Overview of Anatomy and Physiology
Characteristics of blood
- **Consistency**
  - **45% blood cells**
  - **55% blood plasma**
- **pH**
  - **7.35 to 7.45**
- **Volume**
  - **10 to 12 pints**

Overview of Anatomy and Physiology
Red blood cells (RBCs)
- **Erythrocytes**
- **Transport oxygen and carbon dioxide**

White blood cells (WBCs)
- **Leukocytes**
- **Body defenses: destruction of bacteria and viruses**

Thrombocytes (platelets)
- **Initiate blood clotting**

Figure 47-1
Overview of Anatomy and Physiology
Hemostasis: A body process that arrests the flow of blood and prevents hemorrhage
- **Injury**
- **Hemorrhage**
- **Grouping platelets**
- **Thromboplastin released**
- **Converts prothrombin to thrombin**
- **Links with fibrinogen**
- **Formation of fibrin**
- **Traps RBCs and platelets**
- **Forms clot**

Figure 47-2
Overview of Anatomy and Physiology
Blood types (groups)
- **Determined by the presence or absence of specific antigens on the outer surface of the RBC**
  - **Type A**
  - **Type B**
  - **Type AB**
    - **Universal recipient**
  - **Type O**
    - **Universal donor**

Overview of Anatomy and Physiology
Rh factor
- **Rh antibodies may be located on the surface of the RBC**
  - **Rh positive: Antibodies are present**
  - **Rh negative: Antibodies are not present**

Overview of Anatomy and Physiology
Lymphatic system
- **Functions**
  - **Maintenance of fluid balance**
  - **Production of lymphocytes**

- **Absorption and transportation of lipids from the intestine to the bloodstream**

Overview of Anatomy and Physiology

Lymphatic system

- **Lymph and lymph vessels**
  - **Lymph is a specialized fluid formed in the tissue spaces transported by way of the lymphatic vessels and reenters the circulatory system**
- **Lymphatic tissue**
  - **Lymph nodes**
    - **Act as filters, keeping particulate matter such as bacteria from entering bloodstream**

Overview of Anatomy and Physiology

Lymphatic system *(continued)*

- **Lymphatic tissue *(continued)***
  - **Tonsils**
    - **Produce lymphocytes and antibodies: trap bacteria**
  - **Spleen**
    - **Reservoir for blood; forms lymphocytes, monocytes, and plasma; destroys worn-out RBCs; removes bacteria by phagocytosis**
  - **Thymus**
    - **Immune system before and a few months after birth; atrophies at puberty**

Figure 47-4

Disorders of the Hematological and Lymphatic Systems

Diagnostic tests

- **Complete blood count (CBC)**
- **Red cell indices**
- **Peripheral smear**
- **Schilling test**
- **Megaloblastic anemia profile**
- **Lymphangiography**
- **Bone marrow aspiration or biopsy**

Disorders of the Hematological and Lymphatic Systems

Anemia

- **Definition**
  - **Disorder characterized by RBC and hemoglobin and hematocrit levels below normal range**
  - **Causes delivery of insufficient amounts of oxygen to tissues and cells**

Disorders of the Hematological and Lymphatic Systems

Anemia *(continued)*

- **Etiology/pathophysiology**
  - **Types of anemia**
    - **Blood loss**
    - **Impaired production of RBCs**
    - **Increased destruction of RBCs**
    - **Nutritional deficiencies**

Disorders of the Hematological and Lymphatic Systems

Anemia *(continued)*

- **Clinical manifestations/assessment**
  - **Anorexia**
  - **Dyspepsia**
  - **Cardiac dilation**
  - **Disorientation**
  - **Shortness of breath**
  - **Dyspnea**
  - **Fatigue**
  - **Headache**

Disorders of the Hematological and Lymphatic Systems

Anemia *(continued)*

- **Clinical manifestations/assessment *(continued)***
  - **Insomnia**
  - **Pallor**
  - **Palpitation**
  - **Systolic murmur**
  - **Tachycardia**
  - **Vertigo**

Disorders of the Hematological and Lymphatic Systems

Anemia *(continued)*

- **Medical management**
  - **Depends on the cause**
  - **Correction of the disease process may correct or lessen the anemic condition**
  - **Treatment is often specific to the particular anemia**

Disorders of the Hematological and Lymphatic Systems

Hypovolemic anemia

- **Etiology/pathophysiology**
  - **Abnormally low circulating blood volume due to blood loss**
  - **500-mL loss can be tolerated**
  - **1,000-mL loss can cause severe complications**
  - **Severity and signs and symptoms depend on how rapid the blood is lost**

Disorders of the Hematological and Lymphatic Systems

Hypovolemic anemia *(continued)*

- **Clinical manifestations/assessment**
  - **Weakness**
  - **Stupor; irritability**
  - **Pale, cool, moist skin**
  - **Hypotension**
  - **Tachycardia (rapid, weak, thready pulse)**
  - **Hypothermia**
  - **Hemoglobin less than 10 g/100 mL**
  - **Hematocrit less than 40%**

Disorders of the Hematological and Lymphatic Systems

Hypovolemic anemia *(continued)*

- **Medical management/nursing interventions**
  - **Control bleeding**
  - **Treat shock**
    - **O_2, elevate lower extremities, keep warm**
  - **Replace fluid**
    - **Blood transfusion, plasma, dextran, lactated Ringer's**
  - **Monitor vital signs**

Disorders of the Hematological and Lymphatic Systems

Pernicious anemia

- **Etiology/pathophysiology**
  - **Absence of the intrinsic factor**
  - **Intrinsic factor is essential for the absorption of vitamin B_{12}**
  - **Deficiency of vitamin B_{12} affects growth and maturity of all body cells**
  - **Vitamin B_{12} is also related to nerve myelination**
    - **May cause progressive demyelination and degeneration of nerves and white matter**

Disorders of the Hematological and Lymphatic Systems

Pernicious anemia *(continued)*

- **Clinical manifestations/assessment**
  - **Extreme weakness**
  - **Dyspnea**
  - **Fever**
  - **Hypoxia**
  - **Weight loss**
  - **Jaundice (destruction of RBCs)**
  - **Pallor**
  - **GI complaints**

Disorders of the Hematological and Lymphatic Systems

Pernicious anemia *(continued)*

- **Clinical manifestations/assessment *(continued)***
  - **Dysphagia**
  - **Sore, burning tongue**
    - **Smooth and erythematous**
  - **Neurological symptoms**
    - **Tingling of the hands and feet**
    - **Disorientation**
    - **Personality changes; behavior problems**
    - **Partial or total paralysis**

Disorders of the Hematological and Lymphatic Systems

Pernicious anemia *(continued)*

- **Medical management/nursing interventions**
  - **Vitamin B_{12} (cyanocobalamin) 1,000 units**
    - **Daily for 1 week**
    - **Weekly for 1 month**
    - **Monthly for life**
  - **Folic acid supplement**
  - **Iron replacement**

- **RBC transfusion**
- **Diet: high in protein, vitamins, and minerals**

Disorders of the Hematological and Lymphatic Systems

Aplastic anemia

- **Etiology/pathophysiology**
  - **Decrease of bone marrow function**
  - **Primary**
    - **Congenital**
  - **Secondary**
    - **Viral invasion**
    - **Medications**
    - **Chemicals**
    - **Radiation; chemotherapy**

Disorders of the Hematological and Lymphatic Systems

Aplastic anemia *(continued)*

- **Clinical manifestations/assessment**
  - **Pancytopenic**
  - **Repeated infections with high fevers**
  - **Fatigue, weakness, malaise**
  - **Dyspnea**
  - **Palpitations**
  - **Bleeding tendencies**

Disorders of the Hematological and Lymphatic Systems

Aplastic anemia *(continued)*

- **Medical management/nursing interventions**
  - **Identify and remove cause**
  - **Platelet transfusion for severe thrombocytopenia**
  - **Splenectomy for hypersplenism**
  - **Steroids and androgens**
  - **Antithymocyte globulin**
  - **Bone marrow transplant**

Disorders of the Hematological and Lymphatic Systems

Iron deficiency anemia

- **Etiology/pathophysiology**
  - **RBCs contain decreased levels of hemoglobin**
  - **Excessive iron loss**
    - **Caused by chronic bleeding—intestinal, uterine, gastric**

Disorders of the Hematological and Lymphatic Systems

Iron deficiency anemia *(continued)*

- **Clinical manifestations/assessment**
  - **Pallor**
  - **Fatigue; weakness**
  - **Shortness of breath**
  - **Angina; signs and symptoms of heart failure**
  - **Glossitis; burning tongue**
  - **Pagophagia**

- Headache
- Paresthesia

Disorders of the Hematological and Lymphatic Systems

Iron deficiency anemia *(continued)*

- Medical management/nursing interventions
  - Pharmacological management
    - Ferrous sulfate 900 mg daily
      - Oral or injection (Z-track)
    - Ascorbic acid
  - Diet high in iron

Disorders of the Hematological and Lymphatic Systems

Sickle cell anemia

- Etiology/pathophysiology
  - An abnormal, crescent-shaped RBC
  - Severe, chronic, incurable condition
  - Disease
    - Homozygous
  - Trait
    - Heterozygous

Disorders of the Hematological and Lymphatic Systems

Sickle cell anemia *(continued)*

- Clinical manifestations/assessment
  - Precipitating factors
    - Dehydration
    - Change in oxygen tension in the body
  - Loss of appetite
  - Irritability
  - Weakness
  - Abdominal enlargement
  - Joint and back pain
  - Edema of extremities

Disorders of the Hematological and Lymphatic Systems

Sickle cell anemia *(continued)*

- Medical management/nursing interventions
  - No specific treatment—alleviate symptoms
  - Oxygen
  - Rest
  - Fluids
  - Analgesics
  - Bone marrow transplant

Disorders of the Hematological and Lymphatic Systems

Polycythemia (erythrocytosis)

- Polycythemia vera
  - Characterized by hyperplasia of the bone marrow
  - Manifestations
    - Increases in circulating erythrocytes, granulocytes, and platelets

- **Elevated WBC count**
- **Diagnostic tests**
  - **CBC**
  - **Alkaline phosphatase levels**
  - **Uric acid levels**
  - **Histamine levels**

Disorders of the Hematological and Lymphatic Systems

Polycythemia (erythrocytosis)

- **Polycythemia vera**
  - **Medical management/nursing interventions**
    - **Pharmacological management**
      - **Myelosuppressive agents**
      - **Radioactive phosphorus**
    - **Reduction of blood viscosity**
    - **Intake and output**
    - **Assessment of nutritional status**

Disorders of the Hematological and Lymphatic Systems

Agranulocytosis

- **Etiology/pathophysiology**
  - **Severe reduction in the number of granulocytes**
  - **WBC less than 200/mm^3**
  - **Medications**
  - **Chemotherapy**
  - **Radiation**
  - **Neoplastic disease**
  - **Viral and bacterial infections**

Disorders of the Hematological and Lymphatic Systems

Agranulocytosis *(continued)*

- **Clinical manifestations/assessment**
  - **Symptoms of infection**
  - **Ulcerations of mucous membranes**
  - **Bronchial pneumonia**
  - **Urinary tract infection**
- **Medical management/nursing interventions**
  - **Remove cause of bone marrow depression**
  - **Prevent or treat infections**
  - **Meticulous handwashing**
  - **Strict asepsis**

Disorders of the Hematological and Lymphatic Systems

Leukemia

- **Etiology/pathophysiology**
  - **Malignant disorder of the hematopoietic system**
  - **Excess leukocytes accumulate in the bone marrow and lymph nodes**
  - **Cause unknown**
  - **Classification**

- Acute or chronic
- Proliferating cells (lymphocytic, monocytic, etc.)

Disorders of the Hematological and Lymphatic Systems
Leukemia *(continued)*

- Clinical manifestations/assessment
  - Anemia
  - Thrombocytopenia; leukopenia
  - Enlarged lymph nodes
  - Splenomegaly
- Medical management/nursing interventions
  - Pharmacological management
    - Leukeran
    - Hydroxyurea
    - Corticosteroids
    - Cytoxan
  - Chemotherapy; radiation
  - Bone marrow transplant

Disorders of the Hematological and Lymphatic Systems
Thrombocytopenia

- Etiology/pathophysiology
  - Condition in which the number of platelets is reduced below 100,000/mm^3; may be due to decreased production or decreased survival
- Clinical manifestations/assessment
  - Petechiae
  - Ecchymoses
  - Platelets below 100,000/mm^3
  - Bleeding from mucous membranes

Disorders of the Hematological and Lymphatic Systems
Thrombocytopenia *(continued)*

- Medical management/nursing interventions
  - Pharmacological management
    - Corticosteroid therapy
    - Gamma globulin
    - Immunosuppressive therapy
  - Splenectomy
  - Platelet transfusions
  - Avoid trauma

Disorders of the Hematological and Lymphatic Systems
Hemophilia

- Etiology/pathophysiology
  - Hereditary coagulation disorder, characterized by a disturbance of clotting factor
  - Hemophilia A; hemophilia B
  - X-linked hereditary trait
- Clinical manifestations/assessment
  - Internal and external bleeding

- Hemarthrosis
- Excessive blood loss from small cuts and dental procedures

Disorders of the Hematological and Lymphatic Systems

Hemophilia *(continued)*

- Medical management/nursing interventions
  - Minimize bleeding—avoid trauma
  - Relieve pain—no aspirin
  - Transfusions
    - Factor VIII or IX concentrate
    - Cryoprecipitate (rich in factor VIII)
    - Manufactured factor VIII or IX

Disorders of the Hematological and Lymphatic Systems

von Willebrand's disease

- Etiology/pathophysiology
  - Inherited bleeding disorder characterized by abnormally slow coagulation of blood; mild deficiency of factor VIII
  - Similar to hemophilia; not limited to males
- Clinical manifestations/assessment
  - Spontaneous episodes of
    - GI bleeding
    - Epistaxis
    - Gingival bleeding

Disorders of the Hematological and Lymphatic Systems

von Willebrand's disease *(continued)*

- Medical management/nursing interventions
  - Pharmacological management
    - Desmopressin (DDAVP)
  - Cryoprecipitate
  - Fibrinogen
  - Fresh plasma
  - Minimize bleeding—avoid trauma
  - Relieve pain—no aspirin

Disorders of the Hematological and Lymphatic Systems

Disseminated intravascular coagulation

- Etiology/pathophysiology
  - Overstimulation of clotting and anticlotting processes in response to disease or injury
- Clinical manifestations/assessment
  - Bleeding; hemoptysis
  - Dyspnea
  - Diaphoresis
  - Cold, mottled digits
  - Purpura on the chest and abdomen
  - Petechiae

Disorders of the Hematological and Lymphatic Systems

Disseminated intravascular coagulation *(continued)*

- **Medical management/nursing interventions**
  - **Pharmacological management**
    - **Heparin—considered somewhat controversial**
  - **Treat underlying cause**
  - **Cryoprecipitate**
  - **Protect from bleeding and trauma**

Disorders of the Hematological and Lymphatic Systems

Multiple myeloma

- **Etiology/pathophysiology**
  - **Malignant neoplastic immunodeficiency disease of the bone marrow**
- **Clinical manifestations/assessment**
  - **Bone pain; pathological fractures**
  - **Infection**
  - **Anemia; bleeding**
  - **Hypercalcemia**
  - **Renal failure**

Disorders of the Hematological and Lymphatic Systems

Multiple myeloma *(continued)*

- **Medical management/nursing interventions**
  - **Symptomatic; not curable**
  - **Pharmacological management**
    - **Corticosteroids**
    - **Analgesics**
  - **Radiation**
  - **Chemotherapy**
  - **IV fluids**

Disorders of the Hematological and Lymphatic Systems

Lymphangitis

- **Etiology/pathophysiology**
  - **Inflammation of one or more lymphatic vessels**
  - **Usually occurs from acute streptococcal or staphylococcal infection in an extremity**
- **Clinical manifestations/assessment**
  - **Fine red streaks from the affected area**
  - **Edema**
  - **Chills; fever**
  - **Local pain**
  - **Headache; myalgia**

Disorders of the Hematological and Lymphatic Systems

Lymphangitis *(continued)*

- **Medical management/nursing interventions**
  - **Penicillin**
  - **Moist heat**
  - **Elevate extremity**

Disorders of the Hematological and Lymphatic Systems

Lymphedema

- **Etiology/pathophysiology**
  - **Primary or secondary disorder**
  - **Accumulation of lymph in the soft tissue**
- **Clinical manifestations/assessment**
  - **Massive edema and tightness of affected extremity**
  - **Pain**

Disorders of the Hematological and Lymphatic Systems

Lymphedema *(continued)*

- **Medical management/nursing interventions**
  - **Pharmacological management**
    - **Diuretics**
    - **Antibiotics**
  - **Compression pump**
  - **Elastic stocking or sleeve**
  - **Restricted sodium diet**
  - **Avoid constrictive clothing**
  - **Meticulous skin care**

Disorders of the Hematological and Lymphatic Systems

Hodgkin's disease

- **Etiology/pathophysiology**
  - **Inflammatory or infectious process that develops into a neoplasm**
  - **Affects males twice as frequently as females**
  - **Reed-Sternberg cells**

Disorders of the Hematological and Lymphatic Systems

Hodgkin's disease *(continued)*

- **Clinical manifestations/assessment**
  - **Enlargement of cervical lymph nodes**
  - **Anorexia**
  - **Weight loss**
  - **Pruritus**
  - **Low-grade fever**
  - **Night sweats**
  - **Anemia**
  - **Leukocytosis**

Disorders of the Hematological and Lymphatic Systems

Hodgkin's disease *(continued)*

- **Medical management/nursing interventions**
  - **Stage I or II (localized)**
    - **Radiation**
  - **Stage III or IV (generalized)**
    - **Chemotherapy**
    - **Combination**

Figure 47-5

Disorders of the Hematological and Lymphatic Systems

Non-Hodgkin's lymphoma

- **Etiology and pathology**

- **A group of malignant neoplasms**
- **Characterized as a neoplasm of the immune system**
- **Cause is unknown**
- **Tumors usually start in lymph nodes and spread to lymphoid tissue in the spleen, liver, GI tract, and bone marrow**

Disorders of the Hematological and Lymphatic Systems

Non-Hodgkin's lymphoma *(continued)*

- **Clinical manifestations/assessment**
  - **Painless, enlarged cervical lymph nodes**
  - **Fever; susceptibility to infection**
  - **Weight loss; anorexia**
  - **Anemia**
  - **Pruritus**
  - **Fatigue**
  - **Malaise**

Disorders of the Hematological and Lymphatic Systems

Non-Hodgkin's lymphoma *(continued)*

- **Diagnostic tests**
  - **Bone scan**
  - **CBC**
  - **ESR**
  - **Coombs' test**
  - **Chest roentgenogram**
  - **CT scan**
  - **Gallium scan**
  - **Biopsies**

Disorders of the Hematological and Lymphatic Systems

Non-Hodgkin's lymphoma *(continued)*

- **Medical management/nursing interventions**
  - **Accurate staging of the disease is crucial to determine treatment regimen**
  - **Radiation**
  - **Chemotherapy**
  - **Bone marrow transplant**
  - **Tumor necrosis factor (TNF)**

Nursing Process