PHYSIOLOGY OF THE IMMUNE SYSTEM

A. The lymphoid system is composed of organs and cells that participate in the immune response.

1. Primary lymphoid organs.
   a. Thymus.
      (1) Production of T cells.
      (2) Maturation and differentiation of the T cells (lymphocytes). T cells become either T cytotoxic (CD8), or T helper (CD4) cells.
      (3) Provide for long-term immunity.
   b. Bone marrow.
      (1) Production of B cells.
      (2) Differentiate into plasma cells that produce antibodies (immunoglobulins).

2. Peripheral lymphoid organs.
   a. Lymph nodes: filter out foreign material and circulate the lymphocytes.
   b. Spleen: produces lymphocytes and plasma cells; filters the blood.
   c. Mucosal-associated lymphoid tissue: the gastrointestinal tract, the bronchi in the respiratory tract, the genital tract and the skin all contain associated lymphoid tissue.
   d. Tonsils: trap and remove invading organisms.

B. Body recognizes foreign proteins, called antigens, which will elicit a response from the immune system—the production of antibodies, which attack and destroy the invading antigens.

C. Antigens are foreign to the body and are frequently associated with bacteria, viruses, or other pathogens; antigens react with antibodies or antigen receptors on B and T cells.

D. Allergens are antigens that produce an allergic response.

E. Inflammatory response—an innate resistance or natural barrier that responds to the site of tissue injury; examples include infection, mechanical injury, ischemia, temperature extremes.

   1. Redness, heat, swelling, and pain occur secondary to vasodilatation, increased vascular permeability, and white blood cell migration to site of injury.
   2. Complement system consists of plasma proteins that directly destroy pathogens, activated by the formation of an antigen–antibody complex (immune complex).
   3. Complement cells are found in the innate as well as the acquired immune response.

Immunologic Responses

A. Humoral response.

   1. Antibodies, produced by the plasma cells, circulate through the blood and bind to and inactivate antigens or infectious agents.
   2. B lymphocytes (plasma cells) recognize the antigen and become activated, differentiated plasma cells, which produce immunoglobulins.
      a. Immunoglobulin M (IgM): provides the initial antibody response; a large molecule that is primarily confined to the intravascular space.
      b. Immunoglobulin G (IgG): main serum antibody; assumes a major role in bloodborne and tissue infections; the longest-acting immunoglobulin; crosses placenta and provides natural passive immunity in the newborn.
      c. Immunoglobulin A (IgA): appears in body fluids; prevents absorption of antigens from food; plays an important role against infection in respiratory passages.
      d. Immunoglobulin E (IgE): appears in serum and interstitial fluids; is associated with immediate hypersensitivity reactions (anaphylactic and atopic reactions); assists in the defense against parasitic infections.

B. Cell-mediated response—stem cells originate in the bone marrow and travel to the thymus, where they mature into functional T cells.

   1. A response is initiated through recognition of antigens by T cells (T lymphocytes, macrophages, and natural killer cells).
   2. Differentiation of the T cells into specific cells that react directly with the antigen.
      a. T cytotoxic (CD8) cells—antigen-specific; sensitized by exposure to the antigen; a second exposure will result in a more intense and rapid cell-mediated response.
      b. T helper (CD4) cells—differentiate into cytokines, which give directions to cells; changes the proliferation of the cell, as well as the activity or the secretion of the cell.
      c. Natural killer (NK) cells—large lymphocytes that recognize and kill cells from viruses, tumors or transplanted tissue; cells do not require a previous sensitization to the antigen.
3. Provides cellular immunity, delayed hypersensitivity reactions; recognizes tumor cells and inhibits tumor growth; rejects foreign tissue (organ transplants) and produces autoimmune disorders.

C. Humoral and cellular responses are not independent—but interdependent—and an effective immune response is based on the interactions of both responses.

D. Properties of the immunologic response.
   1. Specificity: the formation of a specific antibody for each antigen; antibodies produced against one pathogen will not protect the body from other pathogens.
   2. Memory: both responses are capable of "remembering" the antigen and responding more rapidly if exposed to same antigen again.
   3. Self-recognition: the immune system has the ability to distinguish self or self-antigens from nonself or foreign antigens; the self-antigens do not illicit the immune response.

E. Inflammatory response.
   1. Early inflammatory response is self-limiting. It destroys injurious agents and removes them from the site. Also confines agents to the area, stimulates the immune response, and promotes healing.
   2. Chronic inflammation lasts 2 weeks or longer, frequently preceded by an unsuccessful acute response. Infiltration of lymphocytes and macrophages occur in an attempt to protect the body; the area may be walled off to form a granuloma (e.g., the granuloma associated with tuberculosis).

F. Types of specific immunity (Table 7-1).
   1. Natural immunity: no prior contact with an antigen.
   2. Acquired immunity: develops either actively or passively.

G. Effects of aging on immune response.
   1. Infants are protected at birth by maternal antibodies that cross the placenta; an infant’s antibody system begins to function around 6 months of age.
   2. Newborns have a transiently depressed inflammatory response and immune function; they are prone to infections associated with staphylococci and Candida.

3. Aging decreases the size and activity of the thymus, which results in a diminished response of the cell-mediated immunity. A decline in efficiency of humoral immunity also occurs because of a decrease in antibody production in response to antigens.

4. Older clients are at increased risk for impaired inflammation and wound healing secondary to chronic diseases (cardiovascular, diabetes), as well as medications that impair the inflammatory response (steroids).

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**DISORDERS OF THE IMMUNE SYSTEM**

**Hypersensitivity**

A. Type I (IgE-mediated reaction; IgE antibodies involved).
   1. Occurs when a person has been previously sensitized to a specific antigen.
   2. When same antigen reappears, it interacts with the IgE; this activates the release of chemical mediators, primarily histamine.

3. Histamine: major chemical mediator.
   a. Smooth muscle contraction (spasms of bronchial muscles and airway obstruction).
   b. Capillary vasodilatation and increased capillary permeability, leading to vascular collapse (decreased blood pressure).
   c. Increased nasal stuffiness and bronchial secretions.
   d. Reaction usually begins within minutes after exposure.

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**Table 7-1  ACQUIRED IMMUNITY**

<table>
<thead>
<tr>
<th>Type</th>
<th>Characteristics</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active:</strong></td>
<td>Antibodies synthesized by body in response to antigen stimulation.</td>
<td>Recovery from childhood diseases (e.g., chicken pox, measles, mumps). Immunization with live or attenuated vaccines (varicella, IPV, MMR). Toxoid immunization (tetanus toxoid, diphtheria toxoid). Maternal immunoglobulin in the neonate. Gamma globulin; injection of animal hyperimmune serum (diphtheria antitoxin, tetanus antitoxin).</td>
</tr>
<tr>
<td><strong>Passive:</strong></td>
<td>Antibodies produced in one individual and transferred to another.</td>
<td></td>
</tr>
<tr>
<td><strong>Natural:</strong></td>
<td>Contact with an antigen through exposure; develops slowly, often lifetime protection.</td>
<td></td>
</tr>
<tr>
<td><strong>Artificial:</strong></td>
<td>Immunization with an antigen develops slowly; may provide protection for several years, but “boosters” may be required.</td>
<td></td>
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</tbody>
</table>

*IPV,* Inactivated polio vaccine; *MMR,* measles-mumps-rubella vaccine.
CHAPTER 7  Immune System

4. Conditions associated with type I.
   a. Anaphylaxis (most severe).
   b. Atopic reactions (most common).
      (1) Allergic rhinitis (hay fever).
      (2) Urticaria (hives).
      (3) Bronchial asthma.

B. Type II (cytotoxic; direct binding of IgG and IgM antibodies to an antigen).
   1. Antibodies destroy cell on which antigen is bound, causing tissue injury.
   2. The normal process of phagocytosis is accelerated and begins to damage healthy body tissue.
   3. Conditions associated with type II.
      a. Hemolytic disease of the newborn (Rh factor).
      b. Leukopenia and thrombocytopenia.
      c. ABO blood incompatibility (hemolytic reaction).
      d. Goodpasture syndrome (an antibody–mediated reaction involving the lungs and kidneys).

C. Type III (immune complex; IgG and IgM antibodies involved).
   1. Circulating immune complexes (antibody–antigen complex) are too small to be effectively removed and are deposited in the body tissue.
   2. When the immune complex is deposited in the body tissue (kidneys, skin, joints, blood vessels, and lungs), local tissue inflammation and cell wall damage occur.
   3. Symptoms depend on number of complexes present as well as the area of the body involved (autoimmune conditions).
      a. Persistent infections (streptococcal infections) combined with a poor antibody response may lead to the formation of immune complex that is eventually deposited in an affected organ.
         (1) Endocarditis (Chapter 17).
         (2) Acute glomerulonephritis (Chapter 23).
      b. Rheumatoid arthritis (Chapter 21).
      c. Systemic lupus erythematosus.

D. Type IV (cell-mediated; delayed hypersensitivity).
   1. The T cells are sensitized to an antigen from a previous exposure; occurs 24 to 48 hours after exposure, may take 72 hours to reach maximum intensity.
   2. The sensitized T cells initiate the inflammatory response, leading to cellular damage as well as damage to the surrounding tissue.
   3. Conditions associated with type IV.
      a. Tuberculosis, skin testing.
      b. Contact dermatitis (poison ivy).
      c. Transplant rejection.

Anaphylactic Reaction
Type I occurs in clients who are highly sensitized to a specific allergen—medications, blood products, insect stings. The antigen–antibody response precipitates the release of histamine, causing vasodilatation and increased capillary permeability (Figure 7-1).

Assessment
A. Risk factors.
   1. History of exposure to allergen.
      a. Amount of allergen.
      b. Absorption of ingested allergen.
      c. Antibody levels from previous exposure.
      d. Occupational, social, and environmental factors.
   2. The more rapid the onset of symptoms after exposure, the more severe the reaction.

B. Clinical manifestations—depend on the level of prior sensitivity and the amount of allergen.
   1. Mild to moderate: peripheral tingling/itching (pruritus, urticaria), sensation of warmth, edema of the lips and tongue, nasal congestion, flushing, anxiety.
   2. May rapidly progress to acute anxiety, difficulty breathing (bronchospasm, laryngeal edema), GI cramping, cyanosis, and hypotension; can be fatal.

Diagnostics
According to symptoms and exposure to allergen.

Treatment
A. Mild to moderate reactions—antihistamines and/or epinephrine 0.2 to 0.5 mL (1:1000 solution), administered subcutaneously or intramuscularly (Appendix 7-2).

B. Severe reactions—epinephrine 0.5 mL (concentration of 1:10,000), administered intravenously at 5- to 10-minute intervals (1 mg over at least 1 minute).

C. Oxygen in high concentrations.

**NURSING PRIORITY** When administering epinephrine, make sure you have the correct concentration of solution. It is administered in concentrations of 0.1% or 1:1,000 subcutaneously or IM, and 0.01% or 1:10,000 IV or intracardiac. Intravenous solutions are more dilute due to potential fatal reactions.

FIGURE 7-1 Anaphylaxis. (From Zerwekh J, Claborn J: *Memory notebook of nursing*, vol 2, ed 3, Ingram, Texas, 2007, Nursing Education Consultants.)
D. IV fluids (Lactated Ringer’s or 0.9% saline), vasopressor agents, and volume expanders to maintain circulatory status.
E. Maintain patent airway—intubation or tracheostomy may be necessary.
F. Corticosteroids to reduce inflammatory response (see Appendix 6-7).

ALERT Manage a medical emergency. Anaphylaxis is an immediate response, and symptoms progress very rapidly. Emergency treatment should be initiated immediately if anaphylaxis is suspected. Death from an anaphylactic reaction is most often caused by bronchospasm and edema of the airway.

Nursing Interventions

Goal: To assess clients for predisposition to hypersensitivity reactions.

ALERT Check for client allergies.

A. Evaluate client history regarding reactions to:
   1. Medications, especially penicillin.
   2. Foods (e.g., seafood or iodine, eggs, peanuts).
   3. Insect bites.
   4. Vaccines, especially egg-cultured types.
   5. Blood products (transfusion reaction).
   6. Diagnostic agents (e.g., iodine-based contrast media).
B. If hypersensitivity is suspected, a localized skin test may be done before the administration of substance.
C. Prevention is the priority.

Goal: To maintain adequate ventilation.

1 NURSING PRIORITY Airway positioning and mouth-to-mouth resuscitation will not provide adequate ventilation when client has airway edema. An emergency tracheotomy or intubation may be indicated.

A. Maintain bed rest; place client in low Fowler’s position with the legs elevated.
B. High oxygen concentrations if airway is compromised.
C. Anticipate use of airway adjuncts (tracheostomy, endotracheal intubation).
D. Administration of medications to reverse bronchospasm (albuterol, corticosteroid, epinephrine).

Goal: To restore adequate circulation.

A. Administer IV fluids (normal saline or lactated Ringer’s solution) to correct loss of fluid to third-space shifts and vasodilation.
B. Carefully titrate fluid replacement with vital signs.

1 NURSING PRIORITY Monitor the client’s fluid status closely; as fluid begins to shift back into the vascular compartment, it is very easy to cause fluid overload.

C. Vasopressors and volume expanders may be used to increase blood pressure if fluid replacement is not effective.

Goal: Client teaching to prevent recurrence.

A. Once causative agent is identified, instruct client accordingly.
B. Advise client to wear identification tag or bracelet.
C. Explain to client that if he or she had any level of allergic reaction previously, the next exposure could be worse (penicillin, insect stings, etc.).

Autoimmune Conditions

A. Conditions in which body tolerance has been disrupted and the body tissue or cells cannot recognize their own cells (self-recognition). A critical aspect of the immune response is the ability of the body to recognize normal tissue and to not invade or destroy it.
B. An autoimmune condition occurs when the immune system can no longer recognize the normal tissue; reacts against self-antigens and begins to destroy the host tissue.
C. Some autoimmune responses are very tissue specific and invade only that specific tissue, whereas others response may have body-wide effects.
D. Autoimmune response and disease occurrence.

1. The direct action of the autoantibody on the cell surface. This causes destruction of the cell (cytotoxic); may activate the inflammatory response.
2. An alteration of both B cells and or T cells can produce auto-sensitized T cells and cause tissue damage.
E. Autoimmune response may be systemic or organ-specific.
   b. Connective tissue disorders: systemic lupus erythematosus (SLE).
   c. Rheumatic disorders: rheumatoid arthritis.
2. Organ–specific diseases.
   b. Hyperthyroid (Graves’ disease).
   c. Addison’s disease.
   d. Type 1 diabetes mellitus.

Systemic Lupus Erythematosus (SLE)

SLE is a multisystem inflammatory autoimmune disorder; the disease affects multiple organs. SLE is characterized by a diffuse production of autoantibodies that attack and cause damage to body organs and tissue.

A. Tissue injury in SLE results from deposition of the immune complexes throughout the body (kidneys, heart, skin, brain, and joints); this activates the inflammatory response.
B. The severity of symptoms varies greatly throughout the course of the disease; periods of exacerbation and remission occur.
CHAPTER 7 Immune System

Assessment
A. Risk factors.
1. More common in women, 20 to 40 years of age.
2. Familial tendencies.
3. May be triggered by environmental stimulus, infections, and medications; sun exposure most common.
B. Clinical manifestations (Figure 7-2).
1. Initially may be nonspecific: weight loss, fatigue, and fever.
2. Integumentary: characteristic “butterfly” rash over face in about 50% of clients; erythematous rash on areas of the body exposed to sunlight (photosensitivity); alopecia; dry scaly scalp; palmer erythema.
4. Renal system involvement: lupus nephritis, proteinuria, and glomerulonephritis.
5. Cardiovascular system.
   a. Raynaud’s phenomenon: caused by peripheral vasospasm.
   b. Pericarditis: may progress to endocarditis.
   c. Vascular inflammation of the small vessels. Most commonly affects the small vessels of the fingers and the gastrointestinal tract.
10. Gastrointestinal system: ulcers in the oral mucosa or nasopharyngeal membranes.

Diagnostics
A. No specific test is diagnostic; assess configuration of symptoms.
B. Presence of antinuclear antibody (ANA), high levels of anti-DNA, and presence of anti-Smith (Sm) are most suggestive of a diagnosis of SLE.
C. C-reactive protein (CRP), erythrocyte sedimentation rate (ESR)—monitor progress of inflammation.

FIGURE 7-2 Systemic lupus erythematosus. (From Lewis SL et al: Medical-surgical nursing: assessment and management of clinical problems, ed 7, St. Louis, 2007, Mosby.)
Treatment
SLE has no known cure.
A. Nonsteroidal antinflammatory medications (see Appendix 3-3).
B. Corticosteroids for exacerbations polyarthritis (see Appendix 6-7).
C. Immunosuppressants (see Appendix 23-3).
D. Antimalarial agents (e.g., hydroxychloroquine [Plaquenil]).

Nursing Interventions
Goal: To prevent exacerbations.
A. Maintain good nutritional status; eat a low-cholesterol diet.
B. Avoid exposure to infections.
C. Teach client about skin problems: discoid lesions, loss of hair, dry scaly scalp.
D. Teach client personal hygiene to prevent urinary tract infections.
E. Make sure client understands how to take medications.
F. Avoid exposure to sunlight; use a sunscreen with a high SPF when exposure is unavoidable.
G. Contact physician before participating in any immunization procedures.
H. Counseling regarding pregnancy.
Goal: To maintain adequate tissue perfusion.
A. Assess for indications of impaired peripheral perfusion—numbness, tingling, and weakness of hands and feet.
B. Prevent injury to extremities—especially fingers.
C. Carefully evaluate fluid status with regard to cardiac status, fluid retention, and weight gain.
Goal: To promote effective pain control.
A. Establish schedule to conserve energy, but still maintain physical activity.
B. NSAIDs to control arthritic pain.
C. Nonpharmacologic therapies to supplement analgesics (Chapter 3).
D. Evaluate response of pain to decrease inflammation from corticosteroids.
Goal: To maintain renal function.
A. Monitor for peripheral edema, hypertension, hematuria, decreased output.
B. Monitor blood urea nitrogen and creatinine levels.
C. Monitor for urinary tract infections (glomerulonephritis).
D. Assess for peripheral edema and excess fluid volume.
Goal: To assist client to maintain psychologic equilibrium.
A. Observe for behavioral changes that may indicate central nervous system involvement: headaches, inappropriate speech, difficulty concentrating.
B. Encourage client to participate in support groups and to seek counseling to deal with stress.

Acquired Immunodeficiency Syndrome
Acquired immunodeficiency syndrome (AIDS) is a condition resulting from severe impairment of the immune system's ability to respond to invading pathogens; AIDS ultimately affects all body systems.
A. Occurs as a result of being infected with the human immunodeficiency virus (HIV).
B. Once a client is infected, he or she will harbor the virus for the rest of his life.
C. The disease progression is highly individualized; the average time between the HIV infection and the development of AIDS is about 11 years, during which the symptoms are frequently vague and nonspecific.

Transmission of Human Immunodeficiency Virus
A. Blood transmission.
1. Needle-sticks that occur when the client has a high viral load carry a higher risk than those that occur when client is at a low viral load.
2. Exposure to an infected client's blood via open wounds or mucous membranes carries a lower risk than does a needle-stick.
3. Transmission via blood transfusions has been greatly reduced with the screening of donated blood.
   a. A risk remains when the blood is donated within the first few months of infection and the screening blood test does not identify the donor as being HIV-positive.
   b. Clotting factors for hemophilia clients are treated with chemicals and/or heat to decrease the risk for transmission.
B. Sexual transmission—most common mode of transmission.
1. Sexual practices, not preferences, place people at increased risk.
2. Risk for infection is greater for the partner who receives the semen during oral, vaginal, or anal sex.
3. Any sexual activity that involves direct contact with vaginal secretions and semen may transmit HIV.
C. Perinatal transmission.
1. Exposure can occur during pregnancy, at the time of delivery, or during the postpartum period through breast milk.
2. 25% of infants born to HIV-positive mothers are infected.
3. Prophylactic antiviral medications during pregnancy can reduce rate of transmission.
4. Decreased incidence occurs with cesarean delivery of HIV-positive mothers.
D. HIV cannot be transmitted by:
1. Hugging, kissing, holding hands, or other nonsexual contact.
2. Inanimate objects (money, doorknobs, bathtubs, toilet seats, etc).
3. Dishes, silverware, or food handled by an infected person.
4. Animals or insects.
E. CD4+ T helper cells are the regulating cells in the immune system; the level of CD4+ T cells is used to monitor the stages and progression of the virus;
normal CD4+ T cell count is at least 800 cells/mm$^3$ of blood.
F. The viral load in the semen, blood, vaginal secretions, or breast milk is an important variable in the transmission.

**NURSING PRIORITY** As a nurse, it is essential for you to know the modes of transmission of HIV, activities that do not transmit the virus, and the nursing care to protect yourself, your clients with AIDS, and other clients you are caring for.

**Clinical Manifestations**

A. Acute HIV infection.
1. Intense viral replication and dissemination of HIV throughout the body.
2. Symptoms are mild, ranging from no symptoms to flu-like symptoms (fever, night sweats, chills, headache).
3. Window of seroconversion: time period from when the person is infected with the virus until HIV antibodies can be detected.
4. Average time for seroconversion to occur is 1 to 3 weeks.
5. A client may have vague, nonspecific symptoms for years.
6. During this period, there is a high viral load and the CD4+ T cell count falls, but only temporarily.
B. Early chronic infection—CD4+ T cell count greater than 500 cells/mm$^3$ and low viral load.
1. Viral replication has reached a steady state.
2. Considered asymptomatic phase; however, chronic vague symptoms persist.
3. Persistent generalized lymphadenopathy.
C. Intermediate chronic infection—CD4+ T cell count between 200 and 500 cells/mm$^3$ and increased viral load.
1. Exacerbation of symptoms.
2. Client begins to experience localized infections, increased lymphadenopathy, and neurologic manifestations.
   a. *Candida* is a common problem—persistent oropharyngeal or vulvovaginal candidiasis.
   b. Hairy oral leukoplakia, which may also be indication of progression of disease.
   c. Shingles, oral or genital herpes lesions.
   d. Kaposi’s sarcoma.
      1. A cutaneous skin lesion that looks like a bruise; later will turn dark violet or black.
      2. Invades body organs, extremities, skin, and torso.
      3. May become very painful.
D. Late chronic infection, or AIDS (acquired immunodeficiency syndrome)—CD4+ T cell count less than 200 cells/mm$^3$ and viral load increases. Diagnosis of AIDS is made when the HIV-positive client develops at least one of the following disease processes.
1. CD4+ T cell count below 200 cells/mm$^3$.
2. AIDS dementia complex.
3. Wasting syndrome caused by HIV.
4. At least one opportunistic cancer—invasive cervical cancer, Kaposi’s sarcoma, primary lymphoma of the brain.
5. At least one opportunistic infection—fungal, bacterial, or protozoal infection.

**Opportunistic Diseases**

A. Diseases and infections that occur in clients with AIDS are called *opportunistic* because they take advantage of the suppressed immune system.
1. The type of infection and its extent varies with each client, depending on the extent of immunosuppression.
2. Single opportunistic infections are rare; a client usually has multiple infections.
B. Infections may be delayed or prevented by antiretroviral therapy, vaccines (hepatitis B, influenza, and pneumococcal), and disease-specific prevention.
C. *Coccidioides jiroveci* pneumonia, *Pneumocystis jirovecii* pneumonia (previously called *Pneumocystis carinii* PCP).
1. May be caused by a pathogen in the body that is dormant.
2. Is not common in healthy individuals; immune system must be compromised for the infection to occur.
3. Symptoms: fever, night sweats, nonproductive cough, progressive dyspnea.
D. Tuberculosis (see Chapter 15).
E. Fungal infections: histoplasmosis (pneumonia, meningitis), coccidioidomycosis (pneumonia).
F. Kaposi’s sarcoma: a bruised, dry-appearing skin lesion; may be present internally as well.
G. Candidiasis of the esophagus, mouth, vagina.

**Diagnostics**

**NURSING PRIORITY** A positive test result means the person has HIV—it does not predict the course of the disease. A negative test result means than HIV antibodies were not detected; however, this can occur during the window period of seroconversion.

A. HIV-antibody testing.
1. Enzyme immunoassay testing (EIA): detects the serum antibodies that bind to the HIV antigens. After the acute HIV invasion, an increase in the viral load and a decrease in CD4+ count occur; the client begins to develop antibodies to the HIV. If client has history of recent exposure, retesting is recommended at 3 weeks, 6 weeks, and 3 months.
2. If the EIA test result is positive, then it is repeated; if it remains positive, the Western blot (WB) and immunofluorescence assay (IFA) tests are done to confirm the HIV-positive results.
3. If the EIA is consistently positive and the WB and IFA results are positive, the client is considered to be HIV-antibody positive.
B. Rapid HIV tests—ready in minutes, but results are preliminary and must be confirmed; client needs to return for an antibody-based test (Western blot) 2-4 months later.
1. The OraQuick Rapid HIV-1 Antibody Test and the Reveal Rapid HIV-1 Antibody Test measure HIV antibodies in the blood.
2. OraQuick ADVANCE Rapid HIV-1/2 Antibody Test measures HIV antibodies in the saliva.
3. CD4+ T cell (receptor cell on the T4 helper cell) count: below 200 cells/mm$^3$ in an HIV-positive client indicates progression to acute HIV infection (T4, T4 helper, and CD4+ are synonymous terms).
4. Serum monitoring after diagnosis.
   1. CD4+ T cell counts and plasma assays (HIV RNA viral load).
   2. Evaluation for drug resistance.

**Treatment**

A. Medications: antiretroviral therapy (ART) (Appendix 7-1).
   1. Prescribed according to the viral load and the CD4+ T cell counts.
   2. Combination of at least two different drug classes.
   3. Women should begin ART even if they are pregnant.
   4. Combination drug therapy attacks virus at different stages of replication.
B. Medications do not cure the client, but decrease the viral replication and slow disease process.
C. Adherence to drug schedules is critical—nonadherence to drug regimen can lead to mutations of the virus and increased virus resistance.

**NURSING PRIORITY** Frequently, the treatment for the client with AIDS causes problems in other areas: the high-dose antibiotics may increase the level of leukopenia, and the chemotherapy medications will further decrease the bone marrow functions. The client with AIDS receiving chemotherapy will be even further immunosuppressed.

**Nursing Interventions**

See Nursing Interventions for immunocompromised clients.

**Goal:** To provide and promote client and public education regarding transmission of HIV.

**NURSING PRIORITY** Public and client teaching regarding the transmission of the HIV is vital in the control of this disease. The period of time from when the client is infected until the condition is diagnosed is when the majority of new infections are transmitted.

A. Safe sex.
   1. Maintain monogamous relationships.
   2. Sex with female or male prostitutes is a high-risk activity.
   3. Avoid all direct contact with a partner’s mouth, penis, vagina, or rectum if the HIV status of the partner is not known.

4. Avoid all sexual activities that cause cuts or tears in the vagina, on the penis, or in the rectum.
5. Males should wear a condom if multiple partners are involved.
6. If the HIV status of a sexual partner is not known, a condom should always be used during intercourse.
7. Anyone who has been involved in any high-risk sexual activities or who has injected IV recreational drugs should have a blood test to determine presence of the HIV.

**Home Care**

A. An employee in a health care setting should advise employer of HIV-positive status.
B. Kitchen and bathroom facilities may be shared, provided that normal sanitary practices are observed.
C. Clean up spills of body fluids or waste immediately with a solution of 1 part bleach to 10 parts water. A bleach solution can be used to disinfect kitchen and bathroom floors, showers, sinks, and toilet bowls.
D. Towels and washcloths should not be shared without laundering.
E. Sanitary napkins, tampons, and any bloody dressings should be wrapped in a plastic bag and placed in a trash container.
F. Needles should not be recapped. Dispose of them in an impenetrable sealed container.
G. Do not donate blood or plasma, body organs, or semen.

**Pediatric Acquired Immunodeficiency Syndrome**

The majority of children with AIDS were infected in the perinatal period. Cases related to blood transfusions are relatively rare.

**NURSING PRIORITY** HIV-positive mothers should not breastfeed their infants.

**Assessment**

A. Risk factors.
   1. Pediatric infection from transfused blood is virtually nonexistent.
   2. Sexual activity and IV drug use are the major causes of HIV infection in adolescents.
   3. Infants born to mothers who are HIV-positive account for the majority of children with HIV infection; ART therapy during pregnancy reduces risk for transmission to fetus.
   4. Children rarely have Kaposi’s sarcoma; PCP is most common opportunistic infection.
B. Clinical manifestations.
   1. Infants affected during the prenatal period have rapid disease progression.
   2. HIV-positive infants usually have symptoms by 18 to 24 months of age.
3. Infants diagnosed within the first year of life have a poor prognosis, as do those who develop Pneumocystis jirovecii pneumonia (PCP), and progressive encephalopathy.
4. Symptoms include lymphadenopathy, hepatosplenomegaly, oral candidiasis, chronic diarrhea, and failure to thrive.
5. Severe symptoms include the AIDS-defining illnesses such as PCP, wasting syndrome, HIV encephalopathy, Candida esophagitis, and cryptosporidiosis.
6. Immune categories are based on CD4+ counts; these are age-adjusted.

**Diagnostics**

A. ELA and WB for children 18 months or older.
B. Newborn: polymerase chain reaction (PCR); p24 antigen detection; majority of infants who are HIV-positive can be identified by 3 months of age.
C. Maternal antibodies to the HIV may persist for up to 18 months.
D. Positive results on two separate occasions and from separate blood specimens for p24 antigen detection, polymerase chain reaction, and virus culture are required to confirm diagnosis of HIV infection.

**Treatment**

Treatment for children is essentially the same as that for an adult.

**Nursing Interventions for Immunocompromised Clients**

**Goal**: To monitor for and/or prevent opportunistic infections.

A. The type, location, and severity of the infection depend on the disease progress and the client’s immunosuppressive state.
B. Antimicrobial medications are given in high doses for an extended period. Medications may cause neutropenia.
C. Protect from iatrogenic infections or hospital-associated infections.
D. Observe hospitalized client and/or teach client symptoms of opportunistic infections.
   1. Persistent unexplained fever, night sweats.
   2. Thrush (white spots in the mouth).
   3. Persistent diarrhea and weight loss.

**Goal**: To maintain ventilation and prevent pulmonary involvement.

A. PCP prophylaxis may be maintained with trimethoprim-sulfamethoxazole.
B. Rifabutin is used for Mycobacterium avium prophylaxis.
C. Frequent assessments for pulmonary changes and hypoxemia.
D. Activities may be unlimited, or bed rest may be prescribed.
E. Supplemental oxygen.
F. Coughing and deep-breathing exercises.
G. Carefully evaluate respiratory function if narcotic analgesics are used.
H. Assess activity tolerance.

**Goal**: To assist client to minimize the effects of neurologic changes.

A. Frequent assessment of neurologic status.
B. Assess for visual changes.
C. Observe for neurologic infections, specifically meningitis.
D. If client is confused, provide care directed to reorientation.
E. Provide a safe and supportive environment, according to the neurologic deficits.

**Goal**: To maintain adequate nutritional intake.

A. Teach client regarding nutrition and caloric intake (high-calorie, high-protein diet; nutrition to correct deficiencies).
B. Encourage high-calorie snacks throughout the day.
C. Encourage client to eat several small meals throughout the day.
D. May need to include dietary supplements.
E. Assess client for lactose intolerance.
F. Avoid foods or beverages that may cause oral, esophageal, or gastric irritation.
G. Tube feedings or parenteral nutrition may be necessary.

**Goal:** To maintain fluid and electrolyte status.
A. Evaluate weight gain and loss.
B. Assess for chronic diarrhea.
C. Encourage fluids that assist in maintaining electrolyte balance.

**Goal:** To prevent formation of pressure ulcers and excoriation of the skin.
A. Wash perineal and anal areas; allow areas to dry thoroughly.
B. Observe bony prominence for adequacy of circulation and development of a pressure ulcer.
C. Do not put any lotions on reddened areas or open lesions.
D. Teach client the importance of frequent changes in position.
E. Use gel pads, foam mattress pads, and other devices to prevent skin breakdown in pressure prone areas (heels and sacrum).

**Goal:** To assist client to maintain psychologic equilibrium.
A. Encourage client to express feelings and concerns.
B. Assess for altered self-esteem, family stress, and economic pressures; provide referrals and assistance.
C. Encourage client to maintain as much independence as possible.
D. Help client take advantage of community services available.
E. Do not be judgmental regarding client's lifestyle.
F. Maintain frequent contact with the client.

**Home Care for the Immunocompromised Client**
A. Maintain personal hygiene and practice standard precautions; wash hands frequently.
B. Do not share personal items such as toothbrushes, razors, and enema equipment.
C. Teach client how to prevent infection.
   1. Cook all vegetables and meats, and peel fruit before eating; this eliminates many sources of microorganisms.
   2. Avoid contact with animal waste (e.g., litter boxes, bird cages, or fish); this further decreases contact with microorganisms.
   3. Avoid crowds and people with respiratory tract infections.
D. Do not get pregnant.

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**Appendix 7-1  ANTIRETROVIRAL THERAPY (ART)**

**General Nursing Implications**
— Highly active antiretroviral therapy (HAART) used for treatment of clients with HIV and AIDS.
— Report any sore throat, fever, or other signs of infection to health care provider.
— Very important to administer the medication at the same time each day to maintain consistent blood levels and to decrease drug resistance.
— No vaccines or immunity-conferring agents while client is immunosuppressed.
— Maintain standard precautions, use contact, droplet, and airborne precautions as indicated.
— Medications do not cure AIDS or reduce the risk for transmission.

**MEDICATIONS SIDE EFFECTS NURSING IMPLICATIONS**

**Nonnucleoside Reverse Transcriptase Inhibitors (NNRTIs):** All bind directly to the HIV transcriptase and inhibit the enzyme.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Side Effects</th>
<th>Nursing Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nevirapine (Viramune, NVP): PO</td>
<td>Rash (may be severe—blistering, joint pain, oral lesions), hepatotoxic, hepatitis</td>
<td>Viramune: Monitor LFTs; rash may be so severe that drug is discontinued.</td>
</tr>
<tr>
<td>Delavirdine (Rescriptor, DLV): PO</td>
<td>Rash (may be severe), hepatotoxic, GI symptoms</td>
<td>Rescriptor: Monitor LFTs; rash may be so severe that drug is discontinued.</td>
</tr>
<tr>
<td>Efavirenz (Sustiva, EFV): PO</td>
<td>Rash, hepatotoxic, teratogenic, CNS symptoms</td>
<td>Sustiva: Monitor LFTs; avoid pregnancy, avoid taking with St John's wort.</td>
</tr>
</tbody>
</table>
### Nucleoside/Nucleotide Reverse Transcriptase Inhibitors (NRTIs): All NTRIs suppress the synthesis of viral DNA by reverse transcriptase. Medications are given with other antiretroviral agents; they are not used alone due to rapid development of resistance.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Side Effects</th>
<th>Nursing Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Didanosine (Videx): PO</td>
<td>Nausea, diarrhea, peripheral neuropathy, liver damage, pancreatitis.</td>
<td>Food decreases absorption; give on empty stomach 30 min before eating or 2 hr after.</td>
</tr>
<tr>
<td>Stavudine (Zerit): PO</td>
<td>Pancreatitits, lactic acidosis, diarrhea, peripheral neuropathy</td>
<td>Report peripheral neuropathy; do not use in pregnancy.</td>
</tr>
<tr>
<td>Zidovudine (ZDV, Retrovir, AZT, azidothymidine): PO, IV</td>
<td>Bone marrow suppression, anemia, neutropenia</td>
<td>Maintain upright position to decrease esophageal irritation; monitor levels of anemia and neutropenia.</td>
</tr>
<tr>
<td>Lamivudine (Epivir): PO</td>
<td>Headache, nausea, malaise/fatigue, diarrhea</td>
<td>St. John's wort may decrease concentration.</td>
</tr>
<tr>
<td>Abacavir (Ziagen): PO</td>
<td>Hypersensitivity, pulmonary problems.</td>
<td>ETOH increases risk for hypersensitivity reactions; report respiratory changes.</td>
</tr>
</tbody>
</table>

### Protease Inhibitors (PIs): Bind to the active site of the HIV and render the virus immature and noninfectious; are not given alone due to development of increased resistance.

**Adverse effects of all PIs:** Fat maldistribution, hyperlipidemia, hyperglycemia, bone loss, hepatotoxic.

**Shared interactions:** St John's wort, decreases the effectiveness of PIs.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Side Effects</th>
<th>Nursing Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saquinavir (Fortovase, Invirase): PO</td>
<td>GI affects, headache</td>
<td>Do not give with grapefruit juice; take with food; check for drug interactions.</td>
</tr>
<tr>
<td>Ritonavir (Norvir): PO</td>
<td>GI discomfort, perioral paresthesia</td>
<td>Food increases levels; take with food for tolerance.</td>
</tr>
<tr>
<td>Indinavir (Crixivan): PO</td>
<td>GI discomfort, renal damage</td>
<td>Take 1 hr before or 2 hours after meals.</td>
</tr>
<tr>
<td>Nelfinavir (Viracept): PO</td>
<td>Diarrhea, rash</td>
<td>Take with food.</td>
</tr>
<tr>
<td>Amprenavir (Agenerase): PO</td>
<td>N/V, diarrhea, rash,</td>
<td>Contraindicated in pregnancy, renal or hepatic failure; high-fat meals decrease absorption.</td>
</tr>
<tr>
<td>Lopinavir/ritonavir (Kaletra): PO</td>
<td>N/V, diarrhea, increased fatigue</td>
<td>Moderate fat meal increases absorption; take with food.</td>
</tr>
</tbody>
</table>

### HIV Fusion Inhibitor: Blocks entry of HIV into CD4 T cells.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Side Effects</th>
<th>Nursing Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enfuvirtide (Fuzeon, T-20): subQ</td>
<td>Injection site reaction, bacterial pneumonia, hypersensitivity reactions</td>
<td>Use small-gauge needle to decrease skin reaction; monitor respiratory status.</td>
</tr>
</tbody>
</table>

* AIDS, Acquired immunodeficiency syndrome; GI, gastrointestinal; HIV, human immunodeficiency virus; IV, intravenous; PO, by mouth (orally); subQ, subcutaneous.
# Appendix 7-2  Medications for Allergic Reactions

## Medications

### Antihistamines: Selectively block histamine receptor sites.

<table>
<thead>
<tr>
<th>H&lt;sub&gt;1&lt;/sub&gt;—First Generation</th>
<th>Side Effects</th>
<th>Nursing Implications</th>
</tr>
</thead>
</table>
| Diphenhydramine (Benadryl): PO, IM, IV | Dry mouth, dizziness, blurred vision, urinary retention, constipation, and sedation | 1. Advise client not to engage in activity that requires mental alertness for safety.  
2. Should not take medication with alcohol.  
3. Should not be used in clients with asthma. |
| Clemastine (Tavist Allergy): PO | | |
| Promethazine (Phenergan): PO, IV, IM | | |

<table>
<thead>
<tr>
<th>H&lt;sub&gt;1&lt;/sub&gt;—Second Generation</th>
<th>Side Effects</th>
<th>Nursing Implications</th>
</tr>
</thead>
</table>
| Cetirizine (Zyrtec): PO | Dry mouth and throat | 1. Second generation is nonsedating.  
2. Do not have anticholinergic properties of first generation.  
3. Should not be taken with alcohol.  
4. Are much more expensive than first generation. |
| Fexofenadine (Allegra): PO | | |
| Loratadine (Claritin): PO | | |

### Nasal Sprays

<table>
<thead>
<tr>
<th>Nasal Sprays</th>
<th>Side Effects</th>
<th>Nursing Implications</th>
</tr>
</thead>
</table>
| Fluticasone (Flonase, Flovent) | Nasopharyngeal irritation | 1. Teach client to clear nasal passages before using.  
2. Hold spray bottle upright and insert tip into nostril.  
3. Used to treat allergic rhinitis. |
| Triamcinolone (Nasacort) | | |

### Adrenergic Agonist: Stimulates alpha<sub>1</sub>, alpha<sub>2</sub>, beta<sub>1</sub>, and beta<sub>2</sub> adrenergic receptors.

**Action:** Relaxes smooth muscle of bronchial tree (decreases respiratory distress), cardiac stimulant (increases cardiac rate), produces vasoconstriction (increases blood pressure), drug of choice for anaphylactic reactions.

<table>
<thead>
<tr>
<th>Epinephrine (Adrenalin, EpiPen): subQ, IV</th>
<th>Side Effects</th>
<th>Nursing Implications</th>
</tr>
</thead>
</table>
| 1%—1:100—oral inhalation | Hypertension, dysrhythmias, angina, hyperglycemia | 1. Clients at risk for anaphylaxis should carry emergency epinephrine (EpiPen).  
2. EpiPen—sensitive to extreme heat and light; discard if it is brown in color, has a precipitate, or has passed its expiration date.  
3. Advise clients to obtain medical assistance immediately if epinephrine is used.  
4. 0.1 to 0.5 mL of 1:1000 dilution subQ or IM is used for mild to moderate reaction.  
5. 0.5 mL of 1:10,000 dilution subcutaneously or IV is used for severe reactions and advanced cardiac life support.  
6. Drug of choice for severe anaphylactic reactions.  
7. Closely monitor pulse rate and blood pressure. |
| 0.1%—1:1,000—subQ, IM | Necrosis at IV site if extravasation occurs | |
| 0.01%—1:10,000—IV, intracardiac. | | |
1. To evaluate the progress of the client’s systemic lupus erythematosus (SLE), the nurse evaluates which data?
   1. Increased serum complement fixation, which correlates with reduction of “butterfly” rash
   2. Increasing levels of C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR)
   3. Overall bone marrow proliferation, which correlates with symptoms of inflammation
   4. Presence of antinuclear antibodies (ANA), which correlates with a diminishing immune process

2. The mother of a 15-month-old child who is immunosuppressed asks about continuation of the childhood vaccines. Which immunizations are not recommended to be given to the child during immunosuppression?
   1. Diphtheria, tetanus, and pertussis (DTP)
   2. Haemophilus influenzae B
   3. Varicella; measles, mumps, and rubella (MMR)
   4. Inactivated polio; diphtheria, tetanus, and pertussis (DTP)

3. A client returns to the clinic to receive evaluation of his routine purified protein derivative (PPD) test for tuberculosis screening. The test result is positive. What is the best nursing interpretation of this information?
   1. This is a serious type II reaction and could indicate that he has active tuberculosis; he will need further evaluation immediately.
   2. The positive results indicate the client has been exposed to the tuberculosis bacilli and has had a delayed type IV response.
   3. The client’s immune system has been compromised, which allows the immune system to build up antibodies against the pathogen.
   4. An autoimmune response has occurred and the client will need further evaluation to determine appropriate treatment.

4. A nurse is caring for a client who received a penicillin injection about 15 minutes earlier. The client complains of tingling around the mouth and, this rapidly progresses to severe dyspnea and respiratory distress. What are the priority nursing actions?
   1. Anticipate need for possibility of endotracheal intubation, begin oxygen, call for assistance, and obtain emergency cart.
   2. Place the client in supine position and assess for patent airway and presence of breath sounds.
   3. Start oxygen at 6 L/min via nasal cannula; review chart for history of a penicillin allergy.
   4. Place the client in semi-Fowler’s position, perform a chin-lift to open the airway, and assess for air movement.

5. The nurse is administering medications to a client who has no allergy band on his arm. The nurse tells the client she has his penicillin medication. The client states that the last time he had penicillin, it made his mouth tingle and his hands itch. What would be the best nursing action?
   1. Administer the medication since there is no indication that the client is allergic to penicillin.
   2. Hold the medication and contact the physician regarding the client’s statement about his previous experience with penicillin.
   3. Hold the medication and review the clients chart to determine whether there is a penicillin allergy noted.
   4. Notify the nursing supervisor regarding the client’s statement and request further evaluation of the client.

6. A client has systemic lupus erythematosus (SLE). What statement best describes this client’s immune response?
   1. A delayed hypersensitivity that is cell-mediated
   2. An immediate reaction to prior exposure
   3. An immune complex that forms with antibody production
   4. An immune response that no longer recognizes normal body tissue

7. A client is diagnosed with an immunodeficiency disease. The nurse would understand what as characteristic of this condition?
   1. Occurs when a client’s body is unable to defend itself from an invading microorganism
   2. Creates a severe, sudden problem that is characterized by increased vascular permeability
   3. Is precipitated by the destruction of the normal lymphocytes in the attempt to reduce the serum level of the antigen
   4. Is a condition in which the normal immune response is interrupted and the body cells do not recognize healthy tissue

8. An infant has an acquired active immunity. Which statement best explains this type of immunity?
   1. The infant has received immunizations.
   2. Immunity was transferred from the mother to the infant.
   3. The infant is recovering from a childhood disease that conferred immunity.
   4. The infant has received gamma globulin after exposure to hepatitis.

9. The nurse is preparing discharge teaching for a woman newly diagnosed with SLE. What will be important for the nurse to include in the teaching plan? Select all that apply.
   1. Wear sunscreen and protective clothing when in direct sunlight.
   2. Avoid nonsteroidal antiinflammatory drugs to prevent bleeding episodes.
   3. Plan activities that encourage range of motion in extremities.
   4. Advise the client that pregnancy is contraindicated.

Study Questions Immune System
5. Observe fingertips for changes in circulation.

10. A client with a diagnosis of AIDS has developed *Pneumocystis jirovecii* pneumonia (PCP). What will be important for the nurse to include in the nursing care plan?
1. Put a mask on the client whenever he has visitors in his room.
2. Explain to the client why he cannot go outside his room.
3. Wear a mask and gown when providing direct care to the client.
4. Wear a gown and gloves when assisting the client with personal hygiene.

11. A client is worried he may have been exposed to AIDS. What will be important for the nurse to explain to this client?
1. Symptoms of AIDS will develop immediately in sexually active individuals.
2. Clients may remain asymptomatic for an indefinite period of time.
3. Symptoms of AIDS are usually seen before the client is found to be HIV-positive.
4. After exposure to the virus, symptoms may develop within 6 to 12 weeks or as late as 6 months.

12. The nurse is caring for a client who is categorized as HIV-positive, acute infection. What would the nurse anticipate finding on the nursing assessment?
1. Fatigue, weight loss, night sweats
2. Confusion, disorientation, loss of coordination
3. Dyspnea, tachycardia on exertion, fever
4. Red, raised lesions on neck and face, fever

13. A woman explains to the nurse that she thinks she has been exposed to the HIV. However, she had a test 1 week after the exposure and the result was negative. What is most important for the nurse to explain to this client?
1. Make sure she understands the importance of safe sex practices, especially the use of condoms and contraceptive practices to prevent pregnancy.
2. Even though the client tested negative, she needs to have a series of follow-up blood tests because of the possibility of seroconversion.
3. It is important that she obtain counseling regarding the transmission of the virus and how she may protect herself and her partner.
4. The client should abstain from sexual activity for the next 3 months until the blood test confirms that she is negative for HIV.

14. A client is experiencing difficulty breathing, periorbital swelling, flushing, and itching. He had a diagnostic test in which an iodine-based dye was used about an hour earlier. What medication will the nurse anticipate administering immediately?
1. A bronchodilator such as aminophylline (Theophylline)
2. A corticosteroid such as dexamethasone (Decadron)
3. An antihistamine such as diphenhydramine (Benadryl)
4. An adrenergic agonist such as epinephrine (Adrenalin)

15. The nurse is reviewing with a certified nursing assistant (CNA) the care for a child who is diagnosed with acquired immunodeficiency syndrome (AIDS) and has developed *Pneumocystis* pneumonia. Which of the following precautions would the nurse review with the CNA?
1. Strict handwashing
2. Airborne precautions
3. Contact precautions
4. Standard precautions

16. The nurse is assisting a client with his antiretroviral therapy. What can the nurse do to help the client take his medications as prescribed?
1. Assess the client’s activities of daily living and his lifestyle routine to determine when he can most easily remember to take his medications.
2. Provide the client with brochures that explain the side effects of the medications and why it is so important for him to adhere to his medication schedule.
3. Plan for him to visit with other clients who use the same antiretroviral therapy and have them explain to the client how they handle their medications.
4. Emphasize to the client how important it is to take the medications on the schedule prescribed so that the virus will not get stronger.

17. The nurse is caring for a client who is experiencing a severe anaphylactic reaction caused by an allergy to peanuts. After administering subcutaneous epinephrine and beginning oxygen administration, what would be the next most important nursing action?
1. Administer analgesics to relieve the pain.
2. Start an IV for fluid administration.
3. Insert a catheter to determine urinary output.
4. Obtain a history of possible reactions to penicillin.

18. A client with AIDS has several cutaneous lesions identified as Kaposi’s sarcoma. How will the nurse care for these areas?
1. Gently cleanse the areas, keeping them dry and free of abrasions.
2. Place sterile, saline-soaked gauze over the areas.
3. Apply a topical corticosteroid cream.
4. Decrease infection by applying an antibiotic ointment.

Answers and rationales to these questions are in the section at the end of the book titled Chapter Study Questions: Answers and Rationales.