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).

1 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

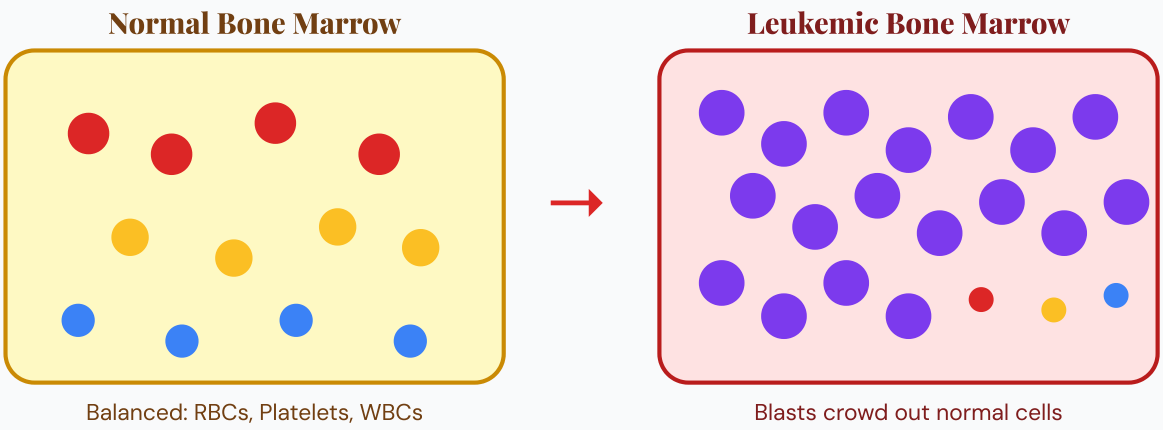
Speed:
Acute
(rapid, blasts) vs
Chronic
(slower, more mature cells). Cell line:
Lymphocytic
(lymphoid) vs
Myelogenous
(myeloid).

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

2 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



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 ≥ 100.4°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: ↑K^+, ↑phos, ↑uric acid, ↓Ca^{2+}

- SOB, crackles, JVD (leukostasis or fluid overload)

4 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 SpO_2, 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**	

5 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

6 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.

7 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 ≥ 100.4°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

- **A**LL → kids (peak 2–5 yrs)
- **A**ML → adults (older)
- **C**LL → 60+ (oldest)
- **C**ML → middle adults

Three Cytopenias = Three Crises

A · B · I

- **A**nemia (↓RBC) → fatigue, pallor
- **B**leeding (↓platelets) → petechiae
- **I**nfection (↓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"

- **F**ruit (raw) — no
- **R**aw veggies — no
- **E**ggs (runny) — no
- **S**ushi / soft cheese — no
- **H**oney (raw) — no

Neutropenic Room "NO FLOWERS"

- **N**o fresh flowers
- **O**nly cooked foods
- **F**ilter air (HEPA)
- **L**imit visitors
- **O**ral care q4h
- **W**ash hands always
- **E**xclude live vaccines
- **R**ectal temps — never
- **S**train — none (no straining stool)

Tumor Lysis Syndrome "PUKE Calcium"

- ↑ **P**hosphate
- ↑ **U**ric 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 × 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, SpO_2 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 ≥ 38°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 × 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 ↓ to < 38°C, BP ≥ 100/60, HR < 100, SpO_2 ≥ 95%, no new bleeding, platelets > 50K post-transfusion, Hgb > 8 g/dL, cultures identify organism & antibiotics narrowed accordingly.