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%
Medical management/nursing interventions
Control bleeding
Treat shock
  
O₂, 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 B₁₂
Deficiency of vitamin B₁₂ affects growth and maturity of all body cells
Vitamin B₁₂ 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 B₁₂ (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
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

Sickle cell anemia

Etiology/pathophysiology
- An abnormal, crescent-shaped RBC
- Severe, chronic, incurable condition

Disease
- Homozygous
- Heterozygous

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

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

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
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
Petechiae
Purpura on the chest and abdomen

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

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

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