Chapter 26 Clients with Hematopoietic and Lymphatic System Disorders

Hematopoietic System
Structure and Function

° Importance of the hemapoietic system
  o Provides nutrients that allow organs to live and function normally.

° Process of blood formation
  o Begins in bone marrow.
    • Red blood cells (RBCs), called erythrocytes
    • White blood cells (WBCs), called leukocytes
    • Platelets, called thrombocytes.
  o Blood cells begin as stem cells, immature cells that can change into any blood cells, depending upon what body needs [corresponds to Figure 26-1]

° Red blood cells - most of cellular portion of blood
  o RBCs live about 120 days, continually produced to replace those that are expiring.
  o RBC production
    • Growth factor erythropoietin – needed for production of RBCs, signals stem cells to produce RBCs, produced by kidney
    • Hypoxia (low oxygen content in the blood) also stimulates RBC production
  o Recycling of RBCs
    • The liver traps and destroys old RBCs
    • Iron is retained and used in formation of new RBCs
      ↑ Iron critical to oxygen transport

° White blood cells or leukocytes
  o Critical in fighting inflammation and infection
  o Two types:
    • Granulocytes
    • Agranulocytes
  o Granulocytes are further differentiated into:
    • Neutrophils
      ↑ Approximately 2/3’s of all WBCs, have very short life span (about 10 hours), constantly replaced, increase in number in response to inflammation
    • Eosinophils
    • Basophils
      ↑ Eosinophils and basophils respond primarily to allergic reactions
  o Agranulocytes are divided into:
    • Monocytes - kill bacteria, respond to foreign materials in body
    • Lymphocytes - formed in lymphatic tissue needed for healthy immune system

° Platelets
  o Needed for proper blood coagulation
  o Production controlled by thrombopoietin (protein manufactured by liver, kidney, smooth muscle and bone marrow).
Collaborative Care

- Laboratory tests
  - Complete blood count (CBC)
    - Normal blood values for CBC [corresponds to Table 26-1]
  - Cross-matching blood types for transfusion [corresponds to Table 26-2]
    - Type A universal recipient
    - Type O universal donor
    - Rh antigens important in pregnancy

Red Blood Cell Disorders

- Anemia - deficiency of red blood cells caused by:
  - Decreased production of RBCs
  - Increased destruction of RBCs
  - Blood loss
  - Manifestations: multi-system effects [corresponds to Figure 26-2]
  - Dyspnea on exertion, muscle weakness, fatigue, difficulty concentrating, pallor, constipation and decreased bowel sounds
  - Treatment depends on type of anemia

- Iron deficiency anemia
  - Common causes: poor eating habits, heavy menstrual flow, chronic gastric bleeding
  - Manifestations as above [corresponds to Figure 26-2]
  - Treatment
    - Increased dietary intake of iron [corresponds to Box 26-1] Oral supplements or Z-track injection
    - Teach that iron will create greenish black stools. If oral liquid, sip through straw to prevent staining teeth.

- Vitamin B₁₂ deficiency anemia
  - B₁₂ needed for utilization of folic acid
  - Causes: poor diet or inability to absorb B₁₂ through lack of intrinsic factor; can occur especially in older adults
  - Manifestations: onset slow, may include numbness and tingling of extremities, dizziness, balance problems, red swollen tongue, fatigue
  - Treatment is replacement of vitamin [corresponds to Box 26-2]; must be parenteral if client lacks intrinsic factor

- Sickle cell anemia
  - Hereditary chronic condition from both parents; some RBCs take sickle shape under stress [corresponds to Figures 26-3 and 26-4]
  - Occurs most in African Americans [corresponds to Box 26-3]
  - Sickle cell crisis can lead to tissue death
  - Manifestations: jaundice, fatigue, pallor, irritability, pain brought on by exertion or stress
  - No specific treatment; increase fluids to 3000 mL/day (no caffeine, no alcohol); avoid sick people, cold environment
  - Treatment during crisis - fluids, oxygen, pain medication, bed rest
  - Nursing care: provide oxygen, pain medications and rest
° Aplastic anemia – bone marrow does not produce stem cells; marrow replaced by fatty tissue
  o Linked to exposure to paint thinner and airplane glue and some medications; 50% of time idiopathic (no known cause)
  o Manifestations of severe anemia, possible bleeding episodes, and infection
  o Treatment: transfusion of blood, white cells, and platelets; bone marrow transplant if no spontaneous recovery
  o Nursing care: protect from infection, avoid needle sticks, conserve energy
° Polycythemia – RBCs greater than normal, blood thick and does not flow normally, leads to clots, increased workload of heart, dilated blood vessels, increased peripheral resistance
  o Manifestations: hypertension, possible chest pain and congestive heart failure, intense itching, fatigue, possible weight loss, enlarged spleen
  o Increased risk of stroke
  o Treatment: reduce circulating RBCs by phlebotomy (up to 5X/wk)
  o Nursing care: encourage client to increase fluids, administer anticoagulants
° Priorities in nursing care for RBC disorders
  o Meet nutritional needs, administer replacement iron as ordered (oral iron through straw to prevent staining teeth, IM by Z-track), assist with ADLs and encourage rest, teach to avoid caffeine and alcohol, pain management and supplemental oxygen as ordered; monitor for complications
Platelet and Coagulation Disorders
° Hemostasis – blood clotting
  o Platelets attracted to damage in vessel
° Thrombocytopenia: = decrease in platelet count lower than 100,000/ml of blood.
  o Caused by decreased production or increased destruction of platelets, or from storage of platelets in the spleen.
  o Primary thrombocytopenia most often autoimmune disorder called idiopathic thrombocytopenia purpura (ITP); ITP may be acute or chronic.
    • Manifestations: petechiae and purple bruising (purpura), especially on the chest, neck, and oral mucous membranes and legs; nose bleeds; menstrual periods much heavier and longer than normal
    • Treatment: corticosteroids and platelet transfusions if necessary; surgical removal of spleen
  o Secondary thrombocytopenia caused by conditions like aplastic anemia, leukemia, or infection.
    • Manifestations same as for primary thrombocytopenia
    • Treatment supportive while primary condition is being treated.
    • Nursing care: teach client about reducing risk of bleeding while platelet count is low [corresponds to Box 26-4], including using soft toothbrush use electric razor, wear shoes when walking. Avoid
- Giving meds IM; test stool for blood; do not offer hot beverages; give PO meds only; no chips or popcorn or other foods that may cut oral mucosa

- Disseminated intravascular coagulation – acute condition, widespread disruption in clotting; clotting causes bleeding
  - Manifestations [corresponds to Box 26-5]
  - Treatment: administer platelets, clotting factors, and fresh frozen plasma to restore clotting capability; heparin if clots impair circulation
  - Nursing care: constant monitoring for signs of bleeding, preventing further injury to client, frequent VS, LOC, and all distal pulses; no IM or new IV punctures; encourage rest; position Fowler’s or high Fowler’s; treat pain; reassure client that frequent assessment can prevent complications

- Hemophilia – chronic hereditary disease, body lacks one or more clotting factors
  - Four types:
    - Type A: lack of clotting factor VIII – most common (classic); occurs only in males, usually bleeding from minor trauma; often, deformity in joints; treated by factor VIII replacement or cryoprecipitate
    - Type B: lack of clotting factor IX (Christmas disease), defect of X chromosome; symptoms same as for A; treatment is replacement of factor IX
    - Von Willebrand’s disease – defective Von Willebrand’s factor; occurs in both sexes, often lack of factor VIII as well; excess bleeding only after dental procedures, surgeries; treatment during bleeding episode is administration of platelets, clotting factors, and fresh frozen plasma
    - Type C: lack of clotting factor XI; most common in Ashkenazi Jews; episodes usually follow surgery
  - Nursing care: protect client from injury; teach that all health care providers must be told of condition; teach to avoid aspirin products

- Priorities in nursing care for coagulation disorders: prevent injury and hemorrhage; assess often for bleeding; report oozing or active bleeding immediately; turn and transfer carefully; be prepared to administer medications as needed; do not give medications IM.

White Blood Cell Disorders
- Agranulocytosis – absence of WBCs (aplastic anemia, post chemosurgery); protect client from infection; wear gloves and masks; client will receive colony-stimulating factors to stimulate WBC production
- Leukemia – malignant disorder with overproduction of (usually immature) WBCs
  - Four types:
    - Acute lymphocytic leukemia (ALL) – most common in children; treatment more successful in children than adults
    - Acute myelogenous leukemia (AML) – most common in adults; best treatment is bone marrow transplant
• Chronic lymphocytic leukemia (CLL) – most clients live 4-10 years
• Chronic myelogenous leukemia (CML) – second most common in adults
  o Manifestations: fever, fatigue, bruising, petechiae on lower extremities; multisystem effects [corresponds to Figure 26-6]
  o Diagnosis by blood count, bone marrow biopsy – nurse holds pressure on wound for 5 minutes
  o Treatment:
    - Chemotherapy
      ↑ Stage 1: geared to type of leukemia, RBC and platelet transfusions and colony-stimulating factors, bone marrow transplant, stem cell transplant, or immunotherapy
      ↑ Common to experience severe bone marrow suppression
      ↑ Stage 2: consolidation therapy, lower dosages of Stage 1 medications; goal to maintain remission; may last 1-2 years
      ↑ Stage 3: maintenance therapy, milder form used for months to years
      ↑ Side effects of chemotherapy
        - Alopecia
        - Nausea and vomiting
        - Mouth ulcers
        - Diarrhea
        - Hematuria
        - Impaired peripheral nerves
  • Bone marrow transplant – aggressive – may have total body irradiation prior to BMT; takes 2-4 weeks for new bone marrow to engraft and begin producing new blood cells; client in protective isolation
    ↑ Complication: graft-versus-host disease- body attacks itself; client must take antirejection medication; often fatal
  ° Multiple myeloma – malignancy of plasma cells, usually in person > 40 or 50, twice as many African Americans as others
    o Moves from bone marrow into bone, makes bone very brittle
    o Manifestations: bone pain, “punched-out holes” in bone on x-ray; hypercalcemia
    o Progresses slowly, no known cure
  ° Treatment: medication to boost immunity, chemotherapy to decrease malignant cells; radiation to treat individual bones
  ° Nursing care: teach need to prevent fractures
  • Priorities in nursing care for clients with WBC disorders:

**Lymphatic System**
  ° Lymph nodes [corresponds to Figure 26-7]
  ° Spleen
  ° Thymus gland
  ° Tonsils
  ° Tissue present in the bone marrow
What is lymph?
- Fluid that resembles plasma but has less protein
- Fluid that leaks out of the capillaries into the interstitial tissue, does not return to the venous system, but instead enters the lymphatic system

Lymph nodes
- Occur along lymphatic pathways, used to filter the lymph
- Become enlarged (lymphadenopathy) due to:
  - Inflammation
  - Infection
  - Malignancy. - enlarged lymph nodes may indicate:
    - Malignancy in area draining into lymph node
    - Malignancy of lymph system itself
- Assess size, density of node; tenderness, redness, or warmth of node

Lymphatic System Disorders
- Lymphangitis – lymph node inflammation
  - Manifestations: red streak along course of inflamed vessel; complaint of pain, elevated temperature
  - Treatment rest, elevated extremity, apply heat, resolve root cause
- Lymphedema – system can’t remove all lymph fluid from tissues because of obstruction, inflammation, or surgical removal of nodes
  - Manifestations: skin becomes hard and tough, resembles piece of wood
  - Treatment aimed at resolving cause, often challenging. Keep limb elevated, wear compression garments; take care to prevent injury; emollients to help soften skin
- Infectious mononucleosis (Epstein-Barr virus)
  - Viral infection of lymph tissue of nose & throat
  - Manifestations: fever, sore throat, cervical lymphadenopathy, profound fatigue, possible enlarged liver & spleen; affects teens most commonly
  - No specific treatment; treat symptoms, encourage rest; with enlarged spleen or liver, avoid vigorous activity till swelling resolves
- Malignant lymphoma
  - Hodgkin’s disease begins in one node and spreads to lymph chain; curable if caught early
  - Non-Hodgkin’s disease group of lymphatic malignancies; symptoms and treatment similar to Hodgkin’s
  - Manifestations – nontender enlarged lymph nodes; fever, fatigue, weight loss, and night sweats
  - Treatment: chemotherapy and radiation to affected nodes
- Nursing care for clients with lymphatic disorders
  - Prevent infection and reduce edema; avoid needle sticks or BPs in affected extremity; elevate affected extremity, apply compression garments as ordered; provide supportive care and encourage rest; provide nutritional support and skin care
  - Teach infection prevention; teach clients and visitors to wash hands meticulously, to avoid contact with people with signs of
infection, to use protective equipment (masks, gowns, and gloves) if the client's white blood cell count is extremely low.

- Check the skin frequently; especially the lower extremities; monitor for signs of infection.
- Turn client often, handle client very gently during nursing care, especially when bathing.

- Nursing Process Care Plan: Client with Iron Deficiency Anemia
- Critical Thinking Care Map: Caring for a client with Thrombocytopenia