

HEMATOLOGY / ONCOLOGY

Leukemia — All Types

ALL · AML · CLL · CML — High-Yield Comparison & Nursing Care

Diane's NGN NCLEX 2026 Study Series

 **Source note:** Leukemia content was not in the uploaded notes. The information here is drawn from standard NGN NCLEX 2026 nursing references (Lewis, Saunders, Hogan, ATI/Kaplan reviews).

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Definition / Overview

What is leukemia?

Cancer of the bone marrow's blood-forming cells — abnormal, immature WBCs (blasts) crowd out normal RBCs, platelets, and mature WBCs.

Why it matters

Bone marrow failure → anemia (↓RBC), bleeding (↓platelets), and infection (↓functional WBCs). Death is most often from infection or hemorrhage, not the cancer itself.

Two-axis classification

Speed:

Acute

(rapid, blasts) vs

Chronic

(slower, more mature cells). Cell line:

Lymphocytic

(lymphoid) vs

Myelogenous

(myeloid).

Type	Full Name	Typical Age	Key Pearl
ALL	Acute Lymphoblastic Leukemia	Children (peak 2–5 yrs)	Most common childhood cancer; best cure rate (~90% in kids)
AML	Acute Myelogenous Leukemia	Adults (median ~65)	Most common acute leukemia in adults; Auer rods on smear
CLL	Chronic Lymphocytic Leukemia	Older adults (>60)	Often asymptomatic; found on routine CBC; smudge cells
CML	Chronic Myelogenous Leukemia	Adults (30–60)	Philadelphia chromosome (BCR-ABL); treated with imatinib

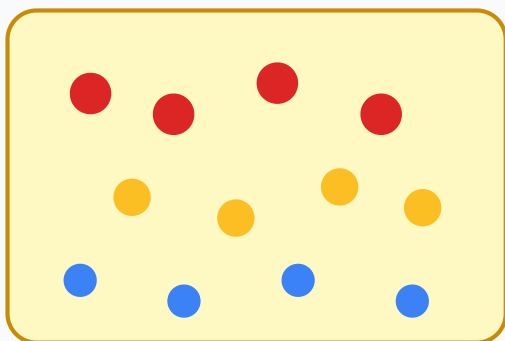
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Pathophysiology (Simplified)

- 1 **DNA mutation** in a single hematopoietic stem cell in the bone marrow.
- ↓
- 2 **Uncontrolled proliferation** of immature, non-functional blasts (acute) or abnormal mature cells (chronic).
- ↓
- 3 Leukemic cells **crowd out** normal bone marrow production.
- ↓
- 4 **Pancytopenia:** ↓RBC (anemia), ↓platelets (bleeding), ↓functional WBC (infection).
- ↓
- 5 **Infiltration** of leukemic cells into liver, spleen, lymph nodes, CNS, gums, skin → organomegaly & symptoms.

Bone Marrow: Normal vs Leukemia

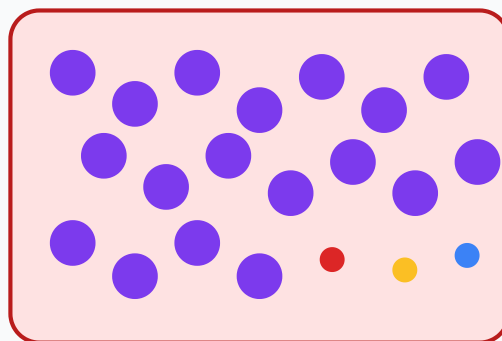
Normal Bone Marrow



Balanced: RBCs, Platelets, WBCs



Leukemic Bone Marrow



Blasts crowd out normal cells

3 Signs & Symptoms

Symptoms reflect the underlying pancytopenia regardless of leukemia type.

Acute (ALL / AML) — Sudden Onset

- **↓ RBC:** fatigue, pallor, dyspnea on exertion, tachycardia
- **↓ Platelets:** petechiae, ecchymoses, epistaxis, gum bleeding
- **↓ Functional WBC:** fever, recurrent infections, sore throat
- **Bone & joint pain** (marrow expansion)
- **Lymphadenopathy**, hepatosplenomegaly
- **AML specific:** gum hypertrophy, leukemia cutis
- **ALL specific:** CNS involvement (HA, vomiting, cranial nerve signs)

Chronic (CLL / CML) — Insidious

- Often **asymptomatic** early; found on routine CBC
- Fatigue, weight loss, night sweats, low-grade fever
- **Painless lymphadenopathy** (CLL hallmark)
- **Massive splenomegaly** → early satiety, LUQ fullness (CML hallmark)
- Frequent infections (CLL — hypogammaglobulinemia)
- Anemia & thrombocytopenia in later phases
- **Blast crisis** (CML transformation): looks like AML

RED FLAGS — Call Provider Immediately

- 🚨 Temp $\geq 100.4^{\circ}\text{F}$ (38°C) with neutropenia
→ **SEPSIS RISK**
- 🚨 Active bleeding + platelets $< 20,000$
- 🚨 Severe headache, vision changes, ↓LOC
(CNS leukemia or bleed)
- 🚨 Petechiae on palate / sclera (impending hemorrhage)
- 🚨 Tumor lysis: $\uparrow\text{K}^+$, $\uparrow\text{phos}$, $\uparrow\text{uric acid}$, $\downarrow\text{Ca}^{2+}$

 SOB, crackles, JVD (leukostasis or fluid overload)

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Priority Nursing Interventions (ABCs & Safety)

A Airway

- ✓ Assess for airway swelling from infection or bleeding
- ✓ Suction **gently** — mucosa bleeds easily
- ✓ Watch for stridor in mediastinal mass (T-cell ALL)

B Breathing

- ✓ Monitor SpO₂, lung sounds, respiratory rate
- ✓ Position upright; pace activities for fatigue from anemia
- ✓ Watch for **leukostasis** if WBC > 100,000

C Circulation

- ✓ Monitor CBC daily (Hgb, platelets, ANC)
- ✓ Assess for bleeding: petechiae, hematuria, melena
- ✓ Transfuse PRBCs / platelets as ordered
- ✓ Strict I&O; daily weights

S Safety / Infection

- ✓ Strict **neutropenic precautions** (ANC < 500)
- ✓ Bleeding precautions (platelets < 50,000)
- ✓ Soft toothbrush; electric razor only; no IM, no rectal temps
- ✓ Hand hygiene — strictest measure

Neutropenic Precautions (ANC < 500/mm³)

Private room with HEPA filter if possible

No fresh flowers, plants, or standing water

No raw fruits/vegetables, sushi, undercooked meat, soft cheese

No live vaccines for patient or visitors

Screen visitors — no one with active infection

Strict hand hygiene — #1 prevention

Daily skin, mouth, perineal assessment

Temp ≥ 100.4°F = **medical emergency**

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Pharmacology

Drug / Class	Use	Key Adverse Effect	Nursing Pearl
Vincristine (vinca alkaloid)	ALL induction	Peripheral neuropathy, paralytic ileus, foot drop	Vesicant — central line; assess bowel sounds & reflexes
Methotrexate (antimetabolite)	ALL, CNS prophylaxis (intrathecal)	Mucositis, hepatotoxicity, bone marrow suppression	Leucovorin rescue ; avoid aspirin/NSAIDs
Cytarabine (Ara-C)	AML induction (7+3 regimen)	Myelosuppression, "cytarabine syndrome" (fever/rash)	Eye drops for high-dose (conjunctivitis)
Daunorubicin / Doxorubicin (anthracycline)	AML, ALL	Cardiotoxicity , red urine, alopecia	Baseline echo/MUGA; monitor EF; vesicant
Cyclophosphamide	ALL, CLL	Hemorrhagic cystitis	Push fluids; mesna protection; check urine
Imatinib (Gleevec — TKI)	CML (Philadelphia chromosome+)	Edema, muscle cramps, ↑LFTs, neutropenia	Take with food & water; first-line CML — has revolutionized outcomes
Allopurinol / Rasburicase	Tumor lysis syndrome prevention	Rash; rasburicase: hemolysis (G6PD)	Start before chemo; hydrate aggressively
Filgrastim (Neupogen — G-CSF)	↑ neutrophil recovery post-chemo	Bone pain, splenomegaly	SubQ; treat bone pain with acetaminophen
Prednisone	ALL, CLL	Hyperglycemia, infection risk, mood changes	Never stop abruptly — taper

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NCLEX Test Traps

Fever in neutropenia

✗ Wrong: "Give Tylenol and recheck in 1 hour"

✓ Right: Notify HCP *immediately*; cultures (blood × 2, urine, sputum) *before* starting broad-spectrum antibiotics within 1 hour.

Roommate selection

✗ Wrong: Place neutropenic patient with a postop appendectomy patient.

✓ Right: Private room. If unavailable, room with a non-infectious, non-immunocompromised patient.

Mouth care

✗ Wrong: "Use a firm toothbrush and alcohol-based mouthwash."

✓ Right: Soft-bristle or sponge toothbrush; saline or sodium bicarbonate rinses. **No flossing.**

Aspirin / NSAIDs

✗ Wrong: "Take aspirin for headache."

✓ Right: Avoid ASA/NSAIDs — antiplatelet effect compounds thrombocytopenia. Use acetaminophen.

Diet teaching

✗ Wrong: "Eat plenty of fresh salads and fruits for vitamins."

✓ Right: Cooked foods only; no raw produce, sushi, or unpasteurized items while neutropenic.

Priority symptom

✗ Wrong: Treat fatigue first.

✓ Right: Fever > bleeding > fatigue. Infection is the #1 cause of death in leukemia.

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Patient & Family Education

Infection Prevention

- ☐ Wash hands often; avoid sick contacts & crowds
- ☐ Avoid raw fish, soft cheese, unpasteurized juice
- ☐ No gardening, changing litter, fresh flowers
- ☐ Report fever $\geq 100.4^{\circ}\text{F}$ (38°C) immediately

Bleeding Precautions

- ☐ Soft toothbrush; electric razor only
- ☐ Avoid aspirin, NSAIDs, alcohol
- ☐ No contact sports or vigorous nose-blowing
- ☐ Report bleeding, bruising, dark stools

Energy Conservation

- ☐ Pace activities; rest before fatigue
- ☐ Sit while bathing; prioritize tasks
- ☐ Small, frequent, high-protein meals

Treatment Adherence

- ☐ Keep all chemo & lab appointments
- ☐ Imatinib (CML): take with food, never stop without HCP
- ☐ Empty bladder q2h on cyclophosphamide; push fluids

Psychosocial

- ☐ Anticipate alopecia; wig/scarf options
- ☐ Fertility counseling *before* chemo
- ☐ Connect to support groups (LLS)

When to Call 911

- ☐ Uncontrolled bleeding, sudden severe headache
- ☐ Chest pain, SOB, fainting
- ☐ Severe abdominal pain, signs of sepsis

8 Memory Boosters & Mnemonics

Age Pattern: "All Children Mostly Catch It"

A · A · C · C

- 💡 ALL → kids (peak 2–5 yrs)
- 💡 AML → adults (older)
- 💡 CLL → 60+ (oldest)
- 💡 CML → middle adults

Three Cytopenias = Three Crises

A · B · I

- 💡 Anemia (↓RBC) → fatigue, pallor
- 💡 Bleeding (↓platelets) → petechiae
- 💡 Infection (↓functional WBC) → fever

Smear Buzzwords

- 💡 Auer rods → AML
- 💡 Smudge cells → CLL
- 💡 Philadelphia chromosome → CML
- 💡 Lymphoblasts in CSF → ALL with CNS spread

Neutropenic Diet "FRESH = FORBIDDEN"

- 💡 Fruit (raw) — no
- 💡 Raw veggies — no
- 💡 Eggs (runny) — no
- 💡 Sushi / soft cheese — no
- 💡 Honey (raw) — no

Neutropenic Room "NO FLOWERS"

- 💡 No fresh flowers
- 💡 Only cooked foods
- 💡 Filter air (HEPA)
- 💡 Limit visitors
- 💡 Oral care q4h
- 💡 Wash hands always
- 💡 Exclude live vaccines
- 💡 Rectal temps — never
- 💡 Strain — none (no straining stool)

Tumor Lysis Syndrome "PUKE Calcium"

- 💡 ↑ Phosphate
- 💡 ↑ Uric acid
- 💡 ↑ K⁺ (potassium)
- 💡 ↓ Calcium ("ate" by phosphate)
- 💡 Tx: hydrate, allopurinol, rasburicase

NCJMM Clinical Judgment Scenario

NCSBN Clinical Judgment Measurement Model — Six-Step Application

Client Scenario: A 62-year-old female with newly diagnosed AML is on day 8 of induction chemotherapy (cytarabine + daunorubicin). Morning labs: WBC $0.4 \times 10^9/L$ (ANC 180), Hgb 7.8 g/dL, platelets 18,000/mm³. Vital signs: T 38.4°C (101.1°F), HR 118, BP 92/54, RR 24, SpO₂ 94% on room air. The client reports a new sore throat, chills, and a "spreading rash" on her shins. She has a peripheral IV in her L forearm and a tunneled central line.

1 Recognize Cues

Fever 38.4°C in neutropenic client (ANC 180), tachycardia 118, BP 92/54 (trending hypotensive), platelets 18K (severe), spreading rash, sore throat, central line present, day 8 chemo (nadir window).

2 Analyze Cues

This is **neutropenic fever with early sepsis**. ANC < 500 + temp $\geq 38^\circ C$ = oncologic emergency. Hypotension + tachycardia suggest distributive shock developing. Petechial rash + platelets 18K = high bleed risk. Central line is a possible source.

3 Prioritize Hypotheses

#1 Sepsis / septic shock (immediately life-threatening) → **#2 Hemorrhage risk** (platelets 18K) → **#3 Anemia-related hypoxia** (Hgb 7.8). Address infection & perfusion first.

4 Generate Solutions

Notify HCP STAT; obtain blood cultures $\times 2$ (peripheral + central line) *before* antibiotics; start broad-spectrum IV antibiotics within 1 hour; IV fluid bolus (NS) for hypotension; type & cross for platelets & PRBCs; place on bleeding & neutropenic precautions; continuous monitoring.

5 Take Action

Draw cultures; administer ordered piperacillin-tazobactam IVPB; bolus 500 mL 0.9% NS; transfuse platelets & PRBCs as ordered; private room with neutropenic precautions; soft toothbrush, no rectal temps; reassess vitals q15min; pad rails & remove sharp objects.

6 Evaluate Outcomes

Expected: Temp $\downarrow$ to $< 38^\circ C$, BP $\geq 100/60$, HR < 100 , SpO₂ $\geq 95\%$, no new bleeding, platelets $> 50K$ post-transfusion, Hgb > 8 g/dL, cultures identify organism & antibiotics narrowed accordingly.

