. Infection of the bone and surrounding soft tissues, most commonly caused by *S. aureus*.
2. Infection may reach bone through open wound (compound fracture or surgery), through the bloodstream, or by direct extension from infected adjacent structures.
3. Infections can be acute or chronic; both cause bone destruction.

B. Assessment findings
1. Malaise, fever
2. Pain and tenderness of bone, redness and swelling over bone, difficulty with weight bearing; drainage from wound site may be present
3. Diagnostic tests
    - **a.** CBC: WBC elevated
    - **b.** Blood cultures may be positive
    - **c.** ESR may be elevated

C. Nursing interventions
1. Administer analgesics and antibiotics as ordered.
2. Use sterile technique during dressing changes.
3. Maintain proper body alignment and change position frequently to prevent deformities.
4. Provide immobilization of affected part as ordered.
5. Provide psychologic support and diversional activities (depression may result from prolonged hospitalization).
6. Prepare client for surgery if indicated.
    - **a.** Incision and drainage of bone abscess
    - **b.** Sequestrectomy: removal of dead, infected bone and cartilage
    - **c.** Bone grafting after repeated infections
    - **d.** Leg amputation
7. Provide client teaching and discharge planning concerning:
    - **a.** Use of prescribed oral antibiotic therapy and side effects
    - **b.** Importance of recognizing and reporting signs of complications (deformity, fracture) or recurrence

Fractures

A. General information
- **1.** A break in the continuity of bone, usually caused by trauma
- **2.** Pathologic fractures: spontaneous bone break, found in certain diseases or conditions (osteoporosis, osteomyelitis, multiple myeloma, bone tumors)
- **3.** Types
  - **a.** Complete: separation of bone into two parts
    - **1)** Transverse
    - **2)** Oblique
    - **3)** Spiral
  - **b.** Incomplete (partial): fracture does not go all the way through the bone, only part of the bone is broken.
  - **c.** Comminuted: bone is broken or splintered into pieces.
  - **d.** Closed or simple: bone is broken without break in skin.
  - **e.** Open or compound: break in skin with or without protrusion of bone.

B. Medical management
- **1.** Traction
- **2.** Reduction
  - **a.** Closed reduction through manual manipulation followed by application of cast
  - **b.** Open reduction
- **3.** Application of a cast

C. Assessment findings
- **1.** Pain, aggravated by motion; tenderness
- **2.** Loss of motion; edema, crepitus (grating sound), ecchymosis
- **3.** Diagnostic test: X-ray reveals break in bone

D. Nursing interventions
- **1.** Provide emergency care of fractures.
- **2.** Perform neurovascular checks on affected extremity.
- **3.** Observe for signs of compartment syndrome (swelling causes an increase within muscle compartment which causes edema and more pressure; irreversible neuromuscular damage can occur within 4 to 6 hours); signs include weak pulse, pallor followed by cyanosis, paresthesias, and severe pain.
- **4.** Observe for signs of fat emboli (respiratory distress, mental disturbances, fever, petechiae) especially in the client with multiple long-bone fractures.
- **5.** Encourage diet high in protein and vitamins to promote healing.
- **6.** Encourage fluids to prevent constipation, renal calculi, and UTIs.
- **7.** Provide care for the client in traction, with a cast, or with open reduction.
- **8.** Provide client teaching and discharge planning concerning
  - **a.** Cast care if indicated
  - **b.** Crutch walking if necessary
  - **c.** Signs of complications and need to report them

Open Reduction and Internal Fixation (ORIF)

A. General information
- **1.** Open reduction of fractures requires surgery to realign bones; may include internal fixation with pins, screws, wires, plates, rods, or nails
- **2.** Indications include:
  - **a.** Compound fractures
  - **b.** Fractures accompanied by serious neurovascular injuries
  - **c.** Fractures with widely separated fragments
  - **d.** Comminuted fractures
  - **e.** Fractures of the femur
  - **f.** Fractures of joints

B. Nursing interventions: preoperative
- **1.** Provide routine pre-op care.
- **2.** Provide meticulous skin preparation to prevent infection.

C. Nursing interventions: postoperative
- **1.** Provide routine post-op care.
- **2.** Maintain affected limb in proper alignment.
- **3.** Perform neurovascular checks to affected extremity.
- **4.** Observe for post-op infection.

Fractured Hip

A. General information
- **1.** Fracture of the head, neck (intracapsular fracture), or trochanteric area (extracapsular fracture) of the femur
- **2.** Occurs most often in elderly women
- **3.** Predisposing factors include osteoporosis and degenerative changes of bone

B. Medical management
- **1.** Buck's or Russell traction as temporary measures to maintain alignment of affected limb and reduce the pain of muscle spasm
- **2.** Surgery
  - **a.** Open reduction and internal fixation with pins, nails, and/or plates
  - **b.** Hemiarthroplasty: insertion of prosthesis (e.g., Austin-Moore) to replace head of femur

C. Assessment findings
- **1.** Pain in affected limb
- **2.** Affected limb appears shorter, external rotation
- **3.** Diagnostic test: X-ray reveals hip fracture

D. Nursing interventions
- **1.** Provide general care for the client with a fracture.
- **2.** Provide care for the client with Buck's or Russell traction.
- **3.** Monitor for disorientation and confusion in the elderly client; reorient frequently and provide safety measures.

4. Perform neurovascular checks to affected extremity.
5. Prevent complications of immobility.
6. Encourage use of trapeze to facilitate movement.
7. Administer analgesics as ordered for pain.
8. In addition to routine post-op care for the client with open reduction and internal fixation:
   a. Check dressings for bleeding, drainage, infection: empty Hemovac and note output; keep compressed to facilitate drainage.
   b. Assess client's LOC.
   c. Reorient the confused client frequently.
   d. Avoid oversedating the elderly client.
   e. Turn client every 2 hours.
   f. Turn to unoperative side only.
   g. Place two pillows between legs while turning and when lying on side.
   h. Institute measures to prevent thrombus formation.
      1) Apply elastic stockings.
      2) Encourage plantarflexion and dorsiflexion foot exercises.
      3) Administer anticoagulants such as aspirin if ordered.
   i. Encourage quadriceps setting and gluteal setting exercises when allowed.
   j. Observe for adequate bowel and bladder function.
   k. Assist client in getting out of bed, usually on first or second post-op day.
   l. Pivot or lift into chair as ordered.
   m. Avoid weight bearing until allowed.
9. Provide care for the client with a hip prosthesis if necessary (similar to care for client with total hip replacement).

Total Hip Replacement

A. General information
   1. Replacement of both acetabulum and head of femur with prostheses
   2. Indications
      a. Rheumatoid arthritis or osteoarthritis causing severe disability and intolerable pain
      b. Fractured hip with nonunion
B. Nursing interventions
   1. Provide routine pre-op care.
   2. In addition to routine post-op care for the client with hip surgery
      a. Maintain abduction of affected limb at all times with abductor splint or two pillows between legs.
      b. Prevent external rotation (may vary depending on type of prosthesis and method of insertion) by placing trochanter rolls along leg.
      c. Prevent hip flexion.
         1) Keep head of bed flat if ordered.
         2) May raise bed to 45° for meals if allowed.
      d. Turn only to unoperative side if ordered; use abductor splint or two pillows between knees while turning and when lying on side.
      e. Assist client in getting out of bed when ordered.
         1) PT usually ordered to get client out of bed day of surgery or first day post-op, and every day thereafter.
         2) Avoid weight bearing until allowed.
         3) Avoid adduction and hip flexion; do not use low chair.
   3. Provide client teaching and discharge planning concerning:
      a. Prevention of adduction of affected limb and hip flexion
         1) Do not cross legs.
         2) Use raised toilet set.
         3) Do not bend down to put on shoes or socks.
         4) Do not sit in low chairs.
      b. Signs of wound infection
      c. Exercise program as ordered
      d. Partial weight bearing only until full weight bearing allowed

Herniated Nucleus Pulposus (HNP)

A. General information
   1. Protrusion of nucleus pulposus (central part of intervertebral disc) into spinal canal causing compression of spinal nerve roots
   2. Occurs more often in men
   3. Herniation most commonly occurs at the fourth and fifth intervertebral spaces in the lumbar region
   4. Predisposing factors include heavy lifting or pulling and trauma
B. Medical management
   1. Conservative treatment
      a. Bed rest
      b. Traction
         1) Lumbosacral disc: pelvic traction
         2) Cervical disc: cervical traction
      c. Drug therapy
         1) Anti-inflammatory agents
         2) Muscle relaxants
         3) Analgesics
      d. Local application of heat and diathermy
      e. Corset for lumbosacral disc
      f. Cervical collar for cervical disc
      g. Epidural injections of corticosteroids
   2. Surgery
      a. Discectomy with or without spinal fusion
      b. Chemonucleolysis
         1) Injection of chymopapain (derivative of papaya plant) into disc to reduce size and pressure on affected nerve root
         2) Used as alternative to laminectomy in selected cases

C. Assessment findings
   1. Lumbosacral disc
      a. Back pain radiating across buttock and down leg (along sciatic nerve)
      b. Weakness of leg and foot on affected side
      c. Numbness and tingling in toes and foot
      d. Positive straight-leg raise test: pain on raising leg
      e. Depressed or absent Achilles reflex
      f. Muscle spasm in lumbar region
   2. Cervical disc
      a. Shoulder pain radiating down arm to hand
      b. Weakness of affected upper extremity
      c. Paresthesias and sensory disturbances
   3. Diagnostic tests: myelogram localizes site of herniation

D. Nursing interventions
   1. Ensure bed rest on a firm mattress with bed board.
   2. Assist client in applying pelvic or cervical traction as ordered.
   3. Maintain proper body alignment.
   4. Administer medications as ordered.
   5. Prevent complications of immobility.
   6. Provide additional comfort measures to relieve pain.
   7. Provide pre-op care for client receiving chemonucleolysis.
      a. Administer cimetidine (Tagamet) and diphenhydramine HCl (Benadryl) every 6 hours as ordered to reduce possibility of allergic reaction.
      b. Possibly administer corticosteroids before procedure.
   8. Provide post-op care for client receiving chemonucleolysis.
      a. Observe for anaphylaxis.
      b. Observe for less serious allergic reaction (e.g., rash, itching, rhinitis, difficulty in breathing).
      c. Monitor for neurologic deficits (numbness or tingling in extremities or inability to void).
   9. Provide client teaching and discharge planning concerning:
      a. Back-strengthening exercises as prescribed
      b. Maintenance of good posture
      c. Use of proper body mechanics, how to lift heavy objects correctly
         1) Maintain straight spine.
         2) Flex knees and hips while stooping.
         3) Keep load close to body.
      d. Prescribed medications and side effects
      e. Proper application of corset or cervical collar
      f. Weight reduction if needed

Discectomy/Laminectomy

A. General information
   1. Discectomy: excision of herniated fragments of intervertebral disc.
   2. Laminectomy: excision of lamina to reduce pressure on the spinal cord, spinal nerves, or to provide access for removing the disc.
   3. Indications
      a. Most commonly used for herniated nucleus pulposus not responsive to conservative therapy or with evidence of decreasing sensory or motor status
      b. Also indicated for spinal decompression as with spinal cord injury, to remove fragments of broken bone, or to remove spinal neoplasm or abscess
   4. Spinal fusion may be done at the same time if spine is unstable

B. Nursing interventions: preoperative
   1. Provide routine pre-op care.
   2. Teach client log rolling (turning body as a unit while maintaining alignment of spinal column) and use of bedpan.

C. Nursing interventions: postoperative
   1. Provide routine post-op care.
   2. Position client as ordered.
      a. Lower spinal surgery: generally flat
      b. Cervical spinal surgery: slight elevation of head of bed to prevent edema around airway
   3. Maintain proper body alignment; with cervical spinal surgery avoid neck flexion and apply cervical collar as ordered.
   4. Turn client every 2 hours.
      a. Use log-rolling technique and turning sheet.
      b. Place pillows between legs while on side.
   5. Assess for complications.
      a. Monitor sensory and motor status every 2–4 hours.
      b. With cervical spinal surgery client may have difficulty swallowing and coughing.
         1) Monitor for respiratory distress.
         2) Keep suction and tracheostomy set available.
   6. Check dressings for hemorrhage, CSF leakage, infection.
   7. Promote comfort.
      a. Administer analgesics as ordered.
      b. Provide additional comfort measures and positioning.
   8. Assess for adequate bladder and bowel function.
      a. Monitor every 2–4 hours for bladder distension.
      b. Assess bowel sounds.
      c. Prevent constipation.
   9. Prevent complications of immobility.
   10. Assist with ambulation.
      a. Usually out of bed day after surgery.

b. Apply brace or corset if ordered.
c. If client allowed to sit, use straight-back chair and keep feet flat on floor.

D. Provide client teaching and discharge planning concerning:
1. Wound care
2. Maintenance of good posture and proper body mechanics
3. Activity level as ordered
4. Recognition and reporting of signs of complications such as wound infection, sensory or motor deficits

Spinal Fusion

A. General information
1. Fusion of spinous processes with bone graft from iliac crest to provide stabilization of spine
2. Performed in conjunction with laminectomy or discectomy

B. Nursing interventions
1. Provide pre-op care as for laminectomy.
2. In addition to post-op care for laminectomy:
a. Position client correctly.
1) Lumbar spinal fusion: keep bed flat for first 12 hours, then may elevate head of bed 20–30°, keep off back for first 48 hours.
2) Cervical spinal fusion: elevate head of bed slightly.
b. Assist with ambulation.
1) Time varies with surgeon and extent of fusion.
2) Usually out of bed 3–4 days post-op.
3) Apply brace before getting client out of bed.
4) Apply special cervical collar for cervical spinal fusion.
c. Promote comfort: client may experience considerable pain from graft site.
3. In addition to client teaching and discharge planning for laminectomy, advise client that:
a. Brace will be needed for 4 months and lighter corset for 1 year after surgery.
b. It takes 1 year until graft becomes stable.
c. No bending, lifting, stooping, or sitting for prolonged periods for 4 months.
d. Walking without excessive tiring is healthful exercise.
e. Diet modification will help prevent weight gain resulting from decreased activity.

Harrington Rod Insertion

See Unit 5.

Amputation of a Limb

See Amputation.

Sample Questions

379. An adult has been diagnosed with rheumatoid arthritis for the past 8 years. Her condition is deteriorating despite conservative treatment, and intramuscular gold is prescribed by the physician. When teaching about gold (chrysotherapy), what important teaching should the nurse emphasize?
1. Cushing's syndrome is common.
2. Improvement may not occur for 3–6 months.
3. Side effects are rare.
4. The need to take this drug daily.

380. A woman who has had rheumatoid arthritis for several years is admitted to the hospital. Upon physical examination of the client, what should the nurse expect to find?
1. Asymmetric joint involvement.
2. Heberden's nodes.
3. Obesity.
4. Small joint involvement.

381. An elderly client is admitted to the orthopedic unit with a diagnosis of a right intracapsular hip fracture. Buck's extension traction is employed prior to surgery. She complains of numbness in the right foot. After the nurse notes the fraction tapes are lengthwise on the opposite sides of the limb, what would be the nurse's best response?
1. "How long has your foot been numb?"
2. "I can adjust it for your comfort."
3. "I'll call your doctor about it."
4. "There is nothing wrong with the traction."

382. An elderly woman had an Austin-Moore prosthesis inserted following an intracapsular hip fracture. Which statement by the client indicates the client has understood instruction about maintaining the hip in proper position?
1. "I shouldn't bend my knees."
2. "Put a pillow between my legs when you turn me."
3. "I will be sure to put my shoes on when I go for a walk."
4. "Put the head of my bed way up so I can eat breakfast in my normal position."

383. The nurse is caring for an elderly woman who has had a fractured hip repaired. In the first few days following the surgical repair which of the following nursing measures will best facilitate the resumption of activities for this client?
1. Arranging for a wheelchair.

2. Asking her family to visit.
3. Assisting her to sit out of bed in a chair qid.
4. Encouraging the use of an overhead trapeze.

384. A 90-year-old woman is preparing for transfer to an extended care facility to continue recovery following repair of a fractured hip. She begins to cry and says, "When you're young these things don't happen. Why did I break my hip at this age?" Which response by the nurse indicates the best understanding of risk factors for the elderly?

1. "As you age you become less aware of your surroundings and careless about safety."
2. "Nothing works as well when we are older."
3. "There are no known specific reasons why hip fractures occur more often in your age group."
4. "Your age and sex are factors in the loss of minerals from your bones, making them more likely to break."

385. An adult is admitted to the hospital. X-rays reveal a fractured tibia and a cast is applied. Of the following, which nursing action would be most important after the cast is in place?

1. Assessing for capillary refill.
2. Arranging for physical therapy.
3. Discussing cast care with the client.
4. Helping the client to ambulate.

386. A client is admitted to the floor after having a laminectomy with spinal fusion. Of the following maneuvers the client may use to avoid pain, which is unsafe?

1. Log rolling.
2. Asking for pain medication.
3. Placing pillows between her legs.
4. Sitting in semi-Fowler's.

387. A client has suffered low-back pain and sciatica for over 2 years. Why is it important for the nurse to conduct a thorough assessment of his level of discomfort from low-back pain?

1. This will provide a baseline for later comparison.
2. This is a method for identifying clients with "low back neurosis."
3. Clients who have pain localized to the back and radiating to one extremity are probably not candidates for surgery.
4. Surgery is contraindicated for clients who have had pain for less than 2 years.

388. An adult man is scheduled for a lumbar laminectomy. Preoperative teaching regarding postoperative pain management should include which of the following explanations?

1. Pain and spasm are not expected and therefore there will be minimal need for pain medication.
2. Pain and spasm are expected and pain medication will be provided as needed.
3. Pain and spasm are expected but pain medication will interfere with a neurological assessment and will therefore be given sparingly.
4. Pain and spasm are expected but pain medication will be limited as client tolerance to the medication is feared.

389. A client attends a class on osteoporosis. Which statement by the client needs further teaching about the relationship between exercise and maintenance of bone mass?

1. I will begin jogging.
2. I will begin jumping rope.
3. I will begin swimming.
4. I will begin walking.

390. In preparing a teaching plan for an adult who has had an arthroscopy, the nurse will include which of the following?

1. Client should check extremity for color, mobility, and sensation at least every 2 hours after procedure.
2. Client may return to regular activities immediately after procedure.
3. Remove compression dressing 6 to 8 hours after procedure.
4. Keep extremity in flexion for 24 hours after procedure.

391. The nursing care plan for an adult who has had a myelogram using an oil-based contrast medium should include which intervention by the nurse?

1. Give the client a light meal immediately before the myelogram, to help prevent nausea or lightheadedness.
2. Restrict fluids for 12 hours after the myelogram.
3. Keep the client in a recumbent position for 12–24 hours after the myelogram.
4. Assure the client that stiff neck or photophobia are expected side effects of the contrast medium used during the myelogram.

392. Which statement by the family tells the nurse that they understand how to perform passive range-of-motion exercises on a bed-bound family member?

1. "We should put each joint through a full series of exercises until Mother tells us she's fatigued."

2. "Every day, we should try to move all of her joints a degree or two further than they naturally go."
3. "If Mother has a muscle spasm, we should stop exercising that limb for a day or two."
4. "To exercise Mother's elbow, we would hold her upper arm still, and move her forearm."

393. An adult is learning how to use a cane. The nurse knows that the person can use the cane safely when observing which of the following?

1. The cane is held on the unaffected side; the cane and affected leg are moved forward, then the unaffected leg comes forward.
2. The cane is held on the affected side; the cane is moved forward, then the unaffected leg, then the affected leg.
3. The cane is held on the unaffected side; the cane is moved forward, then the unaffected leg, then the affected leg.
4. The cane is held on the affected side; the cane and unaffected leg are moved forward, then the affected leg comes forward.

394. An adult who has had a total hip replacement is learning how to walk with a standard (not reciprocal) walker. Which description below tells the nurse that he is using the walker correctly?

1. One side of the walker is simultaneously advanced with the opposite foot; the process is repeated on the other side.
2. Each time he steps on his nonaffected side, the client advances the walker; when moving his affected side, he steps into the walker and lifts his nonaffected foot.
3. The client balances on both feet, most weight on his nonaffected side, and lifts the walker forward; he then balances on the walker and swings both feet forward into the walker.
4. The client lifts the walker in front while balancing on both feet, then walks into the walker, supporting his body weight on his hands while advancing his affected side.

395. A man has sprained his knee and the emergency nurse is fitting him with crutches. If the man is measured while he is lying down, how does the nurse ensure the correct crutch length?

1. Measure client from anterior axillary fold to sole of foot and add 2 inches.
2. Add 6 inches to the length of the client's foot and measure the distance from that point to the client's axilla.
3. Measure from the client's axilla to his palm to get the length from the top of the crutch to the hand piece. Measure from palm to sole to determine length of lower part of crutch.
4. Subtract 24 inches from client's height to determine length of crutch from top to tip.

396. The nurse is teaching a client with a broken left ankle how to go up stairs when using crutches. Which statement by the nurse is correct?

1. "Place both crutches on the next step, stand on the right foot and place the left foot on the step next to the crutches."
2. "Place the left crutch and right foot on the next step and push off with both arms then lift the left foot up to the step."
3. "Place the right foot on the next step, then move the crutches and the left foot onto the step."
4. "Place the right crutch and left foot on the next step; move the right crutch up onto the step, then swing the right foot up."

397. What is one major disadvantage of a fiberglass cast?

1. It is heavy.
2. It must remain dry.
3. It may cause skin irritation.
4. It must be replaced frequently.

398. Which of the following findings would alert the nurse to notify the physician of a serious complication for the client with a cast on his leg?

1. Itching under the cast.
2. Poor capillary refill of the toes.
3. Ability of client to move toes without difficulty.
4. Pain relieved by application of ice bag to cast.

399. Which intervention below would be appropriate for the nurse to teach the client with a cast on his left arm?

1. "Cover your plaster cast with plastic before taking a long bath or shower."
2. "Repair breaks in the cast with super-glue or epoxy."
3. "Remove surface dirt on your cast with a damp cloth."
4. "If your fiberglass cast gets wet, dry it with the warm setting on your blowdryer."

400. An adult is in Russell traction. It is appropriate for the nurse to make which of the following assessments because of the client's treatment modality?

1. Make sure sling under the affected knee is smooth and doesn't apply pressure in the popliteal space.

2. Ensure that both buttocks clear the mattress.
3. Check that the leg in traction is on the mattress, not elevated.
4. Assess for numbness and tingling of one or more fingers, suggesting radial, ulnar, or median nerve pressure.

401. A client's family asks why the client has been put into pelvic traction for low-back pain. What is the nurse's best response?
1. "He really needs bed rest; the traction will force him to stay in bed."
2. "By pulling on either side of the pelvis, the lower back muscles are stretched and this gives relief from the crampy back muscles."
3. "Traction helps to relieve compression of the roots of the nerves."
4. "By holding the pelvis still, the back muscles can relax and start to heal."

402. An adult's left leg is in Buck's extension traction. She complains of burning under the traction boot and the toes on that foot are cool. What is the nurse's first best action?
1. Ask, "What do you mean by 'burning'?"
2. Notify the physician at once.
3. Remove the boot, then reapply and reassess.
4. Apply an ice pack to the boot for 15 minutes.

403. A client whose left leg is in balanced suspension traction for a femur fracture needs to be moved to a new bed. What is the best way to do this safely?
1. All weights are removed from the ends of the traction ropes so the leg moves freely before the move is attempted.
2. The left leg is kept above the level of the heart.
3. Sufficient time is given to the client to move himself to the new bed at his own rate of tolerance.
4. The line of pull is maintained on the left leg.

404. Which statement best describes the nurse's assessment of the client with rheumatoid arthritis?
1. Assessment is done of the musculoskeletal, cardiac, pulmonary, and renal systems.
2. Pain is best assessed by monitoring the client's facial expression during exam and by observing limitations in the client's own movement.
3. Vital signs are an adequate assessment of the acuity of the client's level of pain.
4. The client's health history is not nearly as important as the nurse's findings on physical examination.

405. An adult is admitted to the medical unit with an acute exacerbation of rheumatoid arthritis. Which of the following will the nurse include on his nursing care plan?
1. Administer analgesics for pain when systolic blood pressure increases 20 mm Hg or more or pulse increases 20% or more.
2. Develop plan with client to meet self-care needs.
3. Instruct client to stop taking iron supplements that lead to constipation.
4. Schedule hygiene activities together in one block to provide longer rest periods before and after care.

406. An adult has rheumatoid arthritis and is taking prednisone. In creating a teaching plan, the nurse will be certain to include which of the following?
1. "You should expect to be on corticosteroids for the rest of your life."
2. "It will take 3 to 6 months for you to notice any effect from this medication."
3. "Notify your physician of any stomach upset you may have."
4. "Avoid bananas and spinach while you are taking this drug."

407. Which statement by an adult with osteoarthritis indicates to the nurse that she understands her therapeutic regimen?
1. "I will wait until my pain is very bad before I take my pain medication, or else further on in my disease, the medication won't help at all."
2. "Jogging for short distances is better for my arthritis than walking for longer distances."
3. "It would probably be a good idea for me to lose the 30 pounds my doctor recommended I lose."
4. "I should do all my house cleaning on one day, so I can rest for the remainder of the week."

408. In preparing a teaching plan for the client with osteoarthritis, the nurse would include which of the following?
1. Application of cold packs to affected joints to decrease swelling.
2. Client education regarding self-administration of medications.
3. Progressively increasing activity to point of muscle fatigue to build muscle bulk and improve rate of metabolism.
4. Teaching client that degenerative changes are progressive and that pain is a natural sequela of age.

409. The nurse, assessing a client with systemic lupus erythematosus can expect to find which of the following?

1. Dysphagia.
2. Decreased visual acuity or blindness.
3. Dryness or itching of genitalia.
4. Abnormal lung sounds.

410. A client with systemic lupus erythematosus is taking gold. Which of the following interventions would the nurse include in the teaching plan for this client?

1. "Stop taking your anti-inflammatory medication as long as you are taking gold preparations."
2. "You will give yourself intramuscular injections of gold preparations every day for 2 to 4 weeks, then taper down to one injection every 2 months."
3. "You will be taking a large dose when you start taking gold capsules, and will taper down to a smaller dose as the therapy becomes effective."
4. "Stay away from crowds during flu season and have your blood tested after every other gold injection."

411. In assessing the client with osteomyelitis, the nurse would expect to find which of the following?

1. Pale, cool, tender skin at site.
2. Decreased white blood cell count.
3. Positive wound cultures.
4. Decreased erythrocyte sedimentation rate.

412. An adult has a fractured left radius, which has been casted. While performing an assessment of this client, the nurse will correctly identify which of these findings as *emergent*?

1. Pain at the fracture site.
2. Swelling of fingers of left hand.
3. Diminished capillary refill of fingers of left hand.
4. Warm, dry fingers of left hand.

413. Which intervention by the emergency nurse is critical in caring for the client with a fractured tibia and fibula?

1. Cutting away clothing on the injured leg.
2. Palpation of the dorsalis pedis pulses.
3. Administration of analgesic medications as ordered.
4. Initiating two, large-bore IV catheters and warmed normal saline at a fast rate.

414. A 20-year-old was brought to the emergency department after an auto accident. There is a strong scent of alcohol about her, and she states she had three beers over 3 hours. Her only injury is an open fracture of the left humerus. Which assessment finding by the emergency nurse is critical?

1. Status of client's tetanus immunization.
2. Current blood alcohol level.
3. Support systems available at home to assist with care.
4. Last time client voided.

415. A firefighter fell off a roof while fighting a house fire and fractured his femur. Approximately 24 hours after the incident, the nurse finds him dyspneic, tachypneic, with scattered crackles in his lung fields; he is coughing up large amounts of thick, white sputum. What nursing diagnosis would be formulated?

1. Respiratory compromise related to inhalation of smoke.
2. Pneumonia related to prolonged bed rest.
3. Fat embolism syndrome related to femur fracture.
4. Hypovolemic shock related to multiple trauma.

416. An adult has had a total right hip replacement. Why does the operative hip need to be kept in the extension and abduction position?

1. Reduces the risk for the development of thromboemboli.
2. Promotes circulation to the operative site, reducing the risk of avascular necrosis.
3. Helps to prevent dislocation of the hip prosthesis.
4. Facilitates the drainage of blood and fluid at the operative site.

417. An adult who has had a total right hip replacement asks the nurse about "moving around in this bed." What is the nurse's best response?

1. The client should remain supine for 48 hours after surgery, with affected leg in a slightly inward-rotation position.
2. Although the client must remain supine, she can cross her legs to change position for comfort.
3. A side-lying position is undesirable, but the head of the bed can be elevated 60–75° to shift weight off of back and buttocks.
4. The client will be repositioned using an abductor pillow between the legs.

418. Which statement by a client who has had an open reduction/internal fixation of her fractured left hip indicates to the nurse that the client understands her care?

1. "My nephew will move my bed down to the first floor so I won't have to go upstairs when I get home."
2. "I should expect my surgical site to be swollen and red for a week or two after I get home."
3. "The night nurse will take off these thigh-high stockings at bedtime, and the day nurse will put them back on at breakfast time."
4. "I need to limit my fluid intake so I won't be getting on and off the bedpan so often; it's not good for my hip."

419. The nurse teaches an adult woman that because she has osteoporosis, she must take safety precautions to prevent falls, "because you could break a hip." When the client asks what one has to do with the other, what is the nurse's best response?

1. Osteoporosis yields brittle bones which break easily.
2. Osteoporosis causes changes in balance, which makes the client more susceptible to falls that could lead to hip fractures.
3. Hips are the primary sites of calcium loss in osteoporosis, making them more susceptible to fracture.
4. Both osteoporosis and hip fractures are common in elderly women.

420. An adult is diagnosed with a herniated nucleus pulposus at the C5-C6 interspace and a second at the C6-C7 interspace. Which of the following findings would the nurse expect to discover during the assessment?

1. Constant, throbbing headaches.
2. Numbness of the face.
3. Clonus in the lower extremities.
4. Pain in the scapular region.

421. An adult has undergone a cervical laminectomy. Because of the potential complications associated with this procedure, the nurse must perform which of the following assessments?

1. Assess for wheezes and stridor.
2. Check pupils for response to direct and consensual light.
3. Assess gag reflex.
4. Assess shoulder shrug and neck strength.

422. The nurse is caring for a person who just had a cervical laminectomy. The nurse knows that the client will most likely be maintained in what position?

1. Left lateral decubitus with neck flexed to 30°.
2. Supine, with no pillows under the head.
3. Semi-Fowler's.
4. Modified Trendelenburg, with a soft cervical collar in place.

423. An adult is being discharged after a lumbar laminectomy. Which statement indicates to the nurse that the client understands her discharge teaching?

1. "I can't wait to sit in my own recliner and rest while I watch my soaps!"
2. "I'll be able to man the refreshment stand at my nephew's baseball game next weekend, won't I?"
3. "My friend is getting me a footstool for in front of my sink."
4. "I have to buy a soft mattress so my spine won't be subjected to any extra pressure."

424. The nurse is planning post-op care for a client undergoing a laminectomy. Why does the nurse need to know whether the client will be having a spinal fusion also?

1. The contrast medium used to check the fusion site for grafting could cause an allergic reaction.
2. The client whose laminectomy is performed with a spinal fusion will be on bed rest longer than the client who does not undergo spinal fusion.
3. Clients undergoing spinal fusion will be in long torso casts for 6 to 8 weeks after surgery.
4. The client whose laminectomy is performed with a spinal fusion is at greater risk for spontaneous pneumothorax than the client who does not undergo spinal fusion.

Answers and Rationales

379. 2. Chrysotherapy often requires a 3–6 month period before effects are seen.

380. 4. Small joint involvement is common in rheumatoid arthritis. All of the other symptoms are seen in osteoarthritis but not rheumatoid arthritis.

381. 1. Numbness is symptomatic of circulatory or nerve impairment to the extremity. It is

important to know the length of time the client has been experiencing this sensation.

382. 2. A pillow placed between the client's legs will keep the affected leg abducted and in good alignment while the client is being turned.

383. 4. Exercise is important to keep the joints and muscles functioning and to prevent secondary complications. Use of the overhead trapeze prevents hazards of immobility by permitting movement in bed and strengthening of the upper extremities in preparation for ambulation.

384. 4. Elderly females are prone to hip fractures because the cessation of estrogen production after menopause contributes to demineralization of bone.

385. 1. Good capillary refill indicates that the cast has not caused a circulatory problem in the extremity. Assessing circulation is a priority of action.

386. 4. The client returning from a lumbar spinal fusion should be kept flat in bed.

387. 1. The importance of an accurate history cannot be overemphasized in assessing the character and location of the pain. A baseline assessment of neurological signs is made so that deviation from the database can be noted. Once a pain assessment is complete a plan for pain management can be developed.

388. 2. Clients should be told that they may experience pain and spasm in the early postoperative period and that pain medication will be provided.

389. 3. Physical compression of weight-bearing joints stimulates osteoblastic deposition of calcium. Swimming does not involve weight bearing and physical compression of joints.

390. 1. Because the joint is distended with saline and the arthroscope is introduced into the joint area, the potential for neurovascular damage exists. Color (indicating adequate vascular perfusion), sensation, and mobility (indicating intact neurologic status) should be assessed, although mobility assessment will likely be limited to "wiggling the digits."

391. 3. If an oil-based contrast medium is used, the client will be kept in a recumbent position for 12–24 hours to reduce cerebrospinal fluid leakage, and thus decrease the likelihood of developing a postprocedure headache. If a water-soluble medium is used, the client will usually remain in bed, with the head elevated 15–30° (to minimize the upward migration of the medium), but some physicians may allow these clients to ambulate.

392. 4. To perform passive range of motion, the joint is supported, the bones above the joint are stabilized, and the body part distal to the joint is exercised through the range of motion. The family's description of how to maneuver the elbow illustrates this well.

393. 1. The cane, held on the unaffected side, will provide a wider base of support for the affected side while the unaffected limb is moving. The client should keep the cane close to the body to prevent leaning.

394. 4. The sequence for using a walker is balance on both feet, lift the walker and place in front of you, walk into the walker (using it for support when standing on affected limb) and then balance on both feet before repeating the sequence.

395. 1. Although measuring the client while he is lying down is not the preferred method of fitting crutches, this formula may be used successfully.

396. 3. The unaffected limb is advanced to the next step, then the crutches and the affected limb move to that step (weight stays on crutches or foot of unaffected side). A handy mnemonic for clients is, "Up with the good leg, down with the bad," meaning the "good" leg is used first when going up stairs, and the crutches and "bad" leg go to the new step first when going down stairs.

397. 3. Although fiberglass casts have other advantages, the particles of fiberglass may scratch and cause a skin reaction.

398. 2. Poor capillary refill (a "pinking up" of the toes after the nailbeds are blanched by compression, which takes more than 3 seconds) is indicative of a circulatory compromise. In this scenario, the likely cause is compartment syndrome: an increase of pressure within the cast ("compartment"). Other signs/symptoms include pain unrelieved by usual modalities, disproportional swelling, and inability to move digits.

399. 3. A damp, not wet, cloth can be used to remove superficial dirt. Stained areas can be covered with a thin layer of white shoe polish.

400. 1. Russell traction is a modification of Buck extension, used for a femur fracture that is not appropriate for internal fixation. The

modification occurs when a sling is placed under the affected knee, giving more comfort to the client, and preventing some of the rotation tendencies.

401. 3. Although this information may be a bit technical for the lay members of the client's family, it is the only answer that provides correct information. Increased lumbar flexion relieves compression of the lumbar nerve roots, which is why the head of the bed is elevated 30° and the knees are flexed; 15–30 lb of traction increases lumbar flexion and facilitates relief.

402. 2. These are signs of potential neurovascular compromise, an orthopedic emergency. Additionally, the nurse would check the capillary refill of the toes, any peripheral pulses present, and the sensation and mobility of the foot. In addition, the nurse would compare findings on the affected side with those on the nonaffected side.

403. 4. A vertical transfer is permitted, as long as manual traction is applied to maintain the "line of pull," that is, the direction of the traction, or "pull," which the balanced suspension device supplied.

404. 1. Rheumatoid arthritis is a condition with multisystem effects. The cardiopulmonary and renal systems must be assessed as well as the obvious assessment of the musculoskeletal system. Because some of the medications used in treating rheumatoid arthritis can have serious systemic effects (e.g., gold therapy, corticosteroids), this is especially true of the client on aggressive pharmacotherapy.

405. 2. Although this is an exacerbation of an existing problem, it is always appropriate to formulate a plan—with the client's input—as how best to meet his self-care needs. The plan will need to address protection of joints, conservation of energy, and methods to simplify work tasks. Correct use of assistive devices may also be involved in the plan.

406. 3. High dosage or long-term use of corticosteroids is associated with the development of gastric ulcers. Other adverse effects associated with this treatment include hypertension, hyperglycemia, infection susceptibility, and psychiatric disorders.

407. 3. Weight reduction can reduce stress on weight-bearing joints; because the client's physician has recommended it, we can believe that she will benefit from weight loss.

408. 2. Anti-inflammatory medications including salicylates and NSAIDs will be taken by the client indefinitely. The client must understand the regimen; ways to monitor for (and when possible, diminish) adverse effects must also be taught.

409. 4. Abnormal lung sounds are indicative of respiratory insufficiency from pleural effusions or infiltrations. Pleural effusions may occur with myocarditis, which might manifest as a pericardial friction rub assessed during the cardiovascular exam.

410. 4. Signs of gold toxicity include bone marrow suppression and hematuria, proteinuria, diarrhea, and stomatitis. The client receiving parenteral gold should expect to have blood and urine monitored after every other injection.

411. 3. Positive wound cultures are used to help determine the causative organisms and indicate which antibiotic therapy is appropriate. Blood cultures may also be positive.

412. 3. Diminished capillary refill suggests vascular compromise, an emergency condition.

413. 2. Neurovascular compromise is possible with fracture; distal pulses should be palpated to ensure circulation is adequate; the dorsalis pedis pulses in both feet should be assessed for comparison purposes. Likewise color, sensation, and mobility should be assessed. These interventions are also to be repeated at frequent intervals during the emergent phase, and especially after any intervention (i.e., splinting, casting).

414. 1. There is a strong risk of infection with an open fracture (a fracture with an open wound through skin surface to bone injury), and the nurse will expect the client to be given antibiotics prophylactically; in addition, tetanus immunization status must be assessed, and tetanus prophylaxis given if needed, or if the status cannot be determined.

415. 3. These are classic observations of the client with fat embolism syndrome, seen within 48 hours of a long-bone fracture. Onset of symptoms is rapid, and often fatal. Any respiratory difficulties, personality changes, or chest pain in clients with recent long-bone fractures must be assessed with fat embolism syndrome in mind.

416. 3. Positioning the client in extension and abduction helps to ensure that the femoral head part of the prosthesis remains in the acetabular

cup. The use of wedge pillows or abduction splints helps in maintaining correct position.

417. 4. To maintain the femoral component of the prosthesis in the acetabular cup, an abductor pillow may be used to keep the legs separate; this must be maintained in all repositioning activities. The client is always encouraged to assist with repositioning, as long as the integrity of the hip position is maintained.

418. 1. The client will need to refrain from climbing stairs in the early recovery phase, except as guided during physical therapy sessions. Moving to the first floor is a prudent decision.

419. 1. Osteoporosis is a disorder in which bone formation is slower than bone resorption. The outcome of this disequilibrium is bones that are increasingly porous, brittle, and fragile. Any bone can be broken, but the trauma associated with falls frequently leads to hip fractures in clients with osteoporosis.

420. 4. Sometimes misinterpreted by the client as a heart attack or bursitis, pain with cervical disc herniation at this level may occur between the scapulae, in the neck or the top of the shoulders. Stiffness, paresthesias, or numbness in upper extremities is also possible.

421. 1. The client is assessed for respiratory distress that would be caused by cord edema. The nurse would also look for signs of interstitial edema and/or hematoma.

422. 2. This position will maintain spinal alignment. Occasionally, the physician will approve the use of a pillow under the head, or the head of the bed raised 30° if a soft cervical collar is used, and if the surgical approach was posterior.

423. 3. When standing (for example, while washing dishes at the sink), the client should place one foot on a stool, thus alternating the weight between the feet.

424. 2. Because the bone graft used for fusion is taken from the iliac crest or fibula, the client will have pain and the potential for complications at those sites as well as complications from the laminectomy. Bed rest may be maintained for longer periods of time; lumbar support may be used once the client is ambulating, and pain relief must be directed at the graft site as well as the laminectomy site.

The Endocrine System

OVERVIEW OF ANATOMY AND PHYSIOLOGY

The endocrine system is composed of an interrelated complex of glands (pituitary, adrenals, thyroid, parathyroids, islets of Langerhans of the pancreas, ovaries, and testes) that secrete a variety of hormones directly into the bloodstream. Its major function, together with the nervous system, is to regulate body functions.

Hormone Regulation

A. Hormones: chemical substances that act as messengers to specific cells and organs (target organs), stimulating and inhibiting various processes; two major categories
  1. Local: hormones with specific effect in the area of secretion (e.g., secretin, cholecystokinin-pancreozymin [CCK-PZ])
  2. General: hormones transported in the blood to distant sites where they exert their effect (e.g., cortisol)

B. Negative feedback mechanisms: major means of regulating hormone levels
  1. Decreased concentration of a circulating hormone triggers production of a stimulating hormone from the pituitary gland; this hormone in turn stimulates its target organ to produce hormones.
  2. Increased concentration of a hormone inhibits production of the stimulating hormone, resulting in decreased secretion of the target organ hormone.

C. Some hormones are controlled by changing blood levels of specific substances (e.g., calcium, glucose).

D. Certain hormones (e.g., cortisol or female reproductive hormones) follow rhythmic patterns of secretion.

E. Autonomic and CNS control (pituitary-hypothalamic axis): hypothalamus controls release of the hormones of the anterior pituitary gland through *releasing and inhibiting factors* that stimulate or inhibit hormone secretion.

Structure and Function of Endocrine Glands

See Table 4-25 and Figure 4-25.

Pituitary Gland (Hypophysis)

A. Located in sella turcica at the base of the brain
B. "Master gland" of the body, composed of three lobes

1. Anterior lobe (adenohypophysis)
   a. Secretes tropic hormones (hormones that stimulate target glands to produce their hormone): adrenocorticotropic hormone (ACTH), thyroid-stimulating hormone (TSH), follicle-stimulating hormone (FSH), luteinizing hormone (LH)
   b. Also secretes hormones that have direct effect on tissues: somatotropic or growth hormone, prolactin

Table 4-25 Hormone Functions

Endocrine Gland	Hormones	Functions
Pituitary		
Anterior lobe	TSH	Stimulates thyroid gland to release thyroid hormones.
	ACTH	Stimulates adrenal cortex to produce and release adrenocorticoids.
	FSH, LH	Stimulate growth, maturation, and function of primary and secondary sex organs.
	GH or somatotropin	Stimulates growth of body tissues and bones.
	Prolactin or LTH	Stimulates development of mammary glands and lactation.
Posterior lobe	ADH	Regulates water metabolism; released during stress or in response to an increase in plasma osmolality to stimulate reabsorption of water and decrease urine output.
	Oxytocin	Stimulates uterine contractions during delivery and the release of milk in lactation.
Intermediate lobe	MSH	Affects skin pigmentation.
Adrenal		
Adrenal cortex	Mineralocorticoids (e.g., aldosterone)	Regulate fluid and electrolyte balance; stimulate reabsorption of sodium, chloride, and water; stimulate potassium excretion.
	Glucocorticoids (e.g., cortisol, corticosterone)	Increase blood glucose levels by increasing rate of glyconeogenesis; increase protein catabolism, increase mobilization of fatty acids; promote sodium and water retention; anti-inflammatory effect; aid body in coping with stress.
	Sex hormones (androgens, estrogen, progesterone)	Influence development of secondary sex characteristics.
Adrenal medulla	Epinephrine, norepinephrine	Function in acute stress; increase heart rate, blood pressure; dilate bronchioles; convert glycogen to glucose when needed by muscles for energy.
Thyroid	T_3, T_4	Regulate metabolic rate; carbohydrate, fat, and protein metabolism; aid in regulating physical and mental growth and development.
	Thyrocalcitonin	Lowers serum calcium by increasing bone deposition.
Parathyroid	PTH	Regulates serum calcium and phosphate levels.
Pancreas (Islets of Langerhans)		
Beta cells	Insulin	Allows glucose to diffuse across cell membrane; converts glucose to glycogen.
Alpha cells	Glucagon	Increases blood glucose by causing glyconeogenesis and glycogenolysis in the liver; secreted in response to low blood sugar.
Ovaries	Estrogen, progesterone	Development of secondary sex characteristics in the female, maturation of sex organs, sexual functioning, maintenance of pregnancy.
Testes	Testosterone	Development of secondary sex characteristics in the male, maturation of sex organs, sexual functioning.

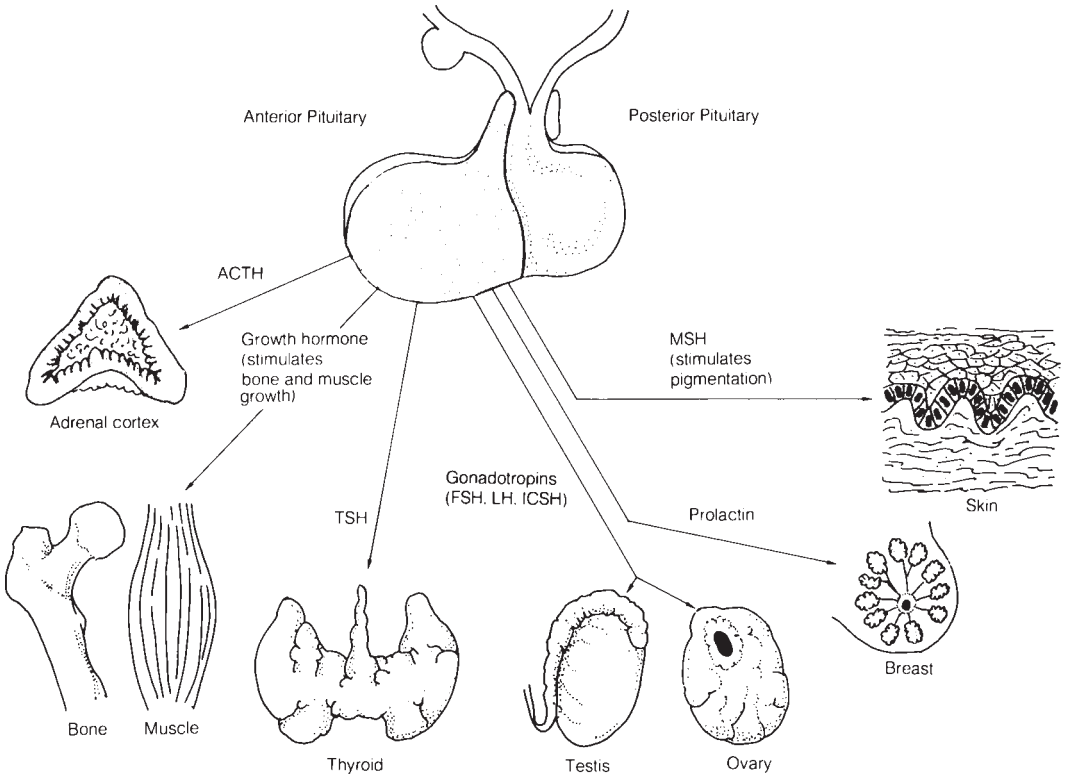


Figure 4–25 Hormones secreted by the anterior pituitary gland

c. Regulated by hypothalamic releasing and inhibiting factors and by negative feedback system

2. Posterior lobe (neurohypophysis): does not produce hormones; stores and releases antidiuretic hormone (ADH) and oxytocin, produced by the hypothalamus

3. Intermediate lobe: secretes melanocyte-stimulating hormone (MSH)

Adrenal Glands

A. Two small glands, one above each kidney

B. Consist of two sections

1. Adrenal cortex (outer portion): produces mineralocorticoids, glucocorticoids, sex hormones

2. Adrenal medulla (inner portion): produces epinephrine, norepinephrine

Thyroid Gland

A. Located in anterior portion of the neck

B. Consists of two lobes connected by a narrow isthmus

C. Produces thyroxine (T_4), triiodothyronine (T_3), thyrocalcitonin

Parathyroid Glands

A. Four small glands located in pairs behind the thyroid gland

B. Produce parathormone (PTH)

Pancreas

A. Located behind the stomach

B. Has both endocrine and exocrine functions (See Gastrointestinal System).

C. Islets of Langerhans (alpha and beta cells) involved in endocrine function

1. Beta cells: produce insulin

2. Alpha cells: produce glucagon

Gonads

A. Ovaries: located in pelvic cavity, produce estrogen and progesterone

B. Testes: located in scrotum, produce testosterone

ASSESSMENT

Health History

A. Presenting problem: symptoms may include:

1. Change in appearance: hair, nails, skin (change in texture or pigmentation); change in size, shape, or symmetry of head, neck, face, eyes, or tongue

2. Change in energy level

3. Temperature intolerance

4. Development of abnormal secondary sexual characteristics; change in sexual function
5. Change in emotional state, thought pattern, or intellectual functioning
6. Signs of increased activity of sympathetic nervous system (e.g., nervousness, palpitations, tremors, sweating)
7. Change in bowel habits, appetite, or weight; excessive hunger or thirst
8. Change in urinary pattern

B. Lifestyle: any increased stress
C. Past medical history: growth and development (any delayed or excessive growth); diabetes, thyroid disease, hypertension, obesity, infertility
D. Family history: endocrine diseases, growth problems, obesity, mental illness

Physical Examination

A. Check height, weight, body stature, and body proportions.
B. Observe distribution of muscle mass, fat distribution, any muscle wasting.
C. Inspect for hair growth and distribution.
D. Check condition and pigmentation of skin; presence of striae.
E. Inspect eyes for any bulging.
F. Observe for enlargement in neck area and quality of voice.
G. Observe development of secondary sex characteristics.
H. Palpate thyroid gland (normally cannot be palpated): note size, shape, symmetry, any tenderness, presence of any lumps or nodules.

Laboratory/Diagnostic Tests

A variety of tests may be performed to measure the amounts of hormones present in the serum or urine in assessing pituitary, adrenal, and parathyroid functions; these tests will be referred to when appropriate under specific disorders of the endocrine system.

Thyroid Function

A. Serum studies: nonfasting blood studies (no special preparation necessary)
1. Serum T_4 level: measures total serum level of thyroxine
2. Serum T_3 level: measures serum triiodothyronine level
3. TSH: measurement differentiates primary from secondary hypothyroidism

B. Radioactive iodine uptake (RAIU)
1. Administration of ^{123}I or ^{131}I orally; measurement by a counter of the amount of radioactive iodine taken up by the gland after 24 hours
2. Performed to determine thyroid function; increased uptake indicates hyperactivity; minimal uptake may indicate hypothyroidism
3. Nursing care
   a. Take thorough history; thyroid medication must be discontinued 7–10 days prior to test; medications containing iodine, cough preparations, excess intake of iodine-rich foods, and tests using iodine (e.g., IVP) can invalidate this test.
   b. Assure client that no radiation precautions are necessary.

C. Thyroid scan
1. Administration of radioactive isotope (orally or IV) and visualization by a scanner of the distribution of radioactivity in the gland
2. Performed to determine location, size, shape, and anatomic function of thyroid gland; identifies areas of increased or decreased uptake; valuable in evaluating thyroid nodules
3. Nursing care: same as RAIU

Pancreatic Function

A. Fasting blood sugar: measures serum glucose levels; client fasts from midnight before the test
B. Two-hour postprandial blood sugar: measurement of blood glucose 2 hours after a meal is ingested
1. Fast from midnight before test
2. Client eats a meal consisting of at least 75 g carbohydrate or ingests 100 g glucose
3. Blood drawn 2 hours after the meal

C. Oral glucose tolerance test: most specific and sensitive test for diabetes mellitus
1. Fast from midnight before test
2. Fasting blood glucose and urine glucose specimens obtained
3. Client ingests 100 g glucose; blood sugars are drawn at 30 and 60 minutes and then hourly for 3–5 hours; urine specimens may also be collected
4. Diet for 3 days prior to test should include 200 g carbohydrate and at least 1500 kcal/day
5. During test, assess the client for reactions such as dizziness, sweating, and weakness

D. Glycosylated hemoglobin (hemoglobin A1c) reflects the average blood sugar level for the previous 100–120 days. Glucose attaches to a minor hemoglobin (A1c). This attachment is irreversible.
1. Fasting is not necessary.
2. Excellent method to evaluate long-term control of blood sugar.

ANALYSIS

Nursing diagnoses for the client with a disorder of the endocrine system may include:
A. Imbalanced nutrition: more or less than body requirements
B. Risk for infection
C. Impaired urinary elimination
D. Deficient fluid volume

E. Risk for impaired skin integrity
F. Sexual dysfunction
G. Deficient knowledge
H. Ineffective individual coping
I. Disturbed sleep pattern
J. Disturbed body image

PLANNING AND IMPLEMENTATION

Goals

Client will:
A. Regain optimal nutritional status.
B. Be free from infection.
C. Have adequate urinary elimination and fluid volume.
D. Maintain skin integrity.
E. Experience optimum sexual health.
F. Demonstrate and use knowledge of disease process, prescribed medications, treatments, and complications in order to maintain optimal health.
G. Use positive coping behaviors in dealing with the effects of acute and chronic illness.
H. Attain an optimal balance of rest and activity.

Interventions

Care of the Client on Corticosteroid Therapy

A. General information
  1. Types of preparations include cortisone, hydrocortisone, prednisone, dexamethasone (Decadron)
  2. Indications
    a. Replacement therapy in primary and secondary adrenocortical insufficiency
    b. Symptomatic treatment for anti-inflammatory effect of numerous inflammatory, allergic, or immunoreactive disorders (e.g., arthritis, SLE, bronchial asthma, skin diseases, ocular disorders, allergic diseases, inflammatory bowel disorders, cerebral edema and increased ICP, shock, nephrotic syndrome, malignancies, myasthenia gravis, multiple sclerosis)
  3. Common side effects: salt and water retention, sweating, increased appetite
  4. Adverse reactions
    a. Cardiovascular: hypertension, CHF
    b. GI: peptic ulcer, ulcerative esophagitis
    c. Integumentary: petechiae, ecchymoses, purpura, hirsutism, acne, thinning of skin, striae, redistribution of body fat in subcutaneous tissue, abnormal pigmentation, poor wound healing
    d. Endocrine: impaired glucose metabolism, hyperglycemia, menstrual dysfunction, growth retardation
    e. Musculoskeletal: muscle weakness, osteoporosis
    f. Neurologic: personality changes, headache, syncope, vertigo, irritability, insomnia, seizures
    g. Ophthalmologic: cataract formation, glaucoma
    h. Other: hypokalemia, thrombophlebitis, masking of signs of infection, increased susceptibility to infection
    i. Sudden withdrawal may precipitate acute adrenal insufficiency
B. Nursing care
  1. Administer with food or milk; instruct client to report gastric distress (antacids may be necessary).
  2. Give in a single daily dose, preferably before 9 A.M. (cortisol level is at highest peak between 6 and 8 A.M.).
  3. Instruct client to avoid infections and to report immediately if one is suspected.
  4. Instruct client never to withdraw the drug abruptly, as this may cause acute adrenal insufficiency.
  5. Observe client for any mental changes (e.g., irritability, mood swings, euphoria, depression).
  6. Alert women that menstrual irregularity may develop.
  7. Monitor blood pressure, I&O, weight, blood glucose, and serum potassium.
  8. Advise client to restrict salt intake.
  9. Encourage intake of foods high in potassium.

EVALUATION

A. Client maintains normal weight; no evidence of malnutrition.
B. Client's temperature is within normal limits; no signs of infection.
C. Client has adequate patterns of urinary elimination.
D. Peripheral edema is reduced.
E. Blood pressure and urine output are within normal limits; no signs of dehydration.
F. Skin is intact and free from irritation.
G. Client verbalizes satisfying sexual activity/expression.
H. Client demonstrates and uses knowledge of disease process, prescribed medications, and treatments; reports any complications.
I. Client uses effective coping behaviors to successfully adapt to effects of illness, changes in body image, and loss of function.
J. Client maintains balance between activity and rest.
K. Client demonstrates increased self-esteem.

DISORDERS OF THE ENDOCRINE SYSTEM

Specific Disorders of the Pituitary Gland

Hypopituitarism

A. General information
  1. Hypofunction of the anterior pituitary gland resulting in deficiencies of both the hormones secreted by the anterior pituitary gland and those secreted by the target glands
  2. May be caused by tumor, trauma, surgical removal, or irradiation of the gland; or may be congenital (pituitary dwarfism)

B. Medical management: specific treatment depends on cause
  1. Tumor: surgical removal or irradiation of the gland
  2. Regardless of cause, treatment will include replacement of deficient hormones: e.g., corticosteroids, thyroid hormone, sex hormones, gonadotropins (may be used to restore fertility).

C. Assessment findings
  1. Tumor: bitemporal hemianopia, headache
  2. Varying signs of hormonal disturbances depending on which hormones are being undersecreted (e.g., menstrual dysfunction, hypothyroidism, adrenal insufficiency)
  3. Retardation of growth if condition occurs before epiphyseal closure
  4. Diagnostic tests
    a. Skull X-ray, CT scan may reveal pituitary tumor
    b. Plasma hormone levels may be decreased depending on specific hormones undersecreted

D. Nursing interventions
  1. Provide care for the client undergoing hypophysectomy or radiation therapy if indicated.
  2. Provide client teaching and discharge planning concerning:
    a. Hormone replacement therapy
    b. Importance of follow-up care

Hyperpituitarism

A. General information
  1. Hyperfunction of the anterior pituitary gland resulting in oversecretion of one or more of the anterior pituitary hormones
  2. Overproduction of the growth hormone produces acromegaly in adults and gigantism in children (if hypersecretion occurs before epiphyseal closure).
  3. Usually caused by a benign pituitary adenoma

B. Medical management: surgical removal or irradiation of the gland

C. Assessment findings
  1. Tumor: bitemporal hemianopia; headache
  2. Hormonal disturbances depending on which hormones are being excreted in excess
  3. Acromegaly caused by oversecretion of growth hormones: transverse enlargement of bones, especially noticeable in skull and in bones of hands and feet; features become coarse and heavy; lips become heavier; tongue enlarged
  4. Diagnostic tests
    a. Skull X-ray, CT scan reveal pituitary tumor
    b. Plasma hormone levels reveal increased growth hormone, oversecretion of other hormones

D. Nursing interventions
  1. Monitor for hyperglycemia and cardiovascular problems (hypertension, angina, HF) and modify care accordingly.
  2. Provide psychologic support and acceptance for alterations in body image.
  3. Provide care for the client undergoing hypophysectomy or radiation therapy if indicated.

Hypophysectomy

A. General information
  1. Partial or complete removal of the pituitary gland
  2. Indications: pituitary tumors, diabetic retinopathy, metastatic cancer of the breast or prostate, which may be endocrine dependent
  3. Surgical approaches
    a. Craniotomy: usually transfrontal
    b. Transphenoidal: incision made in inner aspect of upper lip and gingiva; sella turcica is entered through the floor of the nose and sphenoid sinuses

B. Nursing care
  1. In addition to pre-op care of the craniotomy client, explain post-op expectations.
  2. In addition to post-op care of the craniotomy client, observe for signs of target gland deficiencies (diabetes insipidus, adrenal insufficiency, hypothyroidism) due to total removal of the gland or to post-op edema.
    a. Perform hourly urine outputs and specific gravities; alert physician if urine output is greater than 800–900 mL/2 hours or if specific gravity is less than 1.004.
    b. Administer cortisone replacement as ordered.
  3. If transphenoidal approach used:
    a. Elevate the head of the bed to 30° to decrease headache and pressure on the sella turcica.
    b. Administer mild analgesics for headache as ordered.

c. Perform frequent oral hygiene with soft swabs to cleanse the teeth and mouth rinses; no toothbrushing.
d. Observe for and prevent CSF leak from surgical site.
1) Warn the client not to cough, sneeze, or blow nose.
2) Observe for clear drainage from nose or postnasal drip (constant swallowing); check drainage for glucose; positive results indicate that drainage is CSF.
3) If leakage does occur:
a) Elevate head of bed and call the physician.
b) Most leaks will resolve in 72 hours with bed rest and elevation.
c) May do daily spinal taps to decrease CSF pressure.
d) Administer antibiotics as ordered to prevent meningitis.

4. Provide client teaching and discharge planning concerning:
a. Hormone therapy
1) If gland is completely removed, client will have permanent diabetes insipidus
2) Cortisone and thyroid hormone replacement
3) Replacement of sex hormones
a) Testosterone: may be given for impotence in men
b) Estrogen: may be given for atropy of the vaginal mucosa in women
c) Human pituitary gonadotropins: may restore fertility in some women
b. Need for lifelong follow-up and hormone replacement
c. Need to wear Medic-Alert bracelet
d. If transphenoidal approach was used:
1) Avoid bending and straining at stool for 2 months post-op
2) No toothbrushing until sutures are removed and incision heals (about 10 days)

Diabetes Insipidus

A. General information
1. Hypofunction of the posterior pituitary gland resulting in deficiency of ADH
2. Characterized by excessive thirst and urination
3. Caused by tumor, trauma, inflammation, pituitary surgery

B. Assessment findings
1. Polydipsia (excessive thirst) and severe polyuria with low specific gravity
2. Fatigue, muscle weakness, irritability, weight loss, signs of dehydration
3. Tachycardia, eventual shock if fluids not replaced
4. Diagnostic tests
a. Urine specific gravity less than 1.004
b. Water deprivation test reveals inability to concentrate urine

C. Nursing interventions
1. Maintain fluid and electrolyte balance.
a. Keep accurate I&O.
b. Weigh daily.
c. Administer IV/oral fluids as ordered to replace fluid losses.
2. Monitor vital signs and observe for signs of dehydration and hypovolemia.
3. Administer hormone replacement as ordered.
a. Vasopressin (Pitressin) given IV and SC; desmopressin, given PO or intranasal.
1) Warm to body temperature before giving.
2) Shake tannate suspension to ensure uniform dispersion.
b. Lypressin (Diapid): nasal spray
4. Provide client teaching and discharge planning concerning:
a. Lifelong hormone replacement; lypressin as needed to control polyuria and polydipsia
b. Need to wear Medic-Alert bracelet

Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH)

A. General information
1. Hypersection of ADH from the posterior pituitary gland even when the client has abnormal serum osmolality.
2. SIADH may occur in persons with bronchogenic carcinoma or other nonendocrine conditions.

B. Medical management
1. Treat underlying cause if possible
2. Diuretics and fluid restriction

C. Assessment findings
1. Persons with SIADH cannot excrete a dilute urine
2. Fluid retention and sodium deficiency.

D. Nursing interventions
1. Administer diuretics (furosemide [Lasix]) as ordered.
2. Restrict fluids to promote fluid loss and gradual increase in serum sodium.
3. Monitor serum electrolytes and blood chemistries carefully.
4. Careful intake and output, daily weight.
5. Monitor neurologic status.

Disorders of the Adrenal Gland

Addison's Disease

A. General information
1. Primary adrenocortical insufficiency; hypofunction of the adrenal cortex causes

decreased secretion of the mineralocorticoids, glucocorticoids, and sex hormones
2. Relatively rare disease caused by:
   a. Idiopathic atrophy of the adrenal cortex possibly due to an autoimmune process
   b. Destruction of the gland secondary to tuberculosis (rare, due to early TB treatment available) or fungal infection

B. Assessment findings
1. Fatigue, muscle weakness
2. Anorexia, nausea, vomiting, abdominal pain, weight loss
3. History of frequent hypoglycemic reactions
4. Hypotension, weak pulse
5. Bronzelike pigmentation of the skin
6. Decreased capacity to deal with stress
7. Diagnostic tests: low cortisol levels, hyponatremia, hyperkalemia, hypoglycemia

C. Nursing interventions
1. Administer hormone replacement therapy as ordered.
   a. Glucocorticoids (cortisone, hydrocortisone): to stimulate diurnal rhythm of cortisol release, give ⅔ of dose in early morning and ⅓ of dose in afternoon
   b. Mineralocorticoids: fludrocortisone acetate (Florinef)
2. Monitor vital signs.
3. Decrease stress in the environment.
4. Prevent exposure to infection.
5. Provide rest periods; prevent fatigue.
6. Monitor I&O.
7. Weigh daily.
8. Provide small, frequent feedings of diet high in carbohydrates, sodium, and protein to prevent hypoglycemia and hyponatremia and to provide proper nutrition.
9. Provide client teaching and discharge planning concerning:
   a. Disease process; signs of adrenal insufficiency
   b. Use of prescribed medications for lifelong replacement therapy; never omit medications
   c. Need to avoid stress, trauma, and infections, and to notify physician if these occur as medication dosage may need to be adjusted
   d. Stress management techniques
   e. Diet modification (high in protein, carbohydrates, and sodium)
   f. Use of salt tablets (if prescribed) or ingestion of salty foods (potato chips) if experiencing increased sweating
   g. Importance of alternating regular exercise with rest periods
   h. Avoidance of strenuous exercise especially in hot weather

Addisonian Crisis

A. General information
1. Severe exacerbation of Addison's disease caused by acute adrenal insufficiency
2. Precipitating factors
   a. Overexertion, infection, trauma, stess, failure to take prescribed medications
   b. Iatrogenic: surgery on pituitary or adrenal glands, rapid withdrawal of exogenous steroids in a client on long-term steroid therapy

B. Assessment findings: severe generalized muscle weakness, severe hypotension, hypovolemia, shock (vascular collapse)

C. Nursing interventions
1. Administer IV fluids (5% dextrose in saline, plasma) as ordered to treat vascular collapse.
2. Administer IV glucocorticoids (hydrocortisone [Solu-Cortef]) and vasopressors as ordered.
3. If crisis precipitated by infection, administer antibiotics as ordered.
4. Maintain strict bed rest and eliminate all forms of stressful stimuli.
5. Monitor vital signs, I&O, daily weights.
6. Protect client from infection.
7. Provide client teaching and discharge planning: same as for Addison's disease.

Cushing's Syndrome

A. General information
1. Condition resulting from excessive secretion of corticosteroids, particularly the glucocorticoid cortisol
2. Occurs most frequently in females between ages 30–60
3. Primary Cushing's syndrome caused by adrenocortical tumors or hyperplasia
4. Secondary Cushing's syndrome (also called Cushing's disease): caused by functioning pituitary or nonpituitary neoplasm secreting ACTH, causing increased secretion of glucocorticoids
5. Iatrogenic: caused by prolonged use of corticosteroids

B. Assessment findings
1. Muscle weakness, fatigue, obese trunk with thin arms and legs, muscle wasting
2. Irritability, depression, frequent mood swings
3. Moon face, buffalo hump, pendulous abdomen
4. Purple striae on trunk, acne, thin skin
5. Signs of masculinization in women; menstrual dysfunction, decreased libido
6. Osteoporosis, decreased resistance to infection
7. Hypertension, edema
8. Diagnostic tests: cortisol levels increased, slight hypernatremia, hypokalemia, hyperglycemia

C. Nursing interventions
  1. Maintain muscle tone.
    a. Provide ROM exercises.
    b. Assist with ambulation.
  2. Prevent accidents or falls and provide adequate rest.
  3. Protect client from exposure to infection.
  4. Maintain skin integrity.
    a. Provide meticulous skin care.
    b. Prevent tearing of skin: use paper tape if necessary.
  5. Minimize stress in the environment.
  6. Monitor vital signs; observe for hypertension, edema.
  7. Measure I&O and daily weights.
  8. Provide diet low in calories and sodium and high in protein, potassium, calcium, and vitamin D.
  9. Monitor urine for glucose and acetone; administer insulin if ordered.
  10. Provide psychologic support and acceptance.
  11. Prepare client for hypophysectomy or radiation if condition is caused by a pituitary tumor.
  12. Prepare client for an adrenalectomy if condition is caused by an adrenal tumor or hyperplasia.
  13. Provide client teaching and discharge planning concerning:
    a. Diet modifications
    b. Importance of adequate rest
    c. Need to avoid stress and infection
    d. Change in medication regimen (alternate day therapy or reduced dosage) if cause of the condition is prolonged corticosteroid therapy

Primary Aldosteronism (Conn's Syndrome)

A. General information
  1. Excessive aldosterone secretion from the adrenal cortex
  2. Seen more frequently in women, usually between ages 30–50
  3. Caused by tumor or hyperplasia of adrenal gland
B. Assessment findings
  1. Headache, hypertension
  2. Muscle weakness, polyuria, polydipsia, metabolic alkalosis, cardiac arrhythmias (due to hypokalemia)
  3. Diagnostic tests
    a. Serum potassium decreased, alkalosis
    b. Urinary aldosterone levels elevated
C. Nursing interventions
  1. Monitor vital signs, I&O, daily weights.
  2. Maintain sodium restriction as ordered.
  3. Administer spironolactone (Aldactone) and potassium supplements as ordered.
  4. Prepare the client for an adrenelectomy if indicated.
  5. Provide client teaching and discharge planning concerning
    a. Use and side effects of medication if the client is being maintained on spironolactone therapy
    b. Signs of symptoms of hypo/hyperaldosteronism
    c. Need for frequent blood pressure checks and follow-up care

Pheochromocytoma

A. General information
  1. Functioning tumor of the adrenal medulla that secretes excessive amounts of epinephrine and norepinephrine
  2. Occurs most commonly between ages 25–50
  3. May be hereditary in some cases
B. Assessment findings
  1. Severe headache, apprehension, palpitations, profuse sweating, nausea
  2. Hypertension, tachycardia, vomiting, hyperglycemia, dilation of pupils, cold extremities
  3. Diagnostic tests
    a. Increased plasma levels of catecholamines; elevated blood sugar; glycosuria
    b. Elevated urinary catecholamines and urinary vanillylmandelic acid (VMA) levels
    c. Presence of tumor on X-ray
C. Nursing interventions
  1. Monitor vital signs, especially blood pressure.
  2. Administer medications as ordered to control hypertension.
  3. Promote rest; decrease stressful stimuli.
  4. Monitor urine tests for glucose and acetone.
  5. Provide high-calorie, well-balanced diet; avoid stimulants such as coffee, tea.
  6. Provide care for the client with an adrenalectomy as ordered; observe postadrenelectomy client carefully for shock due to drastic drop in catecholamine level.
  7. Provide client teaching and discharge planning: same as for adrenalectomy.

Adrenalectomy

A. General information
  1. Removal of one or both adrenal glands
  2. Indications
    a. Tumors of adrenal cortex (Cushing's syndrome, hyperaldosteronism) or medulla (pheochromocytoma)
    b. Metastatic cancer of the breast or prostate
B. Nursing interventions: preoperative
  1. Provide routine pre-op care.
  2. Correct metabolic/cardiovascular problems.
    a. Pheochromocytoma: stabilize blood pressure.

b. Cushing's syndrome: treat hyperglycemia and protein deficits.
c. Primary hyperaldosteronism: treat hypertension and hypokalemia.

3. Administer glucocorticoid preparation on the morning of surgery as ordered to prevent acute adrenal insufficiency.

C. Nursing interventions: postoperative
1. Provide routine post-op care.
2. Observe for hemorrhage and shock.
a. Monitor vital signs, I&O.
b. Administer IV therapy and vasopressors as ordered.
3. Prevent infections (suppression of immune system makes clients especially susceptible).
a. Encourage coughing and deep breathing to prevent respiratory infection.
b. Use meticulous aseptic technique during dressing changes.
4. Administer cortisone or hydrocortisone as ordered to maintain cortisol levels.
5. Provide general care for the client with abdominal surgery.

D. Provide client teaching and discharge planning concerning:
1. Self-administration of replacement hormones
a. Bilateral adrenalectomy: lifelong replacement of glucocorticoids and mineralocorticoids
b. Unilateral adrenalectomy: replacement therapy for 6–12 months until the remaining adrenal gland begins to function normally
2. Signs and symptoms of adrenal insufficiency
3. Importance of follow-up care

Specific Disorders of the Thyroid Gland

Simple Goiter

A. General information
1. Enlargement of the thyroid gland not caused by inflammation or neoplasm
2. Types
a. Endemic: caused by nutritional iodine deficiency, most common in the "goiter belt" (midwest, northwest, and Great Lakes regions), areas where soil and water are deficient in iodine; occurs most frequently during adolescence and pregnancy
b. Sporadic: caused by:
1) Ingestion of large amounts of goitrogenic foods (contain agents that decrease thyroxine production): e.g., cabbage, soybeans, rutabagas, peanuts, peaches, peas, strawberries, spinach, radishes
2) Use of goitrogenic drugs: propylthiouracil, large doses of iodine, phenylbutazone, para-amino salicylic acid, cobalt, lithium
3) Genetic defects that prevent synthesis of thyroid hormone
3. Low levels of thyroid hormone stimulate increased secretion of TSH by pituitary; under TSH stimulation the thyroid increases in size to compensate and produces more thyroid hormone.

B. Medical management
1. Drug therapy
a. Hormone replacement with levothyroxine (Synthroid) (T_4), dessicated thyroid, or liothyronine (Cytomel) (T_3)
b. Small doses of iodine (Lugol's or potassium iodide solution) for goiter resulting from iodine deficiency
2. Avoidance of goitrogenic foods or drugs in sporadic goiter
3. Surgery: subtotal thyroidectomy (if goiter is large) to relieve pressure symptoms and for cosmetic reasons

C. Assessment findings
1. Dysphagia, enlarged thyroid, respiratory distress
2. Diagnostic tests
a. Serum T_4 level low-normal or normal
b. RAIU uptake normal or increased

D. Nursing interventions
1. Administer replacement therapy as ordered.
2. Provide care for client with subtotal thyroidectomy if indicated.
3. Provide client teaching and discharge planning concerning
a. Use of iodized salt in preventing and treating endemic goiter
b. Thyroid hormone replacement

Hypothyroidism (Myxedema)

A. General information
1. Slowing of metabolic processes caused by hypofunction of the thyroid gland with decreased thyroid hormone secretion; causes myxedema in adults and cretinism in children.
2. Occurs more often in women between ages 30 and 60
3. Primary hypothyroidism: atrophy of the gland possibly caused by an autoimmune process
4. Secondary hypothyroidism: caused by decreased stimulation from pituitary TSH
5. Iatrogenic: surgical removal of the gland or overtreatment of hyperthyroidism with drugs or radioactive iodine
6. In severe or untreated cases, myxedema coma may occur
a. Characterized by intensification of signs and symptoms of hypothyroidism and neurologic impairment leading to coma
b. Mortality rate high; prompt recognition and treatment essential

c. Precipitating factors: failure to take prescribed medications; infection; trauma, exposure to cold; use of sedatives, narcotics, or anesthetics

B. Medical management
1. Drug therapy: levothyroxine (Synthroid), thyroglobulin (Proloid), dessicated thyroid, liothyronine (Cytomel)
2. Myxedema coma is a medical emergency.
   a. IV thyroid hormones
   b. Correction of hypothermia
   c. Maintenance of vital functions
   d. Treatment of precipitating causes

C. Assessment findings
1. Fatigue; lethargy; slowed mental processes; dull look; slow, clumsy movements
2. Anorexia, weight gain, constipation
3. Intolerance to cold; dry, scaly skin; dry, sparse hair; brittle nails
4. Menstrual irregularities; generalized interstitial nonpitting edema
5. Bradycardia, cardiac complications (CAD, angina pectoris, MI, CHF)
6. Increased sensitivity to sedatives, narcotics, and anesthetics
7. Exaggeration of these findings in myxedema coma: weakness, lethargy, syncope, bradycardia, hypotension, hypoventilation, subnormal body temperature
8. Diagnostic tests
   a. Serum T_3 and T_4 level low
   b. Serum cholesterol level elevated
   c. RAIU decreased

D. Nursing interventions
1. Monitor vital signs, I&O, daily weights; observe for edema and signs of cardiovascular complications.
2. Administer thyroid hormone replacement therapy as ordered and monitor effects.
   a. Observe for signs of thyrotoxicosis (tachycardia, palpitations, nausea, vomiting, diarrhea, sweating, tremors, agitation, dyspnea).
   b. Increase dosage gradually, especially in clients with cardiac complications.
3. Provide a comfortable, warm environment.
4. Provide a low-calorie diet.
5. Avoid the use of sedatives; reduce the dose of any sedative, narcotic, or anesthetic agent by half as ordered.
6. Institute measures to prevent skin breakdown.
7. Provide increased fluids and foods high in fiber to prevent constipation; administer stool softeners as ordered.
8. Observe for signs of myxedema coma; provide appropriate nursing care.
   a. Administer medications as ordered.
   b. Maintain vital functions: correct hypothermia, maintain adequate ventilation.
9. Provide client teaching and discharge planning concerning:
   a. Thyroid hormone replacement
      1) Take daily dose in the morning to prevent insomnia.
      2) Self-monitor for signs of thyrotoxicosis.
   b. Importance of regular follow-up care
   c. Need for additional protection in cold weather
   d. Measures to prevent constipation

Hyperthyroidism (Graves' Disease)

A. General information
1. Secretion of excessive amounts of thyroid hormone in the blood causes an increase in metabolic processes
2. Overactivity and changes in the thyroid gland may be present
3. Most often seen in women between ages 30–50
4. Cause unknown, but may be an autoimmune process
5. Symptomatic hyperthyroidism may also be called thyrotoxicosis

B. Medical management
1. Drug therapy
   a. Antithyroid drugs (propylthiouracil and methimazole ([Tapazole]): block synthesis of thyroid hormone; toxic effects include agranulocytosis
   b. Adrenergic blocking agents (commonly propranolol [Inderal]): used to decrease sympathetic activity and alleviate symptoms such as tachycardia
2. Radioactive iodine therapy
   a. Radioactive isotope of iodine (e.g., ^{131}I) given to destroy the thyroid gland, thereby decreasing production of thyroid hormone
   b. Used in middle-aged or older clients who are resistant to, or develop toxicity from, drug therapy
   c. Hypothyroidism is a potential complication
3. Surgery: thyroidectomy performed in younger clients for whom drug therapy has not been effective

C. Assessment findings
1. Irritability, agitation, restlessness, hyperactive movements, tremor, sweating, insomnia
2. Increased appetite, hyperphagia, weight loss, diarrhea, intolerance to heat
3. Exophthalmos (protrusion of the eyeballs), goiter
4. Warm, smooth skin; fine, soft hair; pliable nails
5. Tachycardia, increased systolic blood pressure, palpitations
6. Diagnostic tests
   a. Serum T_3 and T_4 levels elevated
   b. RAIU increased

D. Nursing interventions
1. Monitor vital signs, daily weights.
2. Administer antithyroid medications as ordered.
3. Provide for periods of uninterrupted rest.
   a. Assign to a private room away from excessive activity.
   b. Administer medications to promote sleep as ordered.
4. Provide a cool environment.
5. Minimize stress in the environment.
6. Encourage quiet, relaxing diversional activities.
7. Provide a diet high in carbohydrates, protein, calories, vitamins, and minerals with supplemental feedings between meals and at bedtime; omit stimulants.
8. Observe for and prevent complications.
   a. Exophthalmos: protect eyes with dark glasses and artificial tears as ordered.
   b. Thyroid storm: see Thyroid Storm.
9. Provide client teaching and discharge planning concerning:
   a. Need to recognize and report signs and symptoms of agranulocytosis (fever, sore throat, skin rash) if taking antithyroid drugs
   b. Signs and symptoms of hyper/hypothyroidism

Thyroid Storm

A. General information
1. Uncontrolled and potentially life-threatening hyperthyroidism caused by sudden and excessive release of thyroid hormone into the bloodstream
2. Precipitating factors: stress, infection, unprepared thyroid surgery
3. Now quite rare

B. Assessment findings
1. Apprehension, restlessness
2. Extremely high temperature (up to 106°F [40.7°C]), tachycardia, HF, respiratory distress, delirium, coma

C. Nursing interventions (see also Hyperthermia)
1. Maintain a patent airway and adequate ventilation; administer oxygen as ordered.
2. Administer IV therapy as ordered.
3. Administer medications as ordered: antithyroid drugs, corticosteroids, sedatives, cardiac drugs.

Thyroidectomy

A. General information
1. Partial or total removal of the thyroid gland
2. Indications
   a. Subtotal thyroidectomy: hyperthyroidism
   b. Total thyroidectomy: thyroid cancer

B. Nursing interventions: preoperative
1. Ensure that the client is adequately prepared for surgery.
   a. Cardiac status is stable.
   b. Weight and nutritional status are normal.
2. Administer antithyroid drugs as ordered to suppress the production and secretion of thyroid hormone and to prevent thyroid storm.
3. Administer iodine preparations (Lugol's or potassium iodide solution) to reduce the size and vascularity of the gland and prevent hemorrhage.

C. Nursing interventions: postoperative
1. Monitor vital signs and I&O.
2. Check dressings for signs of hemorrhage; check for wetness behind neck.
3. Place client in semi-Fowler's position and support head with pillows.
4. Observe for respiratory distress secondary to hemorrhage, edema of the glottis, laryngeal nerve damage, or tetany; keep tracheostomy set, oxygen, and suction nearby.
5. Assess for signs of tetany due to hypocalcemia secondary to accidental removal of parathyroid glands; keep calcium gluconate available (see Hypoparathyroidism).
6. Encourage the client to rest voice.
   a. Some hoarseness is common.
   b. Check every 30–60 minutes for extreme hoarseness or any accompanying respiratory distress.
7. Observe for thyroid storm due to release of excessive amounts of thyroid hormone during surgery.
8. Administer IV fluids as ordered until the client is tolerating fluids by mouth.
9. Administer analgesics as ordered for incisional pain.
10. Relieve discomfort from sore throat.
    a. Cool mist humidifier to thin secretions.
    b. Administer analgesic throat lozenges before meals and prn as ordered.
    c. Encourage fluids.
11. Encourage coughing and deep breathing every hour.
12. Assist the client with ambulation: instruct the client to place hands behind neck to decrease stress on suture line if added support necessary.
13. Provide client teaching and discharge planning concerning:
    a. Signs and symptoms of hypo/hyperthyroidism
    b. Self-administration of thyroid hormones if total thyroidectomy performed
    c. Application of lubricant to the incision once sutures are removed
    d. Performance of ROM neck exercises 3–4 times a day
    e. Importance of regular follow-up care

Specific Disorders of the Parathyroid Glands

Hypoparathyroidism

A. General information
  1. Disorder characterized by hypocalcemia resulting from a deficiency of parathormone (PTH) production
  2. May be hereditary, idiopathic, or caused by accidental damage to or removal of parathyroid glands during surgery, e.g., thyroidectomy

B. Assessment findings
  1. Acute hypocalcemia (tetany)
    a. Tingling of fingers and around lips, painful muscle spasms, dysphagia, laryngospasm, seizures, cardiac arrhythmias
    b. Chvostek's sign: sharp tapping over facial nerve causes twitching of mouth, nose, and eye
    c. Trousseau's sign: carpopedal spasm induced by application of blood pressure cuff for 3 minutes
  2. Chronic hypocalcemia
    a. Fatigue, weakness, muscle cramps
    b. Personality changes, irritability, memory impairment
    c. Dry, scaly skin; hair loss; loss of tooth enamel
    d. Tremor, cardiac arrhythmias, cataract formation
    e. Diagnostic tests
      1) Serum calcium levels decreased
      2) Serum phosphate levels elevated
      3) Skeletal X-rays reveal increased bone density

C. Nursing interventions
  1. Administer calcium gluconate by slow IV drip as ordered for acute hypocalcemia.
  2. Administer medications for chronic hypocalcemia.
    a. Oral calcium preparations: calcium gluconate, lactate, carbonate (Os-Cal)
    b. Large doses of vitamin D (Calciferol) to help absorption of calcium
    c. Aluminum hydroxide gel (Amphogel) or aluminum carbonate gel, basic (Basaljel) to decrease phosphate levels
  3. Institute seizure and safety precautions.
  4. Provide quiet environment free from excessive stimuli.
  5. Monitor for signs of hoarseness or stridor; check for Chvostek's and Trousseau's signs.
  6. Keep emergency equipment (tracheostomy set, injectable calcium gluconate) at bedside.
  7. For tetany or generalized muscle cramps, may use rebreathing bag to produce mild respiratory acidosis.
  8. Monitor serum calcium and phosphate levels.
  9. Provide high-calcium, low-phosphorus diet; milk and egg yolks are restricted because of high levels of phosphorus.
  10. Provide client teaching and discharge planning concerning:
    a. Medication regimen; oral calcium preparations and vitamin D to be taken with meals to increase absorption
    b. Need to recognize and report signs and symptoms of hypo/hypercalcemia
    c. Importance of follow-up care with periodic serum calcium levels

Hyperparathyroidism

A. General information
  1. Increased secretion of PTH that results in an altered state of calcium, phosphate, and bone metabolism
  2. Most commonly affects women between ages 35–65
  3. Primary hyperparathyroidism: caused by tumor or hyperplasia of parathyroid glands
  4. Secondary hyperparathyroidism: caused by compensatory oversecretion of PTH in response to hypocalcemia from chronic renal disease, rickets, malabsorption syndrome, osteomalacia

B. Assessment findings
  1. Bone pain (especially at back), bone demineralization, pathologic fractures
  2. Renal colic, kidney stones, polyuria, polydipsia
  3. Anorexia, nausea, vomiting, gastric ulcers, constipation
  4. Muscle weakness, fatigue
  5. Irritability, personality changes, depression
  6. Cardiac arrhythmias, hypertension
  7. Diagnostic tests
    a. Serum calcium levels elevated
    b. Serum phosphate levels decreased
    c. Skeletal X-rays reveal bone demineralization

C. Nursing interventions
  1. Administer IV infusions of normal saline solution and give diuretics as ordered; monitor I&O and observe for fluid overload and electrolyte imbalances.
  2. Assist client with self-care: provide careful handling, moving, and ambulation to prevent pathologic fractures.
  3. Monitor vital signs; report irregularities.
  4. Force fluids; provide acid-ash juices, e.g., cranberry juice.
  5. Strain urine for stones.
  6. Provide low-calcium, high-phosphorus diet.
  7. Provide care for the client undergoing parathyroidectomy (see Thyroidectomy).

8. Provide client teaching and discharge planning concerning
   a. Need to engage in progressive ambulatory activities
   b. Increased intake of fluids
   c. Use of calcium preparations and importance of high-calcium diet following a parathyroidectomy

Specific Disorders of the Pancreas

Diabetes Mellitus

A. General information
   1. Diabetes mellitus represents a heterogenous group of chronic disorders characterized by hyperglycemia.
   2. Hyperglycemia is due to total or partial insulin deficiency or insensitivity of the cells to insulin.
   3. Characterized by disorders in the metabolism of carbohydrate, fat, and protein, as well as changes in the structure and function of blood vessels.
   4. Most common endocrine problem; affects over 20 million people in the United States.
   5. Exact etiology unknown; causative factors may include:
      a. Genetics, viruses, and/or autoimmune response in Type 1
      b. Genetics and obesity in Type 2
   6. Types
      a. Type 1 (insulin-dependent diabetes mellitus [IDDM])
         1) Secondary to destruction of beta cells in the islets of Langerhans in the pancreas resulting in little or no insulin production; requires insulin injections.
         2) Usually occurs in children (see Unit 5) or in nonobese adults.
      b. Type 2 (non-insulin-dependent diabetes mellitus [NIDDM])
         1) May result from a partial deficiency of insulin production and/or an insensitivity of the cells to insulin.
         2) Usually occurs in obese adults over 40.
      c. Diabetes associated with other conditions or syndromes, e.g., pancreatic disease, Cushing's syndrome, use of certain drugs (steroids, thiazide diuretics, oral contraceptives).
   7. Pathophysiology
      a. Lack of insulin causes hyperglycemia (insulin is necessary for the transport of glucose across the cell membrane).
      b. Hyperglycemia leads to osmotic diuresis as large amounts of glucose pass through the kidney; results in polyuria and glycosuria.
      c. Diuresis leads to cellular dehydration and fluid and electrolyte depletion causing polydipsia (excessive thirst).
      d. Polyphagia (hunger and increased appetite) results from cellular starvation.
      e. The body turns to fats and protein for energy; but in the absence of glucose in the cell, fats cannot be completely metabolized and ketones (intermediate products of fat metabolism) are produced.
      f. This leads to ketonemia, ketonuria (contributes to osmotic diuresis), and metabolic acidosis (ketones are acid bodies).
      g. Ketones act as CNS depressants and can cause coma.
      h. Excess loss of fluids and electrolytes leads to hypovolemia, hypotension, renal failure, and decreased blood flow to the brain resulting in coma and death unless treated.
   8. Acute complications of diabetes include diabetic ketoacidosis (see Ketoacidosis), insulin reaction (see Insulin Reaction/Hypoglycemia), hyperglycemic hyperosmolar nonketotic coma (see Hyperglycemic Hypersmolar Coma (HHNK)).

B. Medical management
   1. Type 1: insulin, diet, exercise
   2. Type 2: ideally managed by diet and exercise; may need oral hypoglycemics or occasionally insulin if diet and exercise are not effective in controlling hyperglycemia; insulin needed for acute stresses, e.g., surgery, infection
   3. Diet Exchange (see Appendix)
      a. Type 1: consistency is imperative to avoid hypoglycemia
      b. Type 2: weight loss is important because it decreases insulin resistance
      c. High-fiber, low-fat diet also recommended
      d. Utilize Exchange list as recommended from American Diabetes Association.
   4. Drug therapy
      a. Insulin: used for Type 1 diabetes (also occasionally used in Type 2 diabetes)
         1) Types (Table 4-25)
            a) Short acting: used in treating ketoacidosis; during surgery, infection, trauma; management of poorly controlled diabetes; to supplement longer-acting insulins
            b) Intermediate: used for maintenance therapy
            c) Long acting: used for maintenance therapy in clients who experience hyperglycemia during the night with intermediate-acting insulin
         2) Various preparations of short-, intermediate-, and long-acting insulins are available (see Table 4-26)
         3) Insulin preparations can consist of a mixture of beef and pork insulin, pure beef, pure pork, or human insulin. Human insulin is the purest insulin and has the lowest antigenic effect.

Table 4–26 Types of Insulins

TYPE	ONSET	PEAK	DURATION
Humalog (Lispro)	Less than 15 minutes	30–90 minutes	4 hours
Regular	30–60 minutes	2–4 hours	5–7 hours
NPH	3–4 hours	6–12 hours	18–28 hours
Lente	1–3 hours	8–12 hours	18–28 hours
Ultra Lente	4–6 hours	18–24 hours	36–hours
70/30	15–30 minutes	2–3 hours and 8–12 hours	18–24 hours
Insulin glargine	1.1 hour	5 hours	24 hours

Adapted from, Broyles, B. E. Reiss, B.S., & Evans, M.E. (2007). *Pharmacological aspects of nursing care* (7th ed.). New York: Thomson Delmar Learning.

4) Human insulin is recommended for all newly diagnosed Type 1 diabetics, Type 2 diabetics who need short-term insulin therapy, the pregnant client, and diabetic clients with insulin allergy or severe insulin resistance.

5) Insulin pumps are small, externally worn devices that closely mimic normal pancreatic functioning. Insulin pumps contain a 3-mL syringe attached to a long (42-inch), narrow-lumen tube with a needle or Teflon catheter at the end. The needle or Teflon catheter is inserted into the subcutaneous tissue (usually on the abdomen) and secured with tape or a transparent dressing. The needle or catheter is changed at least every 3 days. The pump is worn either on a belt or in a pocket (see Figure 4-26). The pump uses only regular insulin. Insulin can be administered via the basal rate (usually 0.5–2.0 units/hr) and by a bolus dose (which is activated by a series of button pushes) prior to each meal.

b. Oral hypoglycemic agents (Table 4-27)

1) Used for Type 2 diabetics who are not controlled by diet and exercise

2) Increase the ability of islet cells of the pancreas to secrete insulin; may have some effect on cell receptors to decrease resistance to insulin

5. Exercise: helpful adjunct to therapy as exercise decreases the body's need for insulin.

C. Assessment findings

1. All types: polyuria, polydipsia, polyphagia, fatigue, blurred vision, susceptibility to infection

2. Type 1: anorexia, nausea, vomiting, weight loss

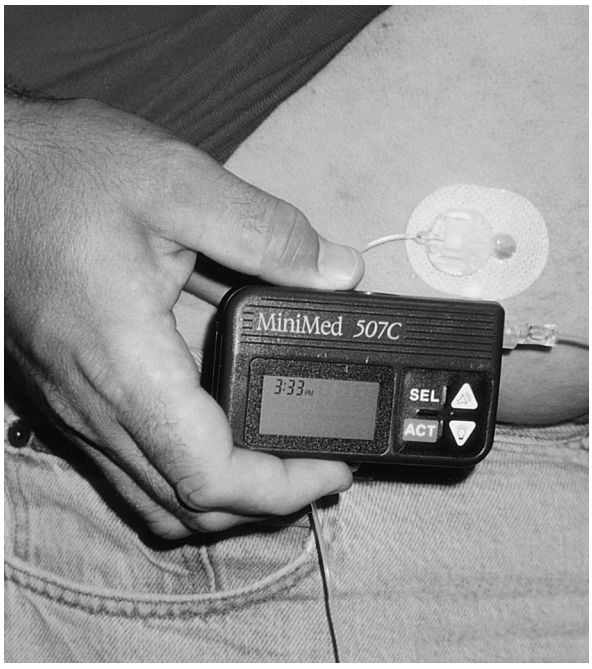


Figure 4–26 Insulin infusion pump

3. Type 2: obesity; frequently no other symptoms

4. Diagnostic tests

a. Fasting blood sugar

1) A level of 126 mg/dL or greater on at least two occasions confirms diabetes mellitus

2) May be normal in Type 2 diabetes

b. Postprandial blood sugar: elevated greater than 200 mg/dL 2 hours after a meal.

c. Oral glucose tolerance test (most sensitive test): elevated greater than 200 mg/dL

d. Glycosolated hemoglobin (hemoglobin A1c) elevated; (normal range 4–6%)

D. Nursing interventions

1. Administer insulin or oral hypoglycemic agents as ordered; monitor for hypoglycemia, especially during period of drug's peak action.

2. Provide special diet as ordered.

a. Ensure that the client is eating all meals.

b. If all food is not ingested, provide appropriate substitutes according to the exchange lists or give measured amount of orange juice to substitute for leftover food; provide snack later in the day.

3. Monitor urine sugar and acetone (freshly voided specimen).

4. Perform finger sticks to monitor blood glucose levels as ordered (more accurate than urine tests).

5. Observe for signs of hypo/hyperglycemia.

6. Provide meticulous skin care and prevent injury.

7. Maintain I&O; weigh daily.

Table 4–27 Oral Hypoglycemic Agents

Drug	Onset of Action (hrs)	Peak Action (hrs)	Duration of Action (hrs)	Comments
Oral Sulfonylureas				
Acetohexamide (Dymelor)	1	4–6	12–24	
Chlorpropamide (Diabinase)	1	4–6	40–60	
Glyburide (Micronase Diabeta)	0.25–1 hr	2–8	10–24	
Oral Biguanides				
Metformin (Glucophage)	2–2.5		10–16	Decreases glucose production in liver; decreases intestinal absorption of glucose and improves insulin sensitivity.
Oral Alpha-glucosidose Inhibitor				
Acarbose (Precose)	Unknown	1	Unknown	Delay glucose absorption and digestion of carbohydrates, lowering blood sugar. Reduces plasma glucose and insulin. Exact mechanism is unknown. Potentiates action of insulin in skeletal muscle and decreases glucose production in liver.
Miglitol (Glyset)		2–3		
Troglitazone (Rezulin)	Rapid	2–3	Unknown	

8. Provide emotional support; assist client in adapting to change in lifestyle and body image.
9. Observe for chronic complications and plan care accordingly.
  a. Macrovascular: changes in large vessels
    1) Atherosclerosis: increased plaque formation (decrease lipid level)
    2) Cardiovascular, cerebral, peripheral vascular diseases (modify lifestyle-obesity, smoking, sedentary lifestyle, hypertension)
  b. Microvascular: thickening of capillaries and arterioles
    1) Diabetic retinopathy: premature cataracts (prevent/control elevated blood glucose)
    2) Diabetic nephropathy: renal disease (control blood glucose)
    3) Diabetic neuropathies: peripheral, autonomic spinal nerves affected (control blood glucose)
10. Provide client teaching and discharge planning concerning
  a. Disease process
  b. Diet
    1) Client should be able to plan meals using exchange lists before discharge
    2) Emphasize importance of regularity of meals; never skip meals
  c. Insulin
    1) How to draw up into syringe
      a) Use insulin at room temperature.
      b) Gently roll vial between palms of hands.
      c) Draw up insulin using sterile technique.
      d) If mixing insulins, draw up clear insulin before cloudy insulin.
    2) Injection technique
      a) Systematically rotate sites to prevent lipodystrophy (hypertrophy or atrophy of tissue).
      b) Insert needle at a 45° or 90° angle depending on amount of adipose tissue.
    3) May store current vial of insulin at room temperature; refrigerate extra supplies.
    4) Provide many opportunities for return demonstration.
  d. Oral hypoglycemic agents
    1) Stress importance of taking the drug regularly.
    2) Avoid alcohol intake while on medication.
  e. Urine testing (not very accurate reflection of blood glucose level)
    1) May be satisfactory for Type 2 diabetics since they are more stable.
    2) Use Clinitest, Tes-Tape, Diastix for glucose testing.
    3) Perform tests before meals and at bedtime.
    4) Use freshly voided specimen.

5) Be consistent in brand of urine test used.
6) Report results in percentages.
7) Report results to physician if results are greater than 1%, especially if experiencing symptoms of hyperglycemia.
8) Urine testing for ketones should be done by Type 1 diabetics when there is persistent glycosuria, increased blood glucose levels, or if the client is not feeling well (Acetest, Ketostix).

f. Blood glucose monitoring
1) Use for Type 1 diabetics since it gives exact blood glucose level and also detects hypoglycemia.
2) Use for Type 2 diabetics to monitor effectiveness of oral and/or insulin treatment.
3) Instruct client in finger-stick technique, use of monitor device (if used), and recording and utilization of test results.

g. General care
1) Perform good oral hygiene and have regular dental exams.
2) Have regular eye exams.
3) Care for "sick days" (e.g., cold or flu)
a) Do not omit insulin or oral hypoglycemic agents because infection causes increased blood sugar.
b) Notify physician.
c) Monitor urine or blood glucose levels and urine ketones frequently.
d) If nausea and/or vomiting occurs, sip on clear liquids with simple sugars.

h. Foot care
1) Wash feet with mild soap and water and pat dry.
2) Apply lanolin to feet to prevent drying and cracking.
3) Cut toenails straight across.
4) Avoid constricting garments such as garters.
5) Wear clean, absorbent socks (cotton or wool).
6) Purchase properly fitting shoes and break new shoes in gradually.
7) Never go barefoot.
8) Inspect feet daily and notify physician if cuts, blisters, or breaks in skin occur.

i. Exercise
1) Undertake regular exercise; avoid sporadic, vigorous exercise.
2) Food intake may need to be increased before exercising.
3) Exercise is best performed after meals when the blood sugar is rising.

j. Complications
1) Learn to recognize signs and symptoms of hypo/hyperglycemia.
2) Eat candy or drink orange juice with sugar added for insulin reaction (hypoglycemia).

k. Need to wear a Medic-Alert bracelet.

Ketoacidosis (DKA)

A. General information
1. Acute complication of diabetes mellitus characterized by hyperglycemia and accumulation of ketones in the body; causes metabolic acidosis
2. Occurs in insulin-dependent diabetic clients
3. Precipitating factors: undiagnosed diabetes, neglect of treatment; infection, cardiovascular disorder; other physical or emotional stress
4. Onset slow, may be hours to days

B. Assessment findings
1. Polydipsia, polyphagia, polyuria
2. Nausea, vomiting, abdominal pain
3. Skin warm, dry, and flushed
4. Dry mucous membranes; soft eyeballs
5. Kussmaul's respirations or tachypnea; acetone breath
6. Alterations in LOC
7. Hypotension, tachycardia
8. Diagnostic tests
a. Serum glucose and ketones elevated (glucose greater than 250 mg/dL)
b. BUN, creatinine, hct elevated (due to dehydration)
c. Serum sodium decreased, potassium (may be normal or elevated at first)
d. ABGs: metabolic acidosis with compensatory respiratory alkalosis

C. Nursing interventions
1. Maintain a patent airway.
2. Maintain fluid and electrolyte balance.
a. Administer IV therapy as ordered.
1) Normal saline (0.9% NaCl), then hypotonic (0.45% NaCl) sodium chloride
2) When blood sugar drops to 250 mg/dL, may add 5% dextrose to IV.
3) Potassium will be added when the urine output is adequate.
b. Observe for fluid and electrolyte imbalances, especially fluid overload, hypokalemia, and hyperkalemia.
3. Administer insulin as ordered.
a. Regular insulin IV (drip or push) and/or subcutaneously (SC).
b. If given IV drip, give with small amounts of albumin since insulin adheres to IV tubing.
c. Monitor blood glucose levels frequently.
4. Check urine output every hour.
5. Monitor vital signs.

6. Assist client with self-care.
7. Provide care for the unconscious client if in a coma.
8. Discuss with client the reasons ketosis developed and provide additional diabetic teaching if indicated.

Insulin Reaction/Hypoglycemia

A. General information
1. Abnormally low blood sugar, usually below 50 mg/dL
2. Usually caused by insulin overdosage, too little food, nutritional and fluid imbalances from nausea and vomiting, excessive exercise
3. Onset rapid; may develop in minutes to hours

B. Assessment findings
1. Headache, dizziness, difficulty with problem solving, restlessness, hunger, visual disturbances
2. Slurred speech; alterations in gait; decreasing LOC; pallor, cold, clammy skin; diaphoresis
3. Diagnostic test: serum glucose level 50–60 mg/dL or lower

C. Nursing interventions
1. Administer oral sugar in the form of candy or orange juice with sugar added if the client is alert.
2. If the client is unconscious, administer 20–50 mL 50% dextrose IV push, or 1 mg glucagon IM, IV, or SC, as ordered.
3. Explore with client reasons for hypoglycemia and provide additional diabetic teaching as indicated.

Hyperglycemic Hyperosmolar Nonketotic Coma (HHNK)

A. General information
1. Complication of diabetes, characterized by hyperglycemia and a hyperosmolar state without ketosis
2. Occurs in non-insulin-dependent diabetics or nondiabetic persons (typically elderly clients)
3. Precipitating factors: undiagnosed diabetes; infections or other stress; certain medications (e.g., Dilantin, thiazide diuretics); dialysis; hyperalimentation; major burns; pancreatic disease

B. Assessment findings
1. Similar to ketoacidosis but without Kussmaul respirations and acetone breath
2. Laboratory tests
   a. Blood glucose level extremely elevated (greater than 600 mg/dL)
   b. BUN, creatine, hct elevated (due to dehydration)
   c. Urine positive for glucose

C. Nursing interventions: treatment and nursing care is similar to DKA, excluding measures to treat ketosis and metabolic acidosis.

Sample Questions

425. A client was admitted to the hospital for uncontrolled diabetes. Lab studies reveal a fasting blood sugar of 310 mg/dL. The client is informed that Type 1 diabetes has a characteristic feature. What is it?
1. It is associated with the destruction of beta cells.
2. It usually causes complete fat metabolism.
3. It often occurs in obese individuals.
4. It is rarely controlled.

426. A diabetic client who is taking regular and NPH insulin asks why she must mix the two insulins. What would be the explanation for mixing regular and NPH insulin?
1. Immediate onset of the regular insulin.
2. Onset of the regular insulin within 2 hours.
3. A peak action of the NPH insulin at 2 hours.
4. A total duration of action of 24 hours.

427. A female client has a simple goiter. She is being seen by the community health nurse for teaching and follow-up regarding nutritional deficiencies related to her goiter. The client's problems are most likely associated with which nutritional deficiency?
1. Calcium.
2. Iodine.
3. Iron.
4. Sodium.

428. The nurse is teaching a woman who has a simple goiter. The nurse teaches the client that to enhance glandular function, she should eliminate which of the following foods?
1. Corn.
2. Milk.
3. Turnips.
4. Watermelon.

429. A client is admitted to the hospital with Addison's disease. He has a respiratory infection. When the client's vital signs are assessed, his blood pressure is 90/40. Why should the nurse notify the physician immediately?
1. Blood gases need to be drawn.
2. Seizure activity is imminent.
3. Shock may be developing.
4. The reading is atypical.

430. A client who is diagnosed with Addison's disease is admitted to the hospital. Which of the following would the nurse expect to find when assessing the client?

1. Acne.
2. Hyperpigmentation.
3. Moon face.
4. Supraclavicular fat pads.

431. A client who is diagnosed as having Addison's disease is receiving teaching about his disease from the nurse. Which statement the client makes indicates to the nurse that he understands the teaching?

1. "I should avoid strenuous exercise during hot weather."
2. "I should not eat salty foods."
3. "I need to take medication only when I am having symptoms."
4. "I should eat foods such as bananas and oranges several times daily."

432. The nurse is teaching a person who has Addison's disease about drug therapy for his condition. In evaluating the effectiveness of teaching regarding drug therapy, what should the client know and be able to verbalize?

1. To avoid antibiotics.
2. For lifelong therapy.
3. To taper the steroid dose.
4. To receive alternate-day therapy.

433. A client is newly diagnosed with Type 1 diabetes. She is hospitalized for insulin dose stabilization and is being taught insulin administration and self-monitoring of blood glucose (SMBG) levels. What is the major benefit of self-monitoring of blood glucose levels?

1. Blood glucose is maintained at close to normal levels.
2. Materials and laboratory expenses are cost efficient.
3. Dependence on the health care system is reduced.
4. Larger but fewer doses of insulin are required.

434. The nurse is teaching an adult client who has Type 1 diabetes mellitus about ketoacidosis. What is the primary cause for the development of ketoacidosis?

1. A GI disturbance.
2. An insulin overdosage.
3. Omitted meals.
4. Not taking insulin regularly.

435. A client is to have the following diagnostic procedures: serum T_3 and T_4, carotid arteriogram, and thyroid scan. In what order should the nurse schedule the tests?

1. Arteriogram, serum T_3 and T_4, scan.
2. Serum T_3 and T_4, scan, arteriogram.
3. Arteriogram, scan, serum T_3 and T_4.
4. Serum T_3 and T_4, arteriogram, scan.

436. After reading about the procedure for his upcoming thyroid scan, a client expresses concern about the dangers of being "radioactive" after the test. Which understanding about the test should guide the nurse's response?

1. There is no danger because the thyroid scan no longer involves the use of a radioactive isotope.
2. The radioactive isotope is only a tracer dose, which is not harmful to the client or others close to him.
3. The client must avoid close contact with others for 5 days following the test.
4. Wearing a lead shield during the test will protect the client from radioactivity.

437. The nurse is explaining to a client about a radioactive iodine uptake test. Which of the following OTC medications should the nurse advise the client to avoid prior to the test?

1. Antiflatulents.
2. Poison ivy remedies.
3. Cough syrups.
4. Antifungal agents.

438. Select the most accurate explanation by the nurse to a client who is to have an oral glucose tolerance test and needs to understand the procedure.

1. "You will go to the laboratory and your blood will be drawn."
2. "After you drink a concentrated glucose solution, you cannot eat or drink anything until your blood is drawn."
3. "You will eat a large meal and your blood will be drawn 2 hours later."
4. "Your blood will be drawn, you will drink a concentrated glucose solution, and your blood will be drawn again."

439. An adult is suffering from adrenocortical insufficiency and is placed on glucocorticoid therapy. The nurse plans to include which of the following administration directions?

1. "You will need to take the large dose of the medication at bedtime and the smaller dose in the morning until the prescription is finished."

2. "You will need to take the medication at bedtime for life."
3. "You will need to take the medication in the morning until the prescription is finished."
4. "You will need to take the large dose of the medication in the morning and the smaller dose in the afternoon for life."

440. Which assessment is most important for the nurse to make when monitoring a client with a pituitary tumor that secretes ACTH?
1. Height.
2. Blood pressure.
3. Pulse rate.
4. Output.

441. The nurse is caring for a client who underwent surgical hypophysectomy. Which of the following assessments is most essential for the nurse to make immediately post-op?
1. Blood pressure.
2. Serum calcium levels.
3. Patent catheter.
4. Bowel sounds.

442. An adult has had a hypophysectomy with a complete removal of the pituitary gland. Which of the following statements represents to the nurse the most complete understanding of follow-up care?
1. "I will need to wear a Medic-Alert bracelet."
2. "I will need to take hormone replacements for the next 2 months."
3. "I will need to wear a Medic-Alert bracelet and take hormone replacements for the next year."
4. "I will need to have lifelong follow-up, to take hormone replacement therapy for the rest of my life, and to wear a Medic-Alert bracelet."

443. A client is admitted with a posterior pituitary tumor and is experiencing diabetes insipidus, a complication of that tumor. Which nursing diagnosis is most appropriate for this client?
1. Fluid volume excess.
2. Deficient fluid volume.
3. Bowel incontinence.
4. Diarrhea.

444. A client who has been taking prednisone to treat lupus erythematosus has discontinued the medication because of lack of funds to buy the drug. When the nurse becomes aware of the situation, which assessment is most important for the nurse to make first?
1. Breath sounds.
2. Capillary refill.
3. Blood pressure.
4. Skin integrity.

445. An adult is readmitted to the medical/surgical care unit in addisonian crisis. He is exhibiting signs of tachycardia, dehydration, hyponatremia, hyperkalemia, and hypoglycemia. What will the initial orders for this client include?
1. Administration of oxygen via 100% nonrebreathing mask.
2. Starting an IV solution of saline and dextrose.
3. Administering potassium chloride.
4. Preparing for an emergency tracheostomy.

446. A female client is suffering from Cushing's syndrome. She is constantly lashing out at her coworkers and family. Her husband informs the nurse of this behavior. What condition does the nurse interpret from this behavior?
1. Mineralocorticoid excess.
2. Glucocorticoid excess.
3. Activity intolerance.
4. Sensory-perceptual alterations.

447. A nurse at a weight loss center assesses a client who has a large abdomen and a rounded face. Which additional assessment finding would lead the nurse to suspect that the client has Cushing's syndrome rather than obesity from imbalance of food intake and body need?
1. Large thighs and upper arms.
2. Pendulous abdomen and large hips.
3. Abdominal striae and ankle enlargement.
4. Posterior neck fat pad and thin extremities.

448. A client has primary aldosteronism. Which assessment findings would the nurse expect to find initially?
1. Decreased serum sodium and potassium.
2. Decreased blood glucose and elevated temperature.
3. Tachycardia and albuminuria.
4. Hypertension and decreased serum potassium.

449. A client who is suspected of having a pheochromocytoma complains of sweating, palpitations, and headache. Which assessment is essential for the nurse to make first?
1. Pupil reaction.
2. Hand grips.
3. Blood pressure.
4. Blood glucose.

450. An adult is to have a bilateral adrenalectomy. The nurse is performing preoperative teaching. The client asks the nurse "What will I look like after surgery?" What is the nurse's best response?

1. "Don't worry about that now. You need to concentrate on the surgery."
2. "You will only have a small incision."
3. "I know you are worried, maybe we should resume the education session later."
4. "You're appearance won't change immediately after surgery."

451. An adult has undergone a bilateral adrenalectomy. Which of the following demonstrates to the nurse the best understanding of long-term care needs?

1. When I run out of the medication the doctor gave me, I can stop taking the hormones.
2. I can take the steroid replacement therapy once every 3 days.
3. I need to take the steroid replacement therapy every day. I should not alter the dose or stop taking it.
4. I can take the dose of the medication when I feel stressed.

452. An adult is admitted to the hospital for removal of a simple goiter. What is the cause of a simple goiter?

1. Low intake of fat-free foods.
2. Excessive thyroid-stimulating hormone (TSH) stimulation.
3. Excessive adrenocorticotropic hormone (ACTH) stimulation.
4. Low intake of goitrogenic foods.

453. An adult is currently being treated at the clinic for Graves' disease. It is essential for the nurse to assess for which of the following signs immediately?

1. Goiter.
2. Tachycardia.
3. Constipation.
4. Hypothermia.

454. A 35-year-old female visits her managed care physician for an annual physical examination. Routine laboratory studies reveal thyroxine (T_4) and triiodothyronine (T_3) levels are elevated, whereas the thyroid-stimulating hormone (TSH) level was undetectable. What condition would the nurse suspect?

1. Hypothyroidism.
2. Addisonian crisis.
3. Hypoparathyroidism.
4. Hyperthyroidism.

455. An adult who is newly diagnosed with Graves' disease asks the nurse "Why do I need to take propranolol (Inderal)?" Based on the nurse's understanding of the medication and Graves' disease, what would be the best response?

1. "The medication will limit thyroid hormone secretion."
2. "The medication will inhibit synthesis of thyroid hormones."
3. "The medication will relieve the symptoms of Graves' disease."
4. "The medication will increase the synthesis of thyroid hormones."

456. The nurse is preparing a room to receive a client immediately post-thyroidectomy. The nurse should be sure that which of the following equipment is available at the bedside?

1. Nasogastric tray.
2. Central venous tray set-up.
3. Tracheostomy tray.
4. Lumbar puncture tray.

457. An adult had a total thyroidectomy. Which statement by the client demonstrates to the nurse an adequate understanding of long-term care?

1. "I will need to take replacement hormones for the rest of my life."
2. "I should try to avoid stress and be alert for signs of recurrent hyperthyroidism."
3. "Thank goodness this is over, I will never have to worry about weight problems again!"
4. "I should increase my caloric intake to replace what I lost during the surgery."

458. The nurse is caring for a client who is status post-thyroidectomy. The client is exhibiting hyperreflexia, muscle twitching, and spasms. What is the first action the nurse should perform?

1. Assess for additional signs of tetany.
2. Prepare to send a blood sample to the laboratory for a calcium level.
3. Place the client in semi-Fowler's position.
4. Administer post-op pain medication.

459. An adult who has Graves' disease just received a dose of sodium ^{131}I. Which of the following statements made to the nurse best demonstrates an understanding of immediate care needs?

1. "I should be able to go home after about 2 hours if I don't have any vomiting."
2. "I have my belongings with me to stay in the isolation room for the next 24 hours."

3. "My daughter is pregnant, so I told her I will not be able to see her for the next month."
4. "I brought my antithyroid drug with me so I will not miss a dose."

460. An adult has had hypoparathyroidism for 20 years. The client has come in to the center for a check-up. For what condition should the nurse assess?
1. Hypothermia.
2. Hyperthermia.
3. Tetany.
4. Hypertension.

461. A client who is newly diagnosed with Type 1 diabetes asks the nurse "Why can't I take a pill for my diabetes like my neighbor?" Select the statement that states the primary difference between Type 1 and Type 2 diabetes.
1. Type 1 diabetes and Type 2 diabetes can be controlled with injections of antibodies.
2. Type 1 diabetes is the result of autoimmune destruction of beta cell function in the pancreas, whereas Type 2 diabetes is the result of the lack of responsiveness of beta cells to insulin.
3. Type 1 diabetes insulin production is a circadian function, whereas in Type 2 diabetes, insulin production depends on serum glucose levels.
4. Type 1 diabetes has a complication known as hyperglycemic hyperosmolar nonketosis, whereas Type 2 diabetes has a complication known as diabetic ketoacidosis.

462. The nurse administers the client's morning dose of regular insulin at 0730. The nurse should anticipate to observe the client for a hypoglycemic reaction at which of the following times?
1. Immediately.
2. 1000.
3. 1300.
4. 1930.

463. The nurse is planning an education session for a client newly diagnosed with diabetes. Which concept is essential to include when developing the plan of care?
1. All diabetic teaching needs to be accomplished within 20 hours before discharge.
2. Insulin injection sites should be cleaned with iodine prior to injection.
3. Snacks should be ingested prior to physical exercise.
4. Urine sugar levels should be checked prior to insulin administration.

464. The nurse is attending a bridal shower for a friend when another guest starts to tremble and complains of dizziness. The nurse notices a medical alert bracelet for diabetes. What will be the nurse's best action?
1. Encourage the guest to eat some baked ziti.
2. Call the guest's personal physician.
3. Offer the guest a peppermint.
4. Give the guest a glass of orange juice.

465. A woman usually administers her NPH insulin at 0600. but she plans to attend a banquet and fashion show next week, at which lunch will be served at 1400. rather than noon when she usually eats lunch. Which of the following statements demonstrates to the nurse an understanding of peak action of NPH and risk for hypoglycemia?
1. "I will administer the insulin at my regular time, it is important to adhere to my schedule."
2. "I will take the insulin at 0800. that day, as the insulin peaks in 6–12 hours."
3. "I will not take any insulin until they serve the lunch at the banquet."
4. "I will take the insulin at 1000. that day as the peak action of NPH is 4 hours after administered."

466. A man is hospitalized for an infected foot ulcer. At 1100 his blood glucose is 460 mg/dL and he has been up to the bathroom seven times this morning to urinate. What will be the nurse's best action?
1. Administer regular insulin according to the physician's sliding scale order.
2. Administer NPH insulin according to the physician's sliding scale order.
3. Notify the physician.
4. Make sure the client's urinal is close to the bed so he does not have to keep getting up.

467. A client with diabetes is displaying signs of irritability and irrational behavior during an office visit. The nurse observes visible tremors in the client's hands. Based on the client's history, how are these findings interpreted?
1. Hyperglycemia.
2. Diabetic ketoacidosis (DKA).
3. Hyperglycemic hyperosmolar nonketosis (HHNK).
4. Hypoglycemia.

468. Which statement by a woman newly diagnosed with NIDDM demonstrates to the nurse an adequate understanding of dietary needs?

1. "I will increase my intake of fat and carbohydrates."
2. "Having diabetes makes it harder for my system to digest food."
3. "I met with the dietician who said to eat carbohydrates, protein, and fats together."
4. "When will I start the TPN medication to control my sugar?"

469. The client came to the diabetic clinic for follow-up teaching on the complications of diabetes. What is a correct explanation for the result of neuropathy?

1. Microangiopathies or metabolic defects that cause by-products to accumulate in the nerve tissues.
2. Microvascular damage to the retina.
3. Macroangiopathy in the extremities.
4. End-stage renal disease.

470. The nurse is teaching a client with Type 2, non-insulin-dependent diabetes about the acute metabolic complications. Why does a client with Type 2 diabetes usually not develop diabetic ketoacidosis?

1. There is no insulin available for the state of hyperglycemia.
2. The client with Type 2 diabetes has no protein or fat reserves.
3. There is sufficient insulin to prevent the breakdown of protein and fatty acid for metabolic needs.
4. There is insufficient serum glucose concentrations.

471. The primary caretaker for a man who was recently started on an oral hypoglycemic agent is his wife. The wife should know to watch for which of the following symptoms of hypoglycemia?

1. High blood sugar readings (greater than 250 mg/dL).
2. Presence of ketones in the urine.
3. Significant increase in urine output.
4. Cold sweats, weakness, and trembling.

472. Which of the following statements by a person who has diabetes mellitus shows the nurse that he has an adequate understanding of special foot care needs?

1. "I am looking forward to the summer when I can go barefoot in my house and at the beach."
2. "I like to use a heating pad at night as I always have cold feet."
3. "I used to take a shower every other night but now I am going to wash and examine my feet every night."
4. "I have a corn on my left foot, so I am going to go to the pharmacy to get something for it right away."

473. A client took her usual NPH insulin dose at 0600, her lunch is delayed until 1300, and she begins to feel weak. Which of the following actions by the client demonstrates an understanding of her condition?

1. Administers an extra 4 units of regular insulin.
2. Administers an additional 4 units of NPH insulin.
3. Takes a nap.
4. Drinks a cup of milk and then eats her lunch.

474. The nurse is teaching a client about diabetic management. The client asks the nurse "What is a hemoglobin A1c test?" What is the most appropriate answer by the nurse?

1. "The hemoglobin A1c is a blood test that evaluates glycemic control over a 3-month time period by measuring the glucose attached to hemoglobin."
2. "The hemoglobin A1c is a blood test that measures the glucose attached to hemoglobin molecule over the last 7 days."
3. "The hemoglobin A1c test is a kidney test that measures protein to evaluate glucose control over the last 7 days."
4. "The hemoglobin A1c test is a urine test that measures protein to evaluate glucose control over the last few months."

Answers and Rationales

425. **1.** Type 1 diabetes mellitus, also know as insulin-dependent diabetes, occurs in individuals in whom the beta islet cells of the pancreas do not make insulin.

426. **4.** NPH insulin is an intermediate-acting insulin. Regular insulin is a rapid-acting insulin. Mixing the two gives insulin over a 24-hour period, requiring fewer injections for the client.

427. **2.** Lack of iodine in the diet is a primary contributor to the development of simple goiter.

428. **3.** Turnips belong to a classification of foods called exogenous goitrogens. Goitrogens are

thyroid-inhibiting substances and therefore should be avoided. Other goitrogens include rutabagas, cabbage, soybeans, peanuts, peaches, peas, strawberries, spinach, and radishes.

429. 3. Any emotional or physical stress, such as infection, may precipitate acute adrenal crisis with vascular collapse and shock.

430. 2. Addison's disease is characterized by bilateral hypofunction of the adrenal cortex, resulting in insufficient production of adrenal steroids including cortisol and aldosterone. There is increased production of melanocyte stimulating hormone (MSH), which stimulates production of melanin, a dark pigment. Persons with Addison's disease note that their skin is darker.

431. 1. If the person with Addison's perspires heavily he will lose sodium and fluid and become hyponatremic and hypovolemic. He should avoid strenuous exercise during hot weather.

432. 2. Addison's disease cannot be cured but it is controlled with lifelong hormone replacement.

433. 1. Self-monitoring of blood glucose has become an important part of diabetes management. Maintaining good control of blood sugar reduces complications. This is the best method to keep close control.

434. 4. In order to meet metabolic demand insulin must be taken on a regular basis. Ketoacidosis occurs when there is a lack of insulin in relation to metabolic demands.

435. 2. The blood work can be done quickly without preparation, while the remaining tests must be scheduled in advance. The scan must precede the arteriogram, because the arteriogram dye contains iodine that will interfere with the scan.

436. 2. The tracer dose used is much smaller than a therapeutic dose and is not harmful. The client can resume contact with others immediately following the test.

437. 3. Many cough syrups contain iodine, which interferes with the test. Other OTC drugs to be avoided include salicylates, multivitamins, and some iodine-containing preparations found in health food stores.

438. 4. A fasting blood glucose is drawn before Glucola is administered. The client can drink only water as blood samples are obtained at designated intervals.

439. 4. Adrenal insufficiency requires lifelong glucocorticoid replacement therapy. Glucocorticoids are given in divided doses, two-thirds in the morning and one-third in the afternoon to reflect the body's own circadian rhythm, which decreases the side effects of therapy.

440. 2. ACTH-secreting tumors can cause Cushing's syndrome, which can elevate the blood pressure to dangerously high levels.

441. 1. Hypophysectomy (removal of the pituitary gland) interferes with the secretion of both glucocorticoids and antidiuretic hormone, both of which are essential to maintain fluid balance and blood pressure. Careful monitoring of blood pressure is essential to ensure that hormone replacement therapy is adequate.

442. 4. Hormone replacement and follow-up care are needed for the rest of the client's life because the pituitary gland has been removed. This is the master gland that secretes trophic hormones that stimulate target glands to produce their hormones. A Medic-Alert bracelet is needed to alert others of the client's condition.

443. 2. Diabetes insipidus is characterized by polydipsia and polyuria. It occurs with lesions of the hypothalamus and pituitary. Because antidiuretic hormone synthesis is affected, the client is at high risk for dehydration, which is life-threatening.

444. 3. Withdrawal from glucocorticoid therapy can precipitate addisonian crisis, which is characterized by circulatory collapse and shock. Hypotension is a major manifestation of addisonian crisis and must be treated vigorously.

445. 2. Management of addisonian crisis includes glucocorticoid management. Intravenous replacement of sodium and dextrose is also necessary.

446. 1. Cushing's syndrome is caused by excessive corticosteroids. Excessive mineralocorticoid produces hypertension, acne, changes in secondary sex characteristics, and mood disturbances such as irritability, anxiety, euphoria, insomnia, irrationality, and psychosis.

447. 4. Clients with Cushing's syndrome exhibit central obesity, with a "buffalo hump," a heavy trunk, and thin extremities. The accumulation of fat on the cheeks makes the face moon-shaped, or rounded.

448. 4. Hypertension and hyperkalemia are the classic manifestations of primary aldosteronism, in which the adrenal cortex secretes excessive mineralocorticoid.

449. 3. Clients with pheochromocytoma can experience episodes of life-threatening hypertension when the adrenal tumor secretes catecholamines that stimulate the sympathetic nervous system. These attacks are often accompanied by sweating, palpitations, and headache.

450. 4. The client will have to take corticosteroids life-long, but the physical changes they may cause take time to present. Explaining all treatment and procedures can reduce the patient's stress and anxiety level for now.

451. 3. Without adrenal glands there is a lifelong need for a constant dose for replacement therapy daily.

452. 2. A simple goiter is an enlargement of the thyroid gland caused by excess thyroid-stimulating hormone (TSH) stimulation, growth-stimulating hormones, or excessive intake of goitrogenic foods.

453. 2. The client with Graves' disease is at risk for tachycardia, shock, hyperthermia, weight loss, and nervousness.

454. 4. Thyroxine and triiodothyronine levels are usually elevated and thyroid-stimulating hormone levels may be normal or undetectable in hyperthyroidism.

455. 3. Propranolol (Inderal) is a beta-adrenergic blocker that will relieve the symptoms of Graves' disease caused by increased circulating thyroid hormone. The symptoms are heat intolerance, palpitations, nervousness, tachycardia, and tremors.

456. 3. Oxygen, suction equipment, and a tracheostomy tray should be available in case airway obstruction occurs.

457. 1. The administration of thyroid hormone is needed after surgery because there is no thyroid gland to perform the usual functions.

458. 2. During a thyroidectomy it is possible for the parathyroid glands to be removed or damaged. If the parathyroid glands are disturbed, hypocalcemia may result.

459. 1. The client remains in the outpatient department for about 2 hours to be monitored for vomiting.

460. 3. The signs and symptoms of hypoparathyroidism are due to low serum calcium levels. A decrease in serum calcium may produce tetany. Tetany produces tingling in lips, fingers, and feet. Severe tetany is associated with muscle spasms.

461. 2. Type 1 diabetes arises from the destruction of the beta cells, which results in little or no insulin production. Type 2 diabetes is the result of tissues being unresponsive to insulin, which eventually exhausts the production of insulin. Type 2 diabetics tend to be older than 35 years and overweight.

462. 2. The peak action for regular insulin occurs in 2 to 4 hours after administration. If regular insulin is administered at 0730, then the client should be observed for hypoglycemia between 0930 and 1130.

463. 3. Snacks should be eaten prior to any exercise so glucose is readily available for the body's use.

464. 4. A conscious client experiencing hypoglycemia needs 5–20 grams of simple carbohydrates immediately. A 4–6 oz glass of orange juice would provide enough glucose to counteract hypoglycemia.

465. 2. The peak action for NPH is 6 hours after administration; therefore, delaying the administration 2 hours in the morning will allow the client to safely eat lunch at 1400.

466. 1. At the first sign of diabetic ketoacidosis (elevated blood glucose and frequent urination) the nurse should administer insulin per physician's order to stabilize the blood glucose level.

467. 4. Hypoglycemia or low blood glucose occurs when there is more insulin than glucose in the serum or when blood glucose levels drop too rapidly. The signs of hypoglycemia include irritability, irrational behavior, dizziness, tremors, or loss of consciousness.

468. 3. The client states the recommendation by the American Diabetes Association and may also use the Exchange List, knowing that eating the different groups will help keep the blood glucose from going up too quickly.

469. 1. Neuropathy is one of the most common complications of diabetes caused by microangiopathies or metabolic defects that cause waste to build up in the nerves, resulting in demyelinization.

470. 3. A client with Type 2 diabetes is more likely to have hyperglycemic hyperosmolar nonketosis because there is sufficient insulin to prevent the metabolism of protein and fats for basic energy needs.

471. 4. The cardinal signs of hypoglycemia are cold sweats, weakness, and trembling. Additional signs include nervousness, irritability, pallor, increased heart rate, confusion, and fatigue.

472. 3. The client with diabetes should wash the feet daily and examine for cuts, blisters, swelling, and any red, tender spots.

473. 4. The client is experiencing low blood sugar or hypoglycemia; ingesting a quick-acting carbohydrate source is the best action.

474. 1. Glycosylated hemoglobin, also known as the hemoglobin A1c test, is used to determine glycemic control over time. Glucose attaches to hemoglobin and remains there for the life of the blood cell (120 days); therefore, the test indicates the overall glucose level of 120 days.

The Integumentary System

OVERVIEW OF ANATOMY AND PHYSIOLOGY

The integumentary system consists of the skin and its appendages, such as hair, nails, and various glands. The integumentary system not only provides a barrier against the external environment, it also plays a role in maintenance of the body's internal environment.

Skin

A. Functions
- **1.** Protection: barrier to noxious agents (microorganisms, parasites, chemical substances) and to loss of water and electrolytes
- **2.** Thermoregulation: radiant cooling, evaporation
- **3.** Sensory perception: touch, temperature, pressure, pain
- **4.** Metabolism: excretion of water and sodium, production of vitamin D, wound repair

B. Layers (see Figure 4-27)
- **1.** Epidermis
  - **a.** The avascular outermost layer
  - **b.** Stratified into several layers
  - **c.** Composed mainly of keratinocytes and melanocytes
    - **1)** Keratinocytes produce keratin, responsible for formation of hair and nails
    - **2)** Melanocytes produce melanin, a pigment that gives color to skin and hair
  - **d.** Appendages (hair and nails, eccrine sweat glands, sebaceous glands, apocrine sweat glands) all derived from epidermis

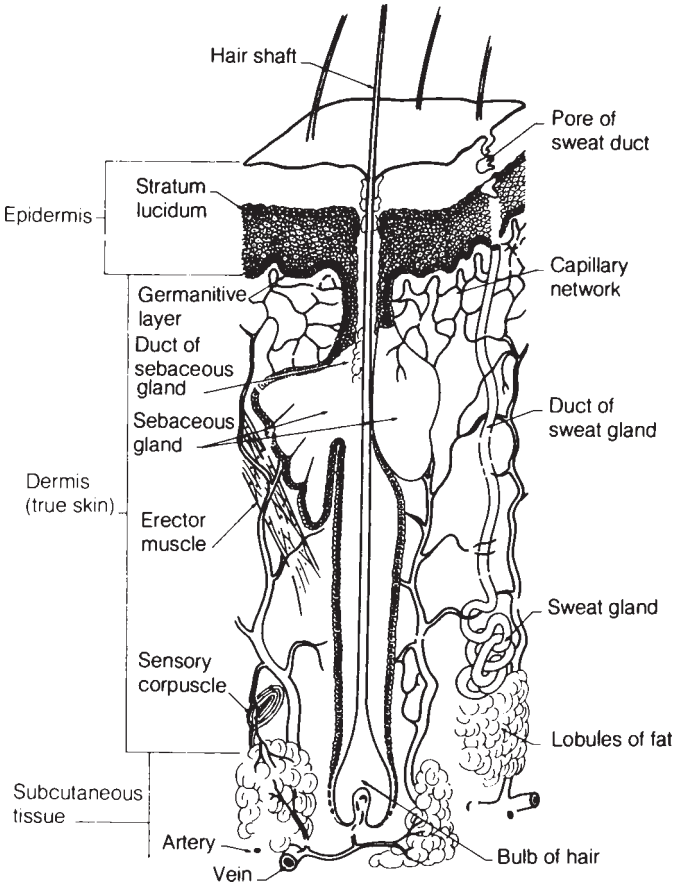


Figure 4-27 Cross-section of skin: observe the skin layers and note the location of the glands in the dermal layer

2. Dermis: layer beneath the epidermis composed of connective tissue that contains lymphatics, nerves, and blood vessels; elasticity of skin results from presence of collagen, elastin, and reticular fibers in the dermis, which also nourish the epidermis
3. Subcutaneous layer: layer beneath the dermis composed of loose connective tissue and fat cells; stores fat; important in temperature regulation

Hair

A. Covers most of the body surface (except palms of hands, soles of feet, lips, nipples, and parts of external genitalia).
B. Hair follicles: tube-like structures, derived from epidermis, from which hair grows.
C. Hair functions as protection from external elements and from trauma.
D. Hair growth is controlled by hormonal influences and by blood supply.
E. Loss of body hair is called alopecia.

Nails

A. Dense layer of flat, dead cells; filled with keratin
B. Systemic illnesses may be reflected by changes in the nail or its bed; common changes include:
1. Clubbing: enlargement of fingers and toes, nail becomes convex; caused by chronic pulmonary or cardiovascular disease
2. Beau's line; transverse groove caused by temporary halt in nail growth because of systemic disorder

Glands

A. Eccrine sweat glands: located all over the body; participate in heat regulation
B. Apocrine sweat glands: odiferous glands, found primarily in axillary, nipple, anal, and pubic areas; bacterial decomposition of excretions causes body odor
C. Sebaceous glands: oil glands, located all over the body except for palms of hands and soles of feet (abundant on face, scalp, upper chest, and back); produce sebum

ASSESSMENT

Health History

A. Presenting problem: symptoms may include changes in color or texture of skin, hair, nails; pruritus; infections; tumors; lesions; dermatitis; ecchymoses; rashes; dryness
B. Lifestyle: hygienic practices (skin-cleansing measures, use of cosmetics [type, brand names]); skin exposure (duration of exposure to sun, irritants [occupational], cold weather)
C. Nutrition/diet: intake of vitamins, essential nutrients, water; food allergies
D. Use of medications: steroids, vitamin use, hormones, antibiotics, chemotherapeutic agents
E. Past medical history: renal, hepatic, or collagen diseases; trauma or surgery; food, drug, or contact allergies
F. Family history: diabetes mellitus, allergic disorders, blood dyscrasias, specific dermatologic problems, cancer

Physical Examination

A. Color: note areas of uniform color; pigmentation; redness, jaundice, cyanosis.
B. Vascular changes
1. Purpuric lesions: note ecchymoses, petechiae.
2. Vascular lesions: note angiomas, hemangiomas, venous stars.
C. Lesions: note color, type, size, distribution, location, consistency, grouping (annular, circular, linear, or clustered).
D. Edema: differentiate pitting from nonpitting.
E. Moisture content: note dryness, clamminess.
F. Temperature: note whether increased or decreased, distribution of temperature changes.
G. Texture: note smoothness, coarseness.
H. Mobility/turgor: note whether increased or decreased.

Laboratory/Diagnostic Studies

A. Blood chemistry/electrolytes: calcium, chloride, magnesium, potassium, sodium
B. Hematologic studies: Hbg, HCT, RBC, WBC
C. Biopsy
1. Removal of a small piece of skin for examination to determine diagnosis
2. Nursing care: instruct client to keep biopsied area dry until healing occurs
D. Skin testing
1. Administration of allergens or antigens on the surface of or into the dermis to determine hypersensitivity
2. Three types: patch, scratch, and intradermal

ANALYSIS

Nursing diagnoses for clients with a disorder of the integumentary system may include:
A. Impaired skin integrity
B. Pain
C. Disturbed body image
D. Risk for infection
E. Ineffective airway clearance
F. Ineffective peripheral tissue perfusion

PLANNING AND IMPLEMENTATION

Goals

A. Restoration of skin integrity.
B. Client will experience absence of pain.
C. Client will adapt to changes in appearance.
D. Client will be free from infection.
E. Maintenance of effective airway clearance.
F. Maintenance of adequate peripheral tissue perfusion.

Interventions

Skin Grafts

A. Replacement of damaged skin with healthy skin to provide protection of underlying structures or to reconstruct areas for cosmetic or functional purposes
B. Graft sources
  1. Autograft: client's own skin
  2. Isograft: skin from a genetically identical person (identical twin)
  3. Homograft or allograft: cadaver of same species
  4. Heterograft or xenograft: skin from another species (such as a porcine graft)
  5. Human amniotic membrane
C. Nursing care: preoperative
  1. Donor site: cleanse with antiseptic soap the night before and morning of surgery as ordered.
  2. Recipient site: apply warm compresses and topical antibiotics as ordered.
D. Nursing care: postoperative
  1. Donor site
    a. Keep area covered for 24–48 hours.
    b. Use bed cradle to prevent pressure and provide greater air circulation
    c. Outer dressing may be removed 24–72 hours postsurgery; maintain fine mesh gauze (innermost dressing) until it falls off spontaneously.
    d. Trim loose edges of gauze as it loosens with healing.
    e. Administer analgesics as ordered (more painful than recipient site).
  2. Recipient site
    a. Elevate site when possible.
    b. Protect from pressure (use bed cradle).
    c. Apply warm compresses as ordered.
    d. Assess for hematoma, fluid accumulation under graft.
    e. Monitor circulation distal to graft.
  3. Provide emotional support and monitor behavioral adjustments; refer for counseling if needed.
E. Provide client teaching and discharge planning concerning
  1. Applying lubricating lotion to maintain moisture on surfaces of healed graft for at least 6–12 months
  2. Protecting grafted skin from direct sunlight for at least 6 months
  3. Protecting graft from physical injury
  4. Need to report changes in graft (fluid accumulation, pain, hematoma)
  5. Possible alteration in pigmentation and hair growth; ability to sweat lost in most grafts
  6. Sensations may or may not return

EVALUATION

A. Healing of burned areas; absence of drainage, edema, and pain over graft sites.
B. Relaxed facial expression/body posture; achieves effective rest patterns; participates in daily activities without pain.
C. Incorporates changes into self-concept without negating self-esteem; verbalizes about changes that occurred; demonstrates interest in physical appearance.
D. Achieves wound healing; vital signs within normal range; lungs clear; laboratory studies within normal range.
E. Lungs clear to auscultation; respiratory rate and depth within normal limits; free of dyspnea.
F. Palpable peripheral pulses of equal quality; adequate capillary refill; skin color normal in uninjured areas.

DISORDERS OF THE INTEGUMENTARY SYSTEM

Primary Lesions of the Skin

A. Macule: a flat, circumscribed area of color change in the skin without surface elevation, up to 2 cm in diameter
B. Papule: a circumscribed solid and elevated lesion, up to 1 cm in size
C. Nodule: a solid, elevated lesion extending deeper into the dermis, 1–2 cm in diameter
D. Wheal: a slightly irregular, transient superficial elevation of the skin with a palpable margin (e.g., hive)
E. Vesicle: circumscribed elevated lesion filled with serous fluid, less than 1 cm in diameter
F. Bulla: a vesicle larger than 1 cm in diameter
G. Pustule: a vesicle or bulla containing purulent exudate

Contact Dermatitis

A. General information
  1. An irritation of the skin from a specific substance or from a hypersensitivity immune reaction from contact with a specific antigen

2. Caused by irritants (mechanical, chemical, biologic); allergens

B. Assessment findings
   1. Pruritus
   2. Erythema; localized edema; vesicles (oozing, crusting, and scaling [later])
   3. Diagnostic test: skin testing reveals hypersensitivity to specific antigen

C. Nursing interventions
   1. Apply wet dressings of Burrow's solution for 20 minutes 4 times a day to help clear oozing lesions.
   2. Provide relief from pruritus (see Cirrhosis of the Liver).
   3. Administer topical steroids and antibiotics as ordered.
   4. Provide client teaching and discharge planning concerning
      a. Avoidance of causative agent
      b. Preventing skin dryness
         1) Use mild soaps (Ivory).
         2) Soak in plain water for 20–30 minutes.
         3) Apply prescribed steroid cream immediately after bath.
         4) Avoid extremes of heat and cold.
      c. Allowing crusts and scales to drop off skin naturally as healing occurs
      d. Avoidance of wool, nylon, or fur fibers on sensitive skin
      e. Need to use gloves if handling irritant or allergenic substances

Psoriasis

A. General information
   1. Chronic type of dermatitis that involves accelerated turnover rate of the epidermal cells
   2. Predisposing factors include stress, trauma, infection; changes in climate may produce exacerbations; familial predisposition to the disease

B. Medical management
   1. Topical corticosteroids
   2. Coal tar preparations
   3. Ultraviolet light
   4. Antimetabolites (methotrexate)

C. Assessment findings
   1. Mild pruritus
   2. Sharply circumscribed scaling placques that are mostly present on the scalp, elbows, and knees; yellow discoloration of nails

D. Nursing interventions
   1. Apply occlusive wraps over prescribed topical steroids.
   2. Protect areas treated with coal tar preparations from direct sunlight for 24 hours.
   3. Administer methotrexate as ordered, assess for side effects.
   4. Provide client teaching and discharge planning concerning
      a. Feelings about changes in appearance of skin (encourage client to cover arms and legs with clothing if sensitive about appearance)
      b. Importance of adhering to prescribed treatment and avoidance of commercially advertised products

Acne

See Unit 5.

Pediculosis

See Unit 5.

Skin Cancer

A. General information
   1. Types of skin cancers
      a. Basal cell epithelioma: most common type of skin cancer; locally invasive and rarely metastasizes; most frequently located between the hairline and upper lip
      b. Squamous cell carcinoma (epidermoid): grows more rapidly than basal cell carcinoma and can metastasize; frequently seen on mucous membranes, lower lip, neck, and dorsum of the hands
      c. Malignant melanoma: least frequent of skin cancers, but most serious; capable of invasion and metastasis to other organs
   2. Precancerous lesions
      a. Leukoplakia: white, shiny patches in the mouth and on the lip
      b. Nevi (moles): junctional nevus may become malignant (signs include a color change to black, bleeding, and irritation); compound and dermal nevi unlikely to become cancerous
      c. Senile keratoses: brown, scalelike spots on older individuals
   3. Contributing factors include hereditary predisposition (fair, blue-eyed people; redheads and blondes); irritation (chemicals or ultraviolet rays)
   4. Occurs more often in those with outdoor occupations who are exposed to more sunlight

B. Medical management: varies depending on type of cancer; surgical excision with or without radiation therapy most common; chemotherapy and immunotherapy for melanoma

C. Assessment findings: characteristics depend on specific type of lesion; biopsy reveals malignant cells

D. Nursing interventions: provide client teaching concerning:
   1. Limitation of contact with chemical irritants
   2. Protection against ultraviolet radiation from sun

a. Wear thin layer of clothing.
b. Use sun block or lotion containing para-amino benzoic acid (PABA).

3. Need to report lesions that change characteristics and/or those that do not heal.

Herpes Zoster (Shingles)

A. General information
1. Acute viral infection of the nervous system
2. The virus causes an inflammatory reaction in isolated spinal and cranial sensory ganglia and the posterior gray matter of the spinal cord
3. Contagious to anyone who has not had varicella or who is immunosuppressed
4. Caused by activation of latent varicella-zoster virus

B. Medical management
1. Analgesics
2. Corticosteroids
3. Acetic acid compresses
4. Acyclovir (Zovirax)

C. Assessment findings
1. Neuralgic pain, malaise, itching, burning
2. Cluster of skin vesicles along course of peripheral sensory nerves, usually unilateral and primarily on trunk, thorax, or face

D. Nursing interventions
1. Apply acetic acid compresses or white petrolatum to lesions.
2. Administer medications as ordered.
a. Analgesics for pain.
b. Systemic corticosteroids: monitor for side effects of steroid therapy.
c. Acyclovir (Zovivax): antivalagent reduces severity when given early in illness.

Herpes Simplex *Virus*, Type I

A. General information
1. Causes cold sores or fever blisters, canker sores, and herpetic whitlow
2. Common disorder, frequently seen in women
3. Primary infection occurs in children, recurrences in adults
4. Self-limiting virus

B. Assessment findings: clusters of vesicles, may ulcerate or crust; burning, itching, tingling; usually appears on lip or cheek

C. Nursing interventions: keep lesions dry; apply topical antibiotics or anesthetic as ordered; antivirals (valacyclovir) may be ordered 1–3 days.

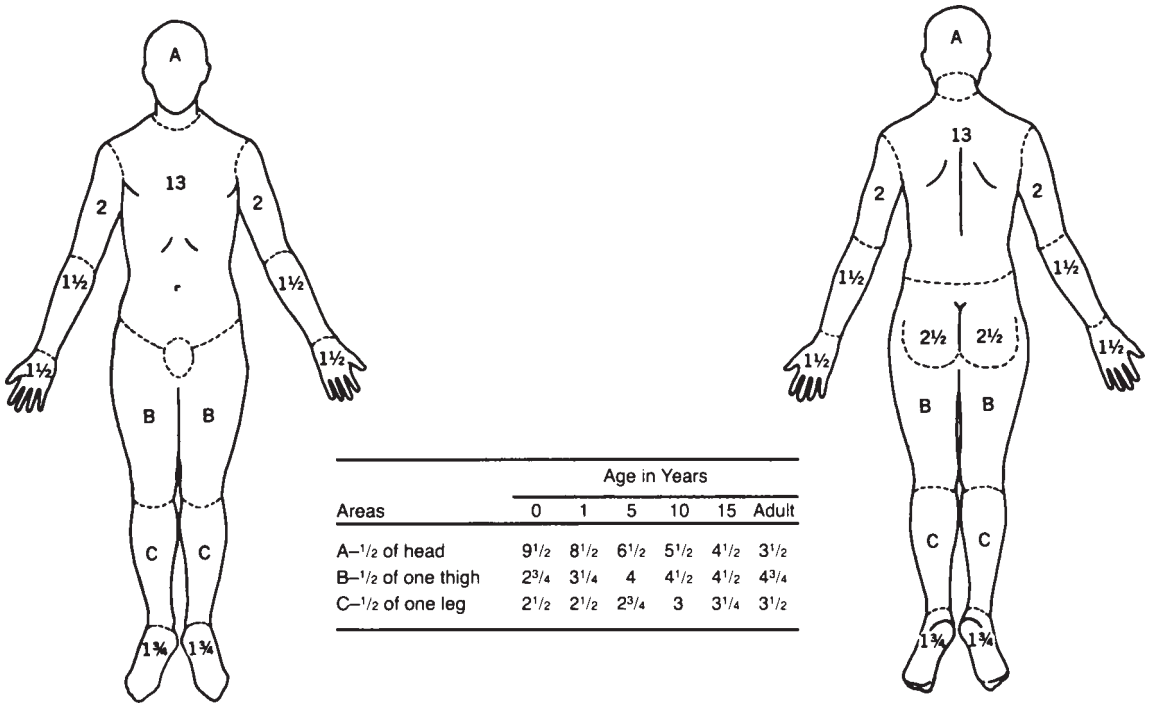
Burns

A. Types
1. Thermal: most common type; caused by flame, flash, scalding, and contact (hot metals, grease)
2. Smoke inhalation: occurs when smoke (particular products of a fire, gases, and superheated air) causes respiratory tissue damage
3. Chemical: caused by tissue contact, ingestion or inhalation of acids, alkalies, or vesicants
4. Electrical: injury occurs from direct damage to nerves and vessels when an electric current passes through the body.

B. Classification
1. Partial thickness
a. Superficial partial-thickness (first degree)
1) Depth: epidermis only
2) Causes: sunburn, splashes of hot liquid
3) Sensation: painful
4) Characteristics: erythema, blanching on pressure, no vesicles
b. Deep partial thickness (second degree)
1) Depth: epidermis and dermis
2) Causes: flash, scalding, or flame burn
3) Sensation: very painful
4) Characteristics: fluid-filled vesicles; red, shiny, wet after vesicles rupture
2. Full thickness (third and fourth degree)
a. Depth: all skin layers and nerve endings; may involve muscles, tendons, and bones
b. Causes: flame, chemicals, scalding, electric current
c. Sensation: little or no pain
d. Characteristics: wound is dry, white, leathery, or hard

C. Medical management
1. Supportive therapy: fluid management (IVs), catheterization
2. Wound care: hydrotherapy, debridement (enzymatic or surgical)
3. Drug therapy
a. Topical antibiotics: mafenide (Sulfamylon), silver sulfadiazine (Silvadene), silver nitrate, povidone-iodine (Betadine) solution
b. Systemic antibiotics: gentamicin
c. Tetanus toxoid or hyperimmune human tetanus globulin (burn wound good medium for anaerobic growth)
d. Analgesics
4. Surgery: excision and grafting

D. Assessment
1. Extent of burn injury by rule of nines: head and neck (9%); each arm (9%), each leg (18%), trunk (36%), genitalia (1%) (see Figure 4-28)
2. Lund and Browder method determines the extent of the burn injury by using client's age in proportion to relative body-part size.
3. Severity of burn
a. Major: partial thickness greater than 25%; full thickness greater than or equal to 10%
b. Moderate: partial thickness 15–25%, full thickness less than 10%
c. Minor: partial thickness less than 15%; full thickness less than 2%



Areas	Age in Years					
	0	1	5	10	15	Adult
A–1/2 of head	9½	8½	6½	5½	4½	3½
B–1/2 of one thigh	2¾	3¼	4	4½	4½	4¾
C–1/2 of one leg	2½	2½	2¾	3	3¼	3½

Figure 4-28 Body proportions change with growth. Shown here, in percentage, is the relationship of the body area to the whole body surface area at various ages. This method of determining the extent of the burned area is attributed to Lund and Browder

E. Stages
- **1.** Emergent phase
  - **a.** Remove person from source of burn.
    - **1)** Thermal: smother burn beginning with the head.
    - **2)** Smoke inhalation: ensure patent airway.
    - **3)** Chemical: remove clothing that contains chemical; lavage area with copious amounts of water.
    - **4)** Electrical: note victim position, identify entry/exit routes, maintain airway.
  - **b.** Wrap in dry, clean sheet or blanket to prevent further contamination of wound and provide warmth.
  - **c.** Assess how and when burn occurred.
  - **d.** Provide IV route if possible.
  - **e.** Transport immediately.
- **2.** Shock phase (first 24–48 hours)
  - **a.** Plasma to interstitial fluid shift causing hypovolemia; fluid also moves to areas that normally have little or no fluid (third-spacing).
  - **b.** Assessment findings
    - **1)** Dehydration, decreased blood pressure, elevated pulse, decreased urine output, thirst
    - **2)** Diagnostic tests: hyperkalemia, hyponatremia, elevated HCT, metabolic acidosis
- **3.** Fluid remobilization or diuretic phase (2–5 days postburn)
  - **a.** Interstitial fluid returns to the vascular compartment.
  - **b.** Assessment findings
    - **1)** Elevated blood pressure, increased urine output
    - **2)** Diagnostic tests: hypokalemia, hyponatremia, metabolic acidosis
- **4.** Convalescent (rehabilitation) phase
  - **a.** Starts when diuresis is completed and wound healing and coverage begin.
  - **b.** Assessment findings
    - **1)** Dry, waxy-white appearance of full thickness burn changing to dark brown; wet, shiny, and serous exudate in partial thickness
    - **2)** Diagnostic test: hyponatremia

F. Nursing interventions
- **1.** Provide relief/control of pain.
  - **a.** Administer morphine sulfate IV and monitor vital signs closely.
  - **b.** Administer analgesics/narcotics 30 minutes before wound care.
  - **c.** Position burned areas in proper alignment.
- **2.** Monitor alterations in fluid and electrolyte balance.
  - **a.** Assess for fluid shifts and electrolyte alteration (see Table 4-5).

Table 4–28 Guidelines and Formulas for Fluid Replacement for Burns

Consensus Formula	Evans Formula	Brooke Army Formula	Parkland/Baxter Formula
Lactated Ringer's: 2–4 mL × wt. in kg × % body surface area (BSA) burned. Half to be given in first 8 hr after burn; remaining fluid to be given over next 16 hr.	1. Colloids: 1 mL × wt. kg × % BSA burned 2. Electrolytes (saline): 1 mL × wt. kg × % BSA burned 3. Glucose (5% in water): 2000 mL for insensible loss Day 1: Half to be given in first 8 hr; remaining half over next 16 hr. Day 2: Half of previous day's colloids and electrolytes; all of insensible fluid replacement. Maximum of 10,000 mL over 24 hr. Second- and third-degree burns exceeding 50% BSA calculated on basis of 50% BSA.	1. Colloids: 0.5 mL × wt. kg × % BSA burned 2. Electrolytes (lactated Ringer's): 1.5 mL × wt. kg × % BSA burned 3. Glucose (5% in water): 2000 mL for insensible loss Day 1: Half to be given in first 8 hr; remaining half over next 16 hr. Day 2: Half of colloids, half of electrolytes, all of insensible fluid replacement. Second- and third-degree burns exceeding 50% BSA calculated on basis of 50% BSA.	Lactated Ringer's: 4 mL × wt. kg × % BSA burned. Day 1: Half to be given in first 8 hr; half to be given over next 16 hr. Day 2: Varies; colloid is added.

b. Administer IV fluids as ordered (see Table 4-28)
c. Monitor Foley catheter output hourly (30 mL/hour desired).
d. Weigh daily.
e. Monitor circulation status regularly.
f. Administer/monitor crystalloids/colloids/H_2O solutions.

3. Promote maximal nutritional status.
a. Monitor tube feedings/TPN if ordered.
b. When oral intake permitted, provide high-calorie, high-protein, high-carbohydrate diet with vitamin and mineral supplements.
c. Serve small portions.
d. Schedule wound care and other treatments at least 1 hour before meals.

4. Prevent wound infection.
a. Place client in controlled sterile environment.
b. Use hydrotherapy for no more than 30 minutes to prevent electrolyte loss.
c. Observe wound for separation of eschar and cellulitis.
d. Apply mafenide (Sulfamylon) as ordered.
1) Administer analgesics 30 minutes before application.
2) Monitor acid-base status and renal function studies.
3) Provide daily tubbing for removal of previously applied cream.
e. Apply silver sulfadiazine (Silvadene) as ordered.
1) Administer analgesics 30 minutes before application.
2) Observe for and report hypersensitivity reactions (rash, itching, burning sensation in unburned areas).
3) Store drug away from heat.
f. Apply silver nitrate as ordered.
1) Handle carefully; solution leaves a gray or black stain on skin, clothing, and utensils.
2) Administer analgesic before application.
3) Keep dressings wet with solution; dryness increases the concentration and causes precipitation of silver salts in the wound.
g. Apply povidone-iodine (Betadine) solution as ordered.
1) Administer analgesics before application.
2) Assess for metabolic acidosis/renal function studies.
h. Administer gentamicin as ordered: assess vestibular/auditory and renal functions at regular intervals.

5. Prevent GI complications.
a. Assess for signs and symptoms of paralytic ileus.
b. Assist with insertion of NG tube to prevent/control Curling's/stress ulcer; monitor patency/drainage.
c. Administer prophylactic antacids through NG tube and/or IV cimetidine (Tagamet) or ranitidine (Zantac) (to prevent gastric pH of less than 5).
d. Monitor bowel sounds.
e. Test stools for occult blood.

6. Provide client teaching and discharge planning concerning
   a. Care of healed burn wound
      1) Assess daily for changes.
      2) Wash hands frequently during dressing change.
      3) Wash area with prescribed solution or mild soap and rinse well with H_2O; dry with clean towel.
      4) Apply sterile dressing.
   b. Prevention of injury to burn wound
      1) Avoid trauma to area.
      2) Avoid use of fabric softeners or harsh detergents (might cause irritation).
      3) Avoid constrictive clothing over burn wound.
   c. Adherence to prescribed diet
   d. Importance of reporting formation of blisters, opening of healed area, increased or foul-smelling drainage from wound, other signs of infection
   e. Methods of coping and resocialization

Complementary and Alternative Medicine (CAM)

OVERVIEW

A. Definitions
   1. Alternative medicine is a holistic approach to health and focuses on balancing the body to achieve optimal wellness.
   2. Alternative medical systems are built upon a complex system of theory and practice and have often evolved apart from, and earlier than, the conventional medicine that is practiced in the United States.
   3. Modalities that are generally not taught widely in Western medical schools nor generally available in hospitals in the United States or other Western societies (see Table 4-29).

B. Patterns of CAM use in the United States
   1. Most clients do not tell their physician they are using CAM unless specifically asked.
   2. Estimates that one in three adults aged 35 to 49 years is using at least one CAM therapy.
   3. Higher incidence in incomes over $50,000.
   4. 42% of CAM use is for treatment of a specific disease or illness, while 58% of use is, at least in part, to prevent future illness from occurring or to maintain health and vitality.

Table 4-29 Complementary and Alternative Modalities

Modality	What It Is	Common Uses
Ayurvedic Medicine	Ayurvedic tradition believes that all illnesses, physical or mental, are a state of disharmony or imbalance in the body's systems. Diagnosis is made by feeling the pulse and looking for indicators of disharmony on the tongue. Utilizes a wide variety of modalities such as medication, herbals, and massage. Nutrition and food groups play a key role in balancing the body systems. Practiced in India for more than 5000 years.	Acute and chronic illness, promotion of health and wellness
Aromatherapy	The use of essential oils, distilled from plants, aromatherapy treats. Oils are massaged into the skin in diluted form, inhaled, or placed in water for diffusion. Aromatherapy is often used in conjunction with massage therapy, acupuncture, reflexology, herbology, chiropractic, and other holistic treatments.	Abdominal pain, stress and anxiety, insomnia, as an antiseptic, skin conditions
Massage	Manipulation of muscles and other soft tissue. Improves circulation, muscle fatigue, and promotes well-being. Multiple techniques including deep tissue, vibration, effleurage, percussion. Developed in both Western and Eastern cultures.	Back and neck pain, stress, insomnia, headache, promotion of well-being

(continues)

Table 4–29 Complementary and Alternative Modalities *(continued)*

Modality	What It Is	Common Uses
Chiropractic	Manipulation of the spine to promote balance and health. Misalignments of the spine thought to cause pressure on the spinal nerve roots. Pressure from trauma or poor posture leads to decreased function and wellness. Adjustment or manipulation of the spine corrects the misalignment and results in a more balanced state of health.	Back and neck pain, stress, insomnia, headache
Acupuncture	Based on the concept of chi, or life-force energy. Very fine needles are placed along energy lines to disperse congestion, increase energy flow, and allow the body to heal and balance.	Pain relief, smoking cessation, treatment of acute and chronic illness; also used extensively with pets
Biofeedback	Use of a sensor unit (TENS) allows individuals to monitor their own bodies' response to stimuli. Usually a light and sound device. A method of monitoring minute metabolic changes in one's own body with the aid of sensitive machines. Individuals use imagery, breathing techniques, and visualization to control their heart rate, breathing, and thought process. These changes are audible and visible on the biofeedback unit.	Stress-related conditions such as asthma, migraines, insomnia, and high blood pressure
Hypnosis	A method of focusing on the unconscious mind and accessing the subconscious to access repressed emotions, forgotten events, and memories that may assist the client to heal. Trained hypnotherapist creates a calm, safe environment for the client. Client remains aware but focused on the subconscious mind rather than the present.	Anxiety, weight loss, pain relief, phobias, chronic pain
Homeopathy	A healing system that uses minute amounts of natural substances, called remedies, to stimulate the individual's immune system. These substances, given in larger dose, mimic the symptoms the client is experiencing. Based on the philosophy "like cures like."	Arthritis, abdominal complaints, allergies, fatigue, menstrual irregularities
Herbal Medicine	The use of plant products for treatment of a wide range of chronic and acute illnesses. Plants, and their derivatives, are used in a variety of forms, including dried, distilled, tincture, pills, caplets, elixirs, and topical preparations. One of the oldest complementary therapies, it is used widely throughout the world today as the primary source of medicinal products. Not regulated by the FDA in the United States.	Acute and chronic illness including, but not limited to, asthma, arthritis, abdominal pain, menstrual irregularities, cuts and bruises; used to enhance the functioning of the body's systems
Reflexology	Designed to stimulate chi, or life-force energy, in the body by applying pressure to meridians, or contact points, on the feet and hands. Pressure on the reflexology points stimulates flow of chi, allowing the client to restore balance in the body and promote healing. The practitioner uses the fingers to apply pressure to the reflexology points.	Respiratory symptoms, stress, headache, fatigue, pain
Reiki	Use of the practitioner's hands to "channel" the universal life-force energy to the client to promote healing. Tibetan healing system. Hands may hover above the client or lightly touch. Use light hand placements to channel healing energies to the recipient.	Pain, digestive problems, stress and stress-related disorders; assist the recipient in achieving spiritual focus and clarity
Therapeutic Touch	Practitioner "senses" client's energy field through auditory-visual-kinetic or intuitive systems. Using the hands, the practitioner facilitates a symmetrical and rhythmical flow of energy and redirects it, allowing the individual's energy to flow freely. Treatment is complete when the practitioner senses a symmetrical state and rhythmic order.	Headache, musculoskeletal pain, emotional distress

Sample Questions

475. A client is seen in the outpatient clinic for treatment of psoriasis. The nurse should anticipate which of the following findings in this man?

1. Intense pain.
2. Discolored nails.
3. Abdominal lesions.
4. Hyperpigmented skin.

476. The physician prescribes coal tar preparations as part of the treatment plan for a client who has psoriasis. The nurse should include which statement in the teaching plan for this client?

1. Avoid sunlight immediately after the treatment.
2. Ingest the coal tar with liberal amounts of water.
3. Eat a high-carbohydrate diet.
4. Restrict activity for 24 hours.

477. An adult's shirt catches on fire and is now in flames. He panics and runs into his neighbor's yard. Which of the following interventions is appropriate? Select all that apply.

_____ Dousing the flames with water.
_____ Removing his burned clothing.
_____ Removing his jewelry.
_____ Rolling him on the ground.

478. The nurse is caring for a man admitted with severe burns sustained when his clothing caught fire while he was burning leaves. During the acute burn phase, which intervention will be absent from the nursing care plan?

1. Strict aseptic technique.
2. Proper alignment of all joints.
3. Maintenance of fluid and electrolyte balance.
4. Frequent and routine administration of narcotics.

479. The nurse is planning care for an adult man who is admitted with severe flame burns. During the first 24–48 hours of a post-burn client, which body changes can the nurse expect to occur?

1. An increase in the total volume of intravascular plasma.
2. Excessive renal perfusion with diuresis.
3. Fluid shift from interstitial spaces to plasma.
4. Fluid shift from plasma to interstitial spaces.

480. The nurse is caring for an adult who was admitted following severe burns sustained in a house fire. What would an acceptable range for hourly urine output during the first 2 days post-burn?

1. 20 mL.
2. 30–50 mL.
3. 100–150 mL.
4. 150–200 mL.

481. The nurse is to perform a scratch test for allergy. Which statement best describes this procedure?

1. The antigen is directly applied to the skin and covered with a gauze dressing.
2. The allergen is applied superficially to a small cut of the outer layer of skin.
3. A small amount of allergen is injected into the intradermal layer of skin.
4. Suspected food allergy items are scratched from the diet, one at a time, until all allergy symptoms are no longer present.

482. An adult has undergone a skin graft from his left buttock to his right upper thigh. What intervention will the nurse expect to perform when caring for the recipient site?

1. Apply silver sulfadiazine to promote rapid healing.
2. Assess for bleeding and large amounts of fluid accumulation beneath the graft.
3. Encourage the client to ambulate and do leg lifts on return from the OR.
4. Encourage the client to take frequent soaking baths to relieve his soreness and discomfort.

483. A client with a skin graft has undergone a full-thickness skin graft from her right upper thigh to her upper chest area. What is the most appropriate nursing action in caring for the donor site?

1. Keep the fine mesh gauze dressing on her chest soaked with normal saline.
2. Completely immobilize her right upper thigh area.
3. Maintain the compression bandage on her right upper thigh for several days.
4. Remove the nylon fabric adhered to the donor site no later than 2 to 3 days after grafting has taken place.

484. A client has undergone a skin graft. Which finding most likely indicates that complications with the recipient site may exist?

1. Small amounts of blood beneath the graft.
2. Small amounts of serum beneath the graft.
3. A meshed pattern in the graft.
4. Continuous bleeding beneath the graft.

485. A female client has been diagnosed with atopic dermatitis. She has severe pruritis. Which interventions are most appropriate to include in the plan of care?

1. Soak in a hot water bath at least once a day for 15–20 minutes.
2. Avoid use of air conditioning when possible.
3. When symptoms are worse, decrease bathing.
4. Use a moisturizing soap.

486. The client is ordered soaks with Burrow's solution due to severe poison ivy. What is the primary reason for the soaks?

1. To clean out the wounds.
2. To help dry the oozing lesions.
3. To stop the pruritus.
4. To stop the pain from the lesions.

487. The nurse has been giving instructions to a white female about preventing skin cancer. Which statement best indicates understanding of skin cancer risk factors?

1. "I guess because I am dark complected I will be more prone to developing skin cancer."
2. "I used to lie in the sun all the time—now I just go to the tanning bed."
3. "My father was treated for melanoma, but my mom says not to worry."
4. "I really need to use sunscreen—even in winter."

488. A client presents with a diagnosis of basal cell epithelioma. What is the best description for the lesion?

1. Dome shaped, shiny, with a well-defined border.
2. Poorly marginated, flat red area.
3. Red, dark blue, or purple macules.
4. Erythema, edema, and blisters.

489. While providing a nursing history, a client with suspected malignant melanoma will most often relate which of the following?

1. A history of intense sunlight exposure.
2. Complaints of frequently occurring irregularly shaped, flat macules with overlying hard scale.
3. Consistent use of sunscreen agents.
4. Complaints of several lesions with a raised border and flattened center.

490. An adult presents with the following symptoms: clusters of vesicles on the right flank; constant, severe pain; burning; itching and discomfort in the flank area. Which of the following diagnoses would be a priority when developing a plan of care for the client?

1. Pain, related to herpes simplex.
2. Pain, related to herpes zoster.
3. Pain, related to herpetic whitlow.
4. Pain, related to staphylococcal cellulitis.

491. What should the nurse include in the plan of care for a client with herpes zoster?

1. Teaching the client to avoid sexual contact during outbreaks.
2. Administering analgesics and evaluating the efficacy.
3. Informing the client that people who have not had chickenpox will not develop them from exposure to the client.
4. Scheduling several diagnostic tests to confirm the presence of herpes zoster.

492. Which client statement best indicates the client understands how herpes simplex is transmitted?

1. "It is okay to share towels as long as it is a family member."
2. "I really don't need to use a condom, unless I have a sore."
3. "Once I'm over this spell, I won't need to worry about it again."
4. "I shouldn't have sex if some of those sores are around."

493. A client is admitted with severe flame burns resulting from smoking in bed. The nurse would expect the room environment to include which of the following?

1. Strict isolation techniques and policies.
2. A semi-private room.
3. Liberal unrestricted visiting.
4. Equipment shared between the client and the other burn client in the unit.

494. An adult client was burned severely in an industrial accident. He has second-degree burns on his right leg and arm and on his back. He has third-degree burns on his left arm. The triage nurse, using the rule of nines, estimates the extent of the client's burns as _____%.

495. An adult was burned in a house fire 16 hours ago. She suffered second- and third-degree burns over 65% of her body. She is receiving lactated Ringer's at 200 mL/h. Which intervention is a *priority* at this time?

1. Monitoring hourly urine output.
2. Assessing for signs and symptoms of infection.

3. Performing range of motion q 1–2 h.
4. Meeting the high caloric needs of the client.

496. A nurse is providing care for a severely burned client during the shock phase of the burn injury. Which assessment findings would indicate that the client is receiving adequate fluid volume replacement?
1. Urine output 20 mL/h, CVP 3, weak pulses, K^+ level of 5.3.
2. Urine output 50 mL/h, BP 100/60, oriented to person and place.
3. Weak thready pulses, BP 70/40, pulse 130, HCT 52%.
4. Restlessness, confusion, urine output 15 mL/h, rapidly increasing weight.

497. A client with severe burns is receiving IV Zantac. Which statement best explains the reason for administration of this medication in this situation?
1. The client was treated for gastritis several years ago.
2. The medication will reduce hypoxemia in burn clients.
3. The medication is an H_2 receptor antagonist and will decrease acid secretion.
4. The medication will aid in removal of pulmonary secretions.

498. An 18-year-old was burned 6 weeks ago. She is now ready for discharge. Select the statement best reflecting understanding of discharge care.
1. "I will be so glad to get home so that I don't have to wear this pressure thing anymore."
2. "I will need to call my doctor if my temperature goes up or this burn area starts draining and oozing."
3. "I really need to stick to a low-calorie, low-protein diet."
4. "To prevent that area of new skin from feeling so tight, I can rub ice and baby oil on it."

499. A client has suffered a chemical burn. What is the nurse's best initial action?
1. Roll the client in a blanket.
2. Secure lead-lined gloves and move the client away from the chemical.
3. Flush the area with copious amounts of water or normal saline.
4. If the chemical is an acid, neutralize with a base.

500. An electrical worker has come in contact with a live power line. He is unconscious and is lying across the power line. What is the nurse's best initial action?
1. Move the person away from the power line using a wooden pole.
2. Cover the person with a blanket.
3. Grab the person and pull him away from the power lines.
4. Flush the wound with copious amounts of water.

Answers and Rationales

475. 2. A yellow discoloration of the nails is frequently seen in psoriasis.

476. 1. Sunlight should be avoided after a coal tar treatment.

477. *Dousing the flames* should be selected. This is an appropriate way to smother the flames. *Removing his jewelry* should be selected. Hot metal jewelry could increase burning. Rings should be removed before edema occurs. *Rolling him on the ground* should be selected because it will smother flames.

478. 4. Narcotics should be given only after careful assessment in this phase due to the danger of shock and respiratory depression.

479. 4. The initial fluid alteration following a severe burn is a plasma-to-interstitial fluid and electrolyte balance, which is a nursing priority.

480. 2. A safe range for the hourly urine output post-burn is 30–50 mL. Less than this amount would indicate severely decreased renal arterial perfusion.

481. 2. The allergen is applied to a small superficial scratch that cuts the outer layer of the skin.

482. 2. Bleeding and large amounts of fluid accumulation beneath the graft may prevent successful adherence of the graft.

483. 3. Compression bandages are often applied in the operating room on top of a synthetic, semipermeable polyurethane film. This dressing allows the polyurethane film to adhere to the donor site, reducing accumulation of fluid.

484. 4. Continuous bleeding beneath a graft may prevent adherence of the graft.

485. 4. A moisturizing soap will help decrease the pruritus, as it will be less drying.

486. 2. The solution helps dry up oozing lesions such as poison ivy. It does not debride wounds, prevent pain, or stop itching.

487. 4. Almost all cases of basal and squamous cell skin cancer diagnosed each year in the United States are considered to be sun-related.

488. 1. The most common presentation of BSE is a nodular lesion that is dome-shaped papules with well-defined borders. The lesions can have a pearly or shiny appearance because it does not keratinize.

489. 1. The majority of malignant melanoma appears to be associated with the intensity of sunlight exposure rather than the duration.

490. 2. Pain is a significant problem with herpes zoster. Topical solutions, cooling soaks, and use of analgesics are usually incorporated into the plan of care.

491. 2. Pain is usually present and can be quite severe. It is important to help the client obtain relief. Cool compresses, analgesics, and topical antipruritic preparations may be used.

492. 4. Sexual contact should be avoided during the initial and recurring infections. The client should also avoid touching the infected area, as it may be transferred to the eyes or face. Good handwashing is vital.

493. 1. Isolation is thought by some clinicians to reduce the incidence of cross contamination significantly. However, methods vary drastically from one center to another. The single most effective technique to prevent transmission of infection is handwashing!

494. The rule of nines is a quick assessment scale used to estimate the extent of burn injury. The basis of the rule is to divide the body into areas each representing 9% or a multiple of 9% of the total body surface area. This client's injuries were assigned the following percentages: R arm 9%, L arm 9%, R leg 18%, back 18%, total 54%.

495. 1. Urine output is the most readily available and reliable indicator for determining the adequacy of fluid resuscitation. Urine output should be monitored every hour and maintained between 30 and 50 mL/h.

496. 2. 50 mL/h of urine is adequate, BP is stable, clear sensorium is another positive sign that adequate fluid volume replacement is occurring. Pulses should also be easily palpable.

497. 3. Burn clients are very susceptible to development of stress ulcers. Routinely they receive Zantac to help prevent this complication.

498. 2. This statement demonstrates that the client realizes she must be alert to the signs and symptoms of infection and notify her physician if they do occur.

499. 3. Water will neutralize most chemicals while decreasing the heat reaction.

500. 1. Emergency treatment starts with separating the client from the power source. It is important to use nonconductive implements such as wooden poles to prevent injury to the rescuer.

REFERENCES AND SUGGESTED READINGS

Adams, J., & Apple, F. (2004). New blood tests for detecting heart disease. *Cardiology Patient Page*, 12–14. (Retrieved from Circulation).

Alternative therapies in health and medicine. Boulder, CO. InnoVision Communications, LLC. Retrieved on August 21, 2008 from http://www.alternative-therapies.com

American Association of Nurse Anesthetists. *Conscious sedation: What patients should expect*. Retrieved August 21, 2008, from http://www.aana.com/forpatients.aspx?ucNavMenu_TSMenuTargetID=68&ucNavMenu_TSMenuTargetType=4&ucNavMenu_TSMenuID=6&id=298&terms=conscious+sedation

Aschenbrenner, D., Cleveland, L., & Venable, S. (2007). *Drug therapy in nursing* (2nd ed.). Philadelphia: Lippincott Williams & Wilkins.

Barash, P., Cullen, B., Stoelting, R., Cullen, B. (2005). *Handbook of clinical anesthesia* (5th ed.). Philadelphia: Lippincott Williams & Wilkins.

Barnes, P. M., Powell-Griner, E., McFann, K., & Nahin, R. L. (2004). Complementary and alternative medicine use among adults: United States, 2002. Advance data from vital & health statistics. Hyattsville, MD: National Center for Health Statistics.

Bickley, L., & Szilagyi, P. (2005). *Bates' guide to physical examination and history taking* (9th ed.). Philadelphia: Lippincott Williams & Wilkins.

Black, J., & Hawks, J. (2008). *Medical-surgical nursing: Clinical management for positive outcomes* (8th ed.). Philadelphia: Saunders.

Board on Health Promotion and Disease Prevention and Institute of Medicine. Institute of Medicine of the National Academies. (2005). *Complementary and alternative medicine in the United States*. The National Academies Press: Washington, D.C.

Brown, K. (2003). *Emergency dysrhythmias & ECG injury patterns*. Clifton Park, NY: Thomson Delmar Learning.

Carpenito, L. (2007). *Nursing diagnosis: Application to clinical practice* (12th ed.). Philadelphia: Lippincott Williams & Wilkins.

Centers for Disease Control and Prevention. (2006). *Trends in tuberculosis incidence—United States, 2006* (March 23, 2007/56(11);245-250). Atlanta, GA.
Daniels, R., Nosek, L., & Nicoll, L. (2007). *Contemporary medical-surgical nursing*. Clifton Park, NY: Thomson Delmar Cengage Learning.
Doenges, M., & Moorehouse, M. (2008). *Application of nursing process and nursing diagnosis* (5th ed.). Philadelphia: F. A. Davis.
Eliopoulos, C. (2004). *Gerontological nursing* (6th ed.). Philadelphia: Lippincott Williams & Wilkins.
Estes, M. (2010). *Health assessment and physical examination* (4th ed.). Clifton Park, NY: Delmar Cengage Learning.
Fischbach, F. (2008). *A manual of laboratory and diagnostic tests* (8th ed.). Philadelphia: Lippincott Williams & Wilkins.
Fischbach, F., & Dunning III, M. (2005). *Nurses' quick reference to common laboratory and diagnostic tests* (4th ed.). Philadelphia: Lippincott Williams & Wilkins.
Guyton, A., & Hall, J. (2006). *Textbook of medical physiology* (11th ed.). Philadelphia: Saunders.
Hudack, C., Morton, P., & Gallo, B. (2004). *Critical care nursing: A holistic approach* (8th ed.). Philadelphia: Lippincott Williams & Wilkins.
Ignatavicius, D., & Workman, M. (2006). *Medical-surgical nursing: Critical thinking for collaborative care* (5th ed.). Philadelphia: W. B. Saunders.
Kost, M. (2002). *Administration of conscious sedation*. http://nsweb.nursingspectrum.com/ce/ce159.htm
Lemone, P., & Burke, K. (2008). *Medical-surgical nursing: Critical thinking in client care* (4th ed.). Upper Saddle River, NJ: Prentice Hall.
Lewis, S., Bucher, L., Heitkemper, M., Dirksen, S. O'Brien, P., & Bucher, L. (2007). *Medical-surgical nursing: Assessment and management of clinical problems* (7th ed.) St. Louis, MO: Elsevier, Health Science Division.
Linton, A., & Lach, H. (2006). *Matteson & McConnell's gerontological nursing: concepts and practice* (3rd ed.). St. Louis, MO: Elsevier, Health Science Division.
Mayhew, M., Edmunds, M., & Wendel, V. (2005). *Gerontological nurse practitioner: Review and resource manual*. Washington, DC: The American Nurses Credentialing Center.
Micozzi, M. S. (2005). *Fundamentals of complementary and alternative medicine*. (3rd ed.). New York: Churchill-Livingston.
Miller, C. (2003). *Nursing for wellness in older adults: Theory & practice* (4th ed.). Philadelphia: Lippincott Williams & Wilkins.
Miller, J. (2003). *Delmar's NCLEX-PN review*. Clifton Park, NY: Thomson Delmar Learning.
NANDA International. (2007). *Nursing diagnosis: Definitions & classification 2007–2008*. NANDA International, Philadelphia. Author.
Phipps, W., Long, B., Woods, N., & Cass Meyer, V. (2006). *Medical-surgical nursing concepts and clinical practice* (8th ed.). St. Louis, MO: Elsevier, Health Science Division.
Reuben, D. B., Pacala, J., & Herr, K. (2004). *Geriatrics at your fingertips* (6th ed.). Malden, MA: Blackwell.
Seeley, R., Stephens, T., & Tate, P. (2006). *Anatomy & physiology* (7th ed.). New York: McGraw Hill.
Smeltzer, S., Bare, B., & Boyer, M. (2008). *Brunner and Suddarth's textbook of medical surgical nursing* (11th ed.). Philadelphia: Lippincott Williams & Wilkins.
Spratto, G. R., & Woods, A. L. (2009). *Delmar Nurse's drug handbook 2009 Edition*. Clifton Park, NY: Delmar Cengage Learning.