LEUKEMIAS

The term *leukemia* describes a malignant disorder of the blood and lymph-forming tissues of the body. The blood's cellular components originate primarily in the marrow of bones such as the sternum, iliac crest, and cranium. All blood cells begin as immature cells (blasts or stem cells) that differentiate and mature into RBCs, platelets, and various types of WBCs. In leukemia, many immature or ineffective WBCs crowd out the developing normal cells. As the normal cells are replaced by leukemic cells, anemia, neutropenia, and thrombocytopenia occur. Leukemia is acute when WBCs proliferate so rapidly that they lose the ability to regulate cell division and do not differentiate into mature cells. In the chronic forms of leukemia, the disease develops gradually. The type of leukemia is based on the predominant cell line that is affected. In adults, the most common of the acute leukemias is acute myelocytic leukemia, which affects any type of WBC other than lymphocytes. The most common of the chronic leukemias is chronic lymphocytic leukemia, which is characterized by an abnormal increase in lymphocytes.

CARE SETTING

Acute inpatient care on medical unit for initial evaluation and treatment typically 4–6 wk, then at the community level.

RELATED CONCERNS

Cancer
Psychosocial aspects of care
Transplantation: postoperative and lifelong needs

Patient Assessment Database

Data depend on degree/duration of the disease and other organ involvement.

ACTIVITY/REST

May report: Fatigue, malaise, weakness; inability to engage in usual activities, flu-like symptoms

May exhibit: Muscle wasting
Increased need for sleep, somnolence

CIRCULATION

May report: Palpitations

May exhibit: Tachycardia, heart murmurs
Pallor of skin, mucous membranes
Cranial nerve deficits and/or signs of cerebral hemorrhage

EGO INTEGRITY

May report: Feelings of helplessness/hopelessness

May exhibit: Depression, withdrawal, anxiety, fear, anger, irritability
Mood changes, confusion

ELIMINATION

May report: Diarrhea; perianal tenderness, pain
Bright red blood on tissue paper, tarry stools
Blood in urine, decreased urine output

May exhibit: Perianal abscess; hematuria

FOOD/FLUID

May report: Loss of appetite, anorexia, vomiting
Change in taste/taste distortions
Weight loss
Pharyngitis, dysphagia

May exhibit: Abdominal distension, decreased bowel sounds
Splenomegaly, hepatomegaly; jaundice

Stomatitis, oral ulcerations
Gum hypertrophy (gum infiltration may be indicative of acute monocytic leukemia)

NEUROSENSORY

May report:
Lack of coordination/decreased coordination
Mood changes, confusion, disorientation, lack of concentration
Dizziness; numbness, tingling, paresthesias

May exhibit:
Muscle irritability, seizure activity, uncoordinated movements

PAIN/DISCOMFORT

May report:
Abdominal pain, headaches, bone/joint pain; sternal tenderness, muscle cramping

May exhibit:
Guarding/distraction behaviors, restlessness; self-focus

RESPIRATION

May report:
Shortness of breath with minimal exertion

May exhibit:
Dyspnea, tachypnea
Cough
Crackles, rhonchi
Decreased breath sounds

SAFETY

May report:
History of recent/recurrent infections; falls
Visual disturbances/impairment
Nosebleeds or other hemorrhages, spontaneous uncontrollable bleeding with minimal trauma

May exhibit:
Fever, infections
Bruises, purpura, retinal hemorrhages, gum bleeding, or epistaxis
Enlarged lymph nodes, spleen, or liver (due to tissue invasion)
Papilledema and exophthalmos
Leukemic infiltrates in the dermis

SEXUALITY

May report:
Changes in libido
Changes in menstrual flow, menorrhagia
Impotence

TEACHING/LEARNING

May report:
History of exposure to chemicals, e.g., benzene (commercially used toxic liquid that is also present in lead-free gasoline), excessive levels of ionizing radiation; previous treatment with chemotherapy, especially alkalating agents
Chromosomal disorder, e.g., Down syndrome or Fanconi's aplastic anemia
Exposure to virus, e.g., human T-cell leukemia/lymphoma virus-I (HTLV-I)

Discharge plan considerations:
DRG projected mean length of inpatient stay: 7.4–9.3 days
May need assistance with therapy and treatment needs/supplies, shopping, food preparation, self-care activities, homemaker/maintenance tasks, transportation
Refer to section at end of plan for postdischarge considerations.

DIAGNOSTIC STUDIES

***Carcinoembryonic antigen* (*CEA*):** May be elevated.
Cold agglutinins: May be elevated (more than 1:16) in lymphatic leukemia.
Cryoglobulins: Positive cryoglobulin findings may be present in patients with lymphocytic leukemia.
CBC: Indicates a normocytic, normochromic anemia.
Hemoglobin: May be less than 10 g/100 mL.
Reticulocytes: Count is usually low.
Platelet count: May be very low (less than 50,000/mm).
WBC: May be more than 50,000/cm with increased immature WBCs ("shift to left"). Leukemic blast cells may be present.

Prothrombin time (PT)/activated partial thromboplastin time (aPTT): Prolonged.
LDH: May be elevated.
Serum/urine uric acid: May be elevated.
Serum muramidase (a lysozyme): Elevated in acute monocytic and myelomonocytic leukemias.
Serum copper: Elevated.
Serum zinc: Decreased.
Bence Jones protein (urine): Increased.
Bone marrow biopsy: Abnormal WBCs usually make up 50% or more of the WBCs in the bone marrow. Often 60%–90% of the cells are blast cells, with erythroid precursors, mature cells, and megakaryocytes reduced.
Chest x-ray and lymph node biopsies: May indicate degree of involvement.

NURSING PRIORITIES

1. Prevent infection during acute phases of disease/treatment.
2. Maintain circulating blood volume.
3. Alleviate pain.
4. Promote optimal physical functioning.
5. Provide psychological support.
6. Provide information about disease process/prognosis and treatment needs.

DISCHARGE GOALS

1. Complications prevented/minimized.
2. Pain relieved/controlled.
3. ADLs met by self or with assistance.
4. Dealing with disease realistically.
5. Disease process/prognosis and therapeutic regimen understood.
6. Plan in place to meet needs after discharge.

Refer to CP: Cancer, for further discussion/expansion of interventions related to cancer care and for patient teaching.

NURSING DIAGNOSIS: Infection, risk for

Risk factors may include

Inadequate secondary defenses: alterations in mature WBCs (low granulocyte and abnormal lymphocyte count), increased number of immature lymphocytes; immunosuppression, bone marrow suppression (effects of therapy/transplant)
Inadequate primary defenses (stasis of body fluids, traumatized tissue)
Invasive procedures
Malnutrition; chronic disease

Possibly evidenced by

[Not applicable; presence of signs and symptoms establishes an *actual* diagnosis.]

DESIRED OUTCOMES/EVALUATION CRITERIA—PATIENT WILL:

Knowledge: Infection Control (NOC)

Identify actions to prevent/reduce risk of infection.
Demonstrate techniques, lifestyle changes to promote safe environment, achieve timely healing.

ACTIONS/INTERVENTIONS	RATIONALE
Infection Protection (NIC)	
Independent	
Place in private room. Screen/limit visitors as indicated. Prohibit use of live plants/cut flowers. Restrict fresh fruits and vegetables or make sure they are washed or peeled.	Protect patient from potential sources of pathogens/infection. *Note:* Profound bone marrow suppression, neutropenia, and chemotherapy place patient at great risk for infection.
Require good handwashing protocol for all personnel and visitors.	Prevents cross-contamination/reduces risk of infection.
Monitor temperature. Note correlation between temperature elevations and chemotherapy treatments. Observe for fever associated with tachycardia, hypotension, subtle mental changes.	Although fever may accompany some forms of chemotherapy, progressive hyperthermia occurs in some types of infections, and fever (unrelated to drugs or blood products) occurs in most leukemia patients. *Note:* Septicemia may occur without fever.
Prevent chilling. Force fluids, administer tepid sponge bath.	Helps reduce fever, which contributes to fluid imbalance, discomfort, and CNS complications.
Encourage frequent turning and deep breathing.	Prevents stasis of respiratory secretions, reducing risk of atelectasis/pneumonia.
Auscultate breath sounds, noting crackles, rhonchi; inspect secretions for changes in characteristics, e.g., increased sputum production or change in sputum color. Observe urine for signs of infection, e.g., cloudy, foul-smelling, or presence of urgency or burning with voids.	Early intervention is essential to prevent sepsis/septicemia in immunosuppressed person.
Handle patient gently. Keep linens dry/wrinkle-free.	Prevents sheet burn/skin excoriation.
Inspect skin for tender, erythematous areas; open wounds. Cleanse skin with antibacterial solutions.	May indicate local infection. *Note:* Open wounds may not produce pus because of insufficient number of granulocytes.
Inspect oral mucous membranes. Provide good oral hygiene. Use a soft toothbrush, sponge, or swabs for frequent mouth care.	The oral cavity is an excellent medium for growth of organisms and is susceptible to ulceration and bleeding.
Promote good perianal hygiene. Examine perianal area at least daily during acute illness. Provide sitz baths, using Betadine or Hibiclens if indicated. Avoid rectal temperatures, use of suppositories.	Promotes cleanliness, reducing risk of perianal abscess; enhances circulation and healing. *Note:* Perianal abscess can contribute to septicemia and death in immunosupressed patients.
Coordinate procedures and tests to allow for uninterrupted rest periods.	Conserves energy for healing, cellular regeneration.
Encourage increased intake of foods high in protein and fluids with adequate fiber.	Promotes healing and prevents dehydration. *Note:* Constipation potentiates retention of toxins and risk of rectalirritation/tissue injury.

ACTIONS/INTERVENTIONS	RATIONALE
Infection Protection (NIC)	
Independent	
Avoid/limit invasive procedures (e.g., venipuncture and injections) as possible.	Break in skin could provide an entry for pathogenic/potentially lethal organisms. Use of central venous lines (e.g., tunneled catheter or implanted port) can effectively reduce need for frequent invasive procedures and risk of infection. *Note:* Myelosuppression may be cumulative in nature, especially when multiple drug therapy (including steroids) is prescribed.
Collaborative	
Monitor laboratory studies, e.g.:	
CBC, noting whether WBC count falls or sudden changes occur in neutrophils;	Decreased numbers of normal/mature WBCs can result from the disease process or chemotherapy, compromising the immune response and increasing risk of infection.
Gram's stain cultures/sensitivity.	Verifies presence of infections; identifies specific organisms and appropriate therapy.
Review serial chest x-rays.	Indicator of development/resolution of respiratory complications.
Prepare for/assist with leukemia-specific treatments such as chemotherapy, radiation, and/or bone marrow transplant.	Leukemia is usually treated with a combination of these agents, each requiring specific safety precautions for patient and care providers.
Administer medications as indicated, e.g.: antibiotics;	May be given prophylactically or to treat specific infection.
Colony-stimulating factors: sargramostim (Leukine).	Restores WBCs destroyed by chemotherapy and reduces risk of severe infection and death in certain types of leukemia.
Avoid use of aspirin-containing antipyretics.	Aspirin can cause gastric bleeding and further decrease platelet count.
Provide nutritious diet, high in protein and calories, avoiding raw fruits, vegetables, or uncooked meats.	Proper nutrition enhances immune system. Minimizes potential sources of bacterial contamination.

NURSING DIAGNOSIS: Fluid Volume, risk for deficient

Risk factors may include

Excessive losses, e.g., vomiting, hemorrhage, diarrhea
Decreased fluid intake, e.g., nausea, anorexia
Increased fluid need, e.g., hypermetabolic state, fever; predisposition for kidney stone formation/tumor lysis syndrome

Possibly evidenced by

[Not applicable; presence of signs and symptoms establishes an *actual* diagnosis.]

DESIRED OUTCOMES/EVALUATION CRITERIA—PATIENT WILL:

Hydration (NOC)

Demonstrate adequate fluid volume, as evidenced by stable vital signs; palpable pulses; urine output, specific gravity, and pH within normal limits.
Identify individual risk factors and appropriate interventions.
Initiate behaviors/lifestyle changes to prevent development of dehydration.

ACTIONS/INTERVENTIONS	RATIONALE
Fluid Management (NIC)	
Independent	
Monitor I&O. Calculate insensible losses and fluid balance. Note decreased urine output in presence of adequate intake. Measure specific gravity and urine pH.	Tumor lysis syndrome occurs when destroyed cancer cells release toxic levels of potassium, phosphorus, and uric acid. Elevated phosphorus and uric acid levels can cause crystal formation in the renal tubules, impairing filtration and leading to renal failure.
Weigh daily.	Measure of adequacy of fluid replacement and kidney function. Continued intake greater than output may indicate renal insult/obstruction.
Monitor BP and HR.	Changes may reflect effects of hypovolemia (bleeding/dehydration).
Evaluate skin turgor, capillary refill, and general condition of mucous membranes.	Indirect indicators of fluid status/hydration.
Note presence of nausea, fever.	Affects intake, fluid needs, and route of replacement.
Encourage fluids of up to 3–4 L/day when oral intake is resumed.	Promotes urine flow, prevents uric acid precipitation, and enhances clearance of antineoplastic drugs.

ACTIONS/INTERVENTIONS	RATIONALE
Bleeding Precautions (NIC)	
Independent	
Inspect skin/mucous membranes for petechiae, ecchymotic areas; note bleeding gums, frank or occult blood in stools and urine; oozing from invasive-line sites.	Suppression of bone marrow and platelet production places patient at risk for spontaneous/uncontrolled bleeding.
Implement measures to prevent tissue injury/bleeding, e.g., gentle brushing of teeth or gums with soft toothbrush, cotton swab, or sponge-tipped applicator; using electric razor and avoiding sharp razors when shaving; avoiding forceful nose blowing and needlesticks when possible; using sustained pressure (sandbags or pressure dressings) on oozing puncture/IV sites.	Fragile tissues and altered clotting mechanisms increase the risk of hemorrhage following even minor trauma.
Limit oral care to mouthwash if indicated (a mixture of 1/4 tsp baking soda or salt in 4–8 oz water or hydrogen peroxide in water). Avoid mouthwashes with alcohol.	When bleeding is present, even gentle brushing may cause more tissue damage. Alcohol has a drying effect and may be painful to irritated tissues.
Provide soft diet.	May help reduce gum irritation.
Fluid Management (NIC)	
Collaborative	
Administer IV fluids as indicated.	Maintains fluid/electrolyte balance in the absence of oral intake; prevents or minimizes tumor lysis syndrome, reduces risk of renal complications.
Administer medications as indicated, e.g.:	
Antiemetics: 5-HT_3 receptor antagonist drugs such as ondansetron (Zofran) or granisetron (Kytril);	Relieves nausea/vomiting associated with administration of chemotherapy agents.
Allopurinol (Zyloprim);	Improves renal excretion of toxic byproducts from breakdown of leukemia cells. Reduces the chances of nephropathy as a result of uric acid production.
Potassium acetate or citrate, sodium bicarbonate;	May be used to alkalinize the urine, preventing or minimizing tumor lysis syndrome/kidney stones.
Stool softeners.	Helpful in reducing straining at stool with trauma to rectal tissues.
Bleeding Precautions (NIC)	
Monitor laboratory studies, e.g., platelets, Hb/Hct, clotting.	When the platelet count is less than 20,000/mm (because of proliferation of WBCs and/or bone marrow suppression secondary to antineoplastic drugs), patient is prone to spontaneous life-threatening bleeding. Decreasing Hb/Hct is indicative of bleeding (may be occult).

ACTIONS/INTERVENTIONS	RATIONALE
Bleeding Precautions (NIC)	
Collaborative	
Administer RBCs, platelets, clotting factors.	Restores/normalizes RBC count and oxygen-carrying capacity to correct anemia. Used to prevent/treat hemorrhage.
Maintain external central vascular access device (subclavian or tunneled catheter or implanted port).	Eliminate peripheral venipuncture as source of bleeding.
Administer medications, e.g., oral contraceptives	Minimizes blood loss by stopping or slowing menstrual flow.

NURSING DIAGNOSIS: Pain, acute

May be related to

Physical agents, e.g., enlarged organs/lymph nodes, bone marrow packed with leukemic cells
Chemical agents, e.g., antileukemic treatments
Psychological manifestations, e.g., anxiety, fear

Possibly evidenced by

Reports of pain (bone, nerve, headaches, and so forth)
Guarding/distraction behaviors, facial grimacing, alteration in muscle tone
Autonomic responses

DESIRED OUTCOMES/EVALUATION CRITERIA—PATIENT WILL:

Pain Level (NOC)

Report pain is relieved/controlled.
Appear relaxed and able to sleep/rest appropriately.

Pain Control (NOC)

Demonstrate behaviors to manage pain.

ACTIONS/INTERVENTIONS	RATIONALE
Pain Management (NIC)	
Independent	
Investigate reports of pain. Note changes in degree (use scale of 0–10) and site.	Helpful in assessing need for intervention; may indicate developing complications.
Monitor vital signs, note nonverbal cues, e.g., muscle tension, restlessness.	May be useful in evaluating verbal comments and effectiveness of interventions.
Provide quiet environment and reduce stressful stimuli, e.g., noise, lighting, constant interruptions.	Promotes rest and enhances coping abilities.

ACTIONS/INTERVENTIONS	RATIONALE
Pain Management (NIC)	
Independent	
Place in position of comfort and support joints, extremities with pillows/padding.	May decrease associated bone/joint discomfort.
Reposition periodically and provide/assist with gentle ROM exercises.	Improves tissue circulation and joint mobility.
Provide comfort measures (e.g., massage, cool packs) and psychological support (e.g., encouragement, presence).	Minimizes need for/enhances effects of medication.
Review/promote patient's own comfort interventions, e.g., position, physical activity/nonactivity, and so forth.	Successful management of pain requires patient involvement. Use of effective techniques provides positive reinforcement, promotes sense of control, and prepares patient for interventions to be used after discharge.
Evaluate and support patient's coping mechanisms.	Using own learned perceptions/behaviors to manage pain can help patient cope more effectively.
Encourage use of stress management techniques, e.g., relaxation/deep-breathing exercises, guided imagery, visualization; Therapeutic Touch.	Facilitates relaxation, augments pharmacological therapy, and enhances coping abilities.
Assist with/provide diversional activities, relaxation techniques.	Helps with pain management by redirecting attention.
Collaborative	
Monitor uric acid level as appropriate.	Rapid turnover and destruction of leukemic cells during chemotherapy can elevate uric acid, causing swollen painful joints in some patients. *Note:* Massive infiltration of WBCs into joints can also result in intense pain.
Administer medications as indicated: Analgesics, e.g., acetaminophen (Tylenol);	Given for mild pain not relieved by comfort measures. *Note:* Avoid aspirin-containing products because they may potentiate hemorrhage.
Opioids, e.g., codeine, morphine, hydromorphone (Dilaudid);	Used around-the-clock, rather than prn, when pain is severe. *Note:* Use of patient-controlled analgesia (PCA) is beneficial in preventing peaks and valleys associated with intermittent drug administration and increases patient's sense of control.
Antianxiety agents, e.g., diazepam (Valium), lorazepam (Ativan).	May be given to enhance the action of analgesics/opioids.

NURSING DIAGNOSIS: Activity intolerance

May be related to

Generalized weakness; reduced energy stores, increased metabolic rate from massive production of leukocytes
Imbalance between oxygen supply and demand (anemia/hypoxia)
Therapeutic restrictions (isolation/bedrest); effect of drug therapy

Possibly evidenced by

Verbal report of fatigue or weakness
Exertional discomfort or dyspnea
Abnormal HR or BP response

DESIRED OUTCOMES/EVALUATION CRITERIA—PATIENT WILL:

Endurance (NOC)

Report a measurable increase in activity tolerance.
Participate in ADLs to level of ability.
Demonstrate a decrease in physiological signs of intolerance; e.g., pulse, respiration, and BP remain within patient's normal range.

ACTIONS/INTERVENTIONS	RATIONALE
Energy Management (NIC)	
Independent	
Evaluate reports of fatigue, noting inability to participate in activities or ADLs.	Effects of leukemia, anemia, and chemotherapy may be cumulative (especially during acute and active treatment phase), necessitating assistance.
Encourage patient to keep a diary of daily routines and energy levels, noting activities that increase fatigue.	Helps patient prioritize activities and arrange them around fatigue pattern.
Provide quiet environment and uninterrupted rest periods. Encourage rest periods before meals.	Restores energy needed for activity and cellular regeneration/tissue healing.
Implement energy-saving techniques, e.g., sitting, rather than standing, use of shower chair. Assist with ambulation/other activities as indicated.	Maximizes available energy for self-care tasks.
Schedule meals around chemotherapy. Give oral hygiene before meals and administer antimetics as indicated.	May enhance intake by reducing nausea. (Refer to CP: Cancer, ND: Nutrition: imbalanced, less than body requirements.)
Recommend small, nutritious, high-protein meals and snacks throughout the day.	Smaller meals require less energy for digestion than larger meals. Increased intake provides fuel for energy.
Collaborative	
Provide supplemental oxygen.	Maximizes oxygen available for cellular uptake, improving tolerance of activity.

NURSING DIAGNOSIS: Knowledge, deficient [Learning Need] regarding disease, prognosis, treatment, self-care, and discharge needs

May be related to

Lack of exposure to resources
Information misinterpretation/lack of recall

Possibly evidenced by

Verbalization of problem/request for information
Statement of misconception

DESIRED OUTCOMES/EVALUATION CRITERIA—PATIENT WILL:

Knowledge: Illness Care (NOC)

Verbalize understanding of condition/disease process and potential complications.
Verbalize understanding of therapeutic needs.
Initiate necessary lifestyle changes.
Participate in treatment regimen.

ACTIONS/INTERVENTIONS	RATIONALE
Teaching: Disease Process (NIC)	
Independent	
Review pathology of specific form of leukemia and various treatment options.	Treatments can include various antineoplastic drugs, transfusions, peripheral progenitor (stem) cell transplant or bone marrow transplant.

For additional interventions refer to CP: Cancer, ND: Knowledge, deficient.

POTENTIAL CONSIDERATIONS following acute hospitalization (dependent on patient's age, physical condition/presence of complications, personal resources, and life responsibilities)

Infection, risk for—inadequate secondary defenses: alterations in mature WBCs (low granulocyte and abnormal lymphocyte count), increased number of immature lymphocytes; immunosuppression, bone marrow suppression (effects of therapy/ transplant).

Role Performance, ineffective—situational crisis; health-alterations, change in physical capacity.

Therapeutic Regimen: ineffective management—complexity of therapeutic regimen, decisional conflicts, economic difficulties, excessive demands made on individual or family, perceived benefits, powerlessness.

Family Processes, interrupted—situational crisis (illness, disabling/expensive treatments).