

NGN NCLEX 2026 · IMMUNOLOGY · INFECTIOUS DISEASE

Opportunistic Infections

Infections caused by pathogens that exploit a weakened immune system — a leading cause of morbidity and mortality in immunocompromised clients.



Bacterial · Viral · Fungal · Parasitic



Neutropenic Precautions



HIV/AIDS · Chemo · Transplant

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Definition & Overview

What It Is

Infections caused by organisms that normally do **not cause disease** in a healthy person but produce severe illness when the immune system is suppressed.

Who Is at Risk

HIV/AIDS (especially CD4 < 200), chemotherapy/radiation, organ transplant recipients, long-term steroid use, neutropenia (ANC < 1500), splenectomy, severe malnutrition.

Why It Matters

Fever may be the only sign in neutropenic clients — leading cause of sepsis and death. Prophylactic therapy is often required based on CD4 count or ANC.

NCLEX Focus

Recognition of immunocompromised cues, neutropenic precautions, CD4-based prophylaxis, fever as priority finding, patient education for self-protection.

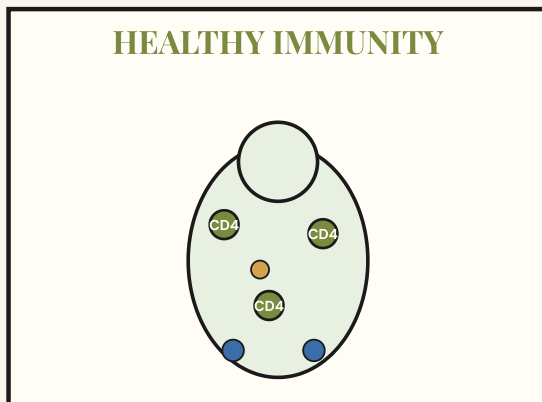
2 Pathophysiology *Simplified*

1 Immune system suppressed — HIV destroys CD4 T-cells · chemo destroys WBCs · steroids/immunosuppressants blunt response

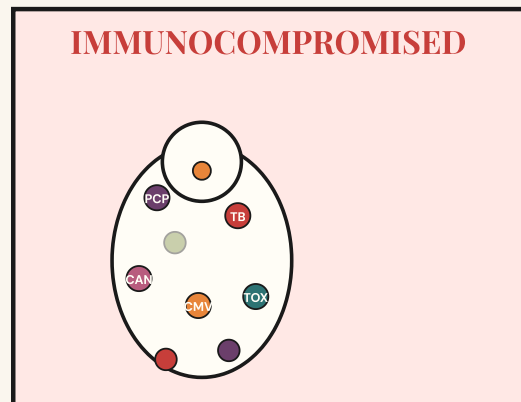
2 Loss of immune surveillance — neutrophils, T-cells, and macrophages can no longer contain commensal or latent organisms

3 Pathogen proliferation — fungi (Candida, Pneumocystis), viruses (CMV, HSV), bacteria (MAC, TB), and parasites (Toxoplasma) multiply unchecked

4 Systemic illness — invasion of lungs, brain, GI tract, eyes, blood → sepsis, organ failure, death without prompt treatment



Pathogens controlled · No illness



Pathogens unchecked · Severe illness

HIV/AIDS · Opportunistic Infections by CD4 Count

< 500

Early stage

Oral candidiasis (thrush)
Kaposi sarcoma

< 200

AIDS-defining

PCP pneumonia
Esophageal candidiasis

< 100

Severe

Toxoplasmosis (brain)
Cryptococcal meningitis

< 50

Critical

CMV retinitis
MAC (M. avium complex)

TB reactivation
Herpes zoster

Start TMP-SMX
prophylaxis

Cryptosporidium diarrhea

Start azithromycin
prophylaxis

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Signs & Symptoms



Early / Subtle Findings

- › Low-grade fever, night sweats
- › Fatigue, malaise
- › White patches in mouth (thrush)
- › Persistent dry cough
- › Mild dyspnea on exertion
- › Painless skin lesions (Kaposi)
- › Unintentional weight loss
- › Lymphadenopathy



Late / Severe Findings

- › High fever, rigors, sepsis
- › SOB at rest, hypoxia (PCP)
- › Severe diarrhea, dehydration
- › Vision changes, blurred vision (CMV)
- › Headache, neck stiffness (cryptococcal)
- › Confusion, focal deficits (toxoplasmosis)
- › Hemoptysis, weight loss (TB)
- › Hypotension, altered LOC (sepsis)



RED FLAG FINDINGS · Notify HCP Immediately

- **Fever $\geq 100.4^{\circ}\text{F}$ (38°C)** in a neutropenic client — even a single reading is a medical emergency
- **ANC < 500** = severe neutropenia · **ANC < 100** = profound · sepsis risk extreme
- **SOB + dry cough + hypoxia** in HIV with **CD4 < 200** → suspect PCP
- **Headache + neck stiffness + photophobia** in AIDS → suspect cryptococcal meningitis
- **New visual floaters or blurring** in **CD4 < 50** → suspect CMV retinitis (can cause blindness)
- **Hypotension + tachycardia + altered LOC** → septic shock

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Priority Nursing Interventions

A

Airway / Breathing

Monitor SpO₂, respiratory rate, breath sounds; assess for PCP (hypoxia disproportionate to physical exam); position semi-Fowler's; administer O₂ as ordered.

B

Temperature q4h

Report any fever $\geq 100.4^{\circ}\text{F}$ immediately in neutropenic client — no waiting, no Tylenol first. Fever may be the ONLY sign of life-threatening infection.

C

Neutropenic Precautions

Private room (positive-pressure if available); strict hand hygiene; no fresh flowers/plants; no raw fruits or vegetables; cooked foods only; limit visitors; PPE per facility.

D

Strict Asepsis

No invasive procedures unless necessary; sterile technique for all line/dressing changes; daily CHG bathing if ordered; remove indwelling devices ASAP.

E

Skin & Mucosa Care

Inspect skin daily; soft toothbrush, alcohol-free mouth rinse; assess for thrush, perirectal abscess, line site redness; no rectal temps, suppositories, or enemas.

F

Monitor Labs

CBC with differential (ANC), CD4 count, viral load, cultures (blood $\times$ 2, urine, sputum), CMP, lactate; recognize sepsis criteria early.

G

Administer Prophylaxis

TMP-SMX for PCP (CD4 $<$ 200); azithromycin for MAC (CD4 $<$ 50); fluconazole for fungi; acyclovir for HSV; INH for TB exposure. Teach adherence.

H

Cultures BEFORE Antibiotics

Obtain cultures FIRST when possible, but never delay empiric broad-spectrum antibiotics in febrile neutropenia — start within 1 hour of fever.

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Pharmacology Comparison Table

Drug / Class	Treats / Prevents	Key Side Effects	Nursing Considerations
TMP-SMX (Bactrim, sulfonamide)	PCP prophylaxis & treatment (CD4 < 200)	Rash (Stevens-Johnson), hyperkalemia, photosensitivity, bone marrow suppression	Push fluids 2–3 L/day ; monitor K ⁺ , CBC; avoid sun; assess for rash daily; check sulfa allergy
Azithromycin (macrolide)	MAC prophylaxis (CD4 < 50) & treatment	QT prolongation, GI upset, hepatotoxicity	Monitor ECG / QT interval; check LFTs; give with or without food
Fluconazole (azole antifungal)	Candidiasis, cryptococcal meningitis	Hepatotoxicity, QT prolongation, GI upset	Monitor LFTs & ECG; many drug interactions (warfarin, phenytoin)
Acyclovir (antiviral)	HSV, VZV (shingles)	Nephrotoxicity, crystalluria	Push fluids ; monitor BUN/creatinine; IV form: infuse slowly
Ganciclovir (antiviral)	CMV retinitis (CD4 < 50)	Severe bone marrow suppression , nephrotoxicity	Monitor CBC closely (neutropenia/thrombocytopenia); handle as hazardous drug
Pyrimethamine + Sulfadiazine	Toxoplasmosis (CD4 < 100)	Bone marrow suppression, rash, folate deficiency	Give leucovorin (folinic acid) to prevent marrow suppression; monitor CBC
INH (Isoniazid)	TB prophylaxis & treatment	Hepatotoxicity, peripheral neuropathy	Give vitamin B6 (pyridoxine) to prevent neuropathy; empty stomach; monitor LFTs; no alcohol
Filgrastim (G-CSF) (Neupogen)	Boost neutrophil production	Bone pain, splenomegaly	SubQ injection; treat bone pain with acetaminophen; monitor ANC for recovery

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NCLEX Test Traps

✗ WRONG THINKING

"Patient's temp is 100.5°F but they look fine — I'll give Tylenol and recheck."



✓ NCLEX PRIORITY

Fever in a neutropenic client is a **medical emergency**. Notify HCP, draw cultures, and start empiric antibiotics within 1 hour — BEFORE giving antipyretics.

✗ WRONG THINKING

"I'll bring this nice fresh fruit basket to the patient on chemo."



✓ NCLEX PRIORITY

No raw fruits, vegetables, or fresh flowers in neutropenic precautions — they harbor bacteria, fungi, and pseudomonas. Cooked foods only.

✗ WRONG THINKING

"Patient is going home tomorrow — let's update all routine vaccines including MMR and varicella."



✓ NCLEX PRIORITY

No live vaccines in immunocompromised clients (MMR, varicella, intranasal flu, yellow fever). Inactivated vaccines OK. Household contacts should also avoid live attenuated flu vaccine.

✗ WRONG THINKING

"CD4 is 180 — I'll just monitor and not start anything yet."



✓ NCLEX PRIORITY

CD4 < 200 = start TMP-SMX for PCP prophylaxis. This is one of the most testable HIV thresholds. Memorize: 200 → PCP, 50 → MAC.

✗ WRONG THINKING

"Patient needs a rectal temperature for accuracy."



✓ NCLEX PRIORITY

No rectal temps, suppositories, or enemas in neutropenia — mucosal disruption introduces bacteria. Use oral or temporal route.

✗ WRONG THINKING

"Patient with AIDS asks about gardening — that's a great low-stress hobby."



✓ NCLEX PRIORITY

Avoid gardening and soil exposure (fungi: histoplasma, cryptococcus, aspergillus). Also avoid cat litter (toxoplasma) and reptiles (salmonella).

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Patient & Family Education



Food Safety

- ✓ Cook all meats well-done (no rare/sushi)
- ✓ Wash all produce thoroughly; peel when possible
- ✓ Avoid unpasteurized dairy & juices
- ✓ No raw eggs (Caesar dressing, raw cookie dough)
- ✓ No deli meats unless reheated steaming
- ✓ Avoid soft cheeses (brie, blue, feta)



Hygiene & Daily Care

- ✓ Hand hygiene — soap & water 20+ sec
- ✓ Daily shower with mild soap
- ✓ Soft toothbrush; alcohol-free rinse
- ✓ Inspect skin daily for breaks or redness
- ✓ Wear shoes/slippers at all times
- ✓ No shared razors, toothbrushes, towels



Environment & Social

- ✓ Avoid crowds (theaters, malls, public transit)
- ✓ Stay away from sick household members
- ✓ No live plants or fresh flowers in home
- ✓ No gardening, mowing, or yard work
- ✓ Avoid cat litter (toxoplasmosis)
- ✓ Wear mask in healthcare settings



Medications & Follow-Up

- ✓ Take prophylaxis exactly as prescribed
- ✓ Never skip doses, even when feeling well
- ✓ No live vaccines (MMR, varicella, nasal flu)
- ✓ Annual inactivated flu shot & PPSV23
- ✓ Report fever $\geq 100.4^{\circ}\text{F}$ immediately
- ✓ Keep all lab and clinic appointments

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Memory Boosters & Mnemonics

CD4 THRESHOLDS

200 = PCP (think: 2 lungs, O-2 sats dropping)
100 = Toxo + Crypto (brain bugs)
50 = CMV + MAC (lowest = worst)

NO-FLOWERS, NO-FRUITS, NO-FRESH

The 3 Big "Nos" of neutropenic precautions:
No fresh Flowers/plants
No raw Fruits/vegetables
No Fever ignored — even 100.4°F!

"PROTECT" – Neutropenic Care

Private room
Restrict visitors
Oral hygiene (soft brush)
Temp q4h
Eat cooked foods
Cultures before antibiotics
Teach strict hand hygiene

"BUG BUSTERS"

Match the drug to the bug:
PCP → "Bactrim" (TMP-SMX)
MAC → "Azithro" (Z-pak)
CMV → "Ganci" (Ganciclovir)
Toxo → "Sulfa + Pyri" + Leucovorin
Crypto → "Flu" (Fluconazole)
TB → "INH + B6"

FEVER = EMERGENCY

In a neutropenic patient:
1°F can kill.
 One temp $\geq 100.4^\circ\text{F}$ (38°C) =
 → Cultures $\times 2$
 → Empiric antibiotics within **1 hour**
 → Notify HCP *now*

ANC CHEAT SHEET

Normal: 2,500–8,000
Mild neutropenia: 1,000–1,500
Moderate: 500–1,000
Severe: < 500 ⚠️
Profound: < 100 🚑
 $ANC = WBC \times (\% \text{ segs} + \% \text{ bands})$

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NCJMM Clinical Judgment Scenario

Case Scenario

A 42-year-old male with a history of HIV/AIDS presents to the ED reporting a dry cough, progressive shortness of breath on exertion, and fatigue × 2 weeks. He stopped his antiretroviral therapy 6 months ago.

Vital signs:

T 102.4°F (39.1°C) · HR 118 · RR 28 · BP 102/64 · SpO₂ 87% on room air

Labs:

CD4 count 75 cells/μL · WBC 3.2 · ANC 800 · LDH 540 (elevated)

Chest X-ray:

Bilateral diffuse interstitial infiltrates ("ground-glass")

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Recognize Cues

Hypoxia (SpO₂ 87%), tachypnea (RR 28), tachycardia (HR 118), fever 102.4°F, hypotension trending downward, CD4 < 200 (severely immunocompromised), elevated LDH, "ground-glass" infiltrates on CXR, dry cough × 2 weeks, ART non-adherence. Subtle cue: hypoxia **disproportionate** to physical exam — classic for PCP.

2

Analyze Cues

The combination of CD4 < 200, bilateral ground-glass infiltrates, elevated LDH, and disproportionate hypoxia strongly suggests **Pneumocystis jirovecii pneumonia (PCP)**. ANC 800 indicates moderate neutropenia — fever ≥ 100.4°F is a medical emergency requiring sepsis workup. Vital sign trend suggests early septic shock (qSOFA: RR ≥ 22, SBP ≤ 100, altered mental status pending).

3

Prioritize Hypotheses

Highest priority: PCP with respiratory failure & impending septic shock. **Differentials to rule out:** bacterial pneumonia, TB reactivation, CMV pneumonitis, Kaposi sarcoma of the lung. The combination of CD4 + LDH + CXR pattern makes PCP most likely.

4

Generate Solutions

Immediate goals: (1) Restore oxygenation — apply O₂ to maintain SpO₂ ≥ 92%; (2) Obtain blood cultures × 2 and sputum/BAL **before** antibiotics if no delay; (3) Start empiric **high-dose TMP-SMX IV** for PCP; (4) Add **corticosteroids** (PaO₂ < 70 or A-a gradient > 35); (5) Fluid resuscitation for hypotension; (6) Initiate sepsis bundle within 1 hour; (7) Resume ART after acute infection stabilizes.

5

Take Action

Apply O₂ via non-rebreather at 10–15 L/min · place client in semi-Fowler's · establish 2 large-bore IVs · draw cultures (blood × 2, sputum) · administer empiric IV TMP-SMX + corticosteroids per order · 30 mL/kg lactated Ringer's bolus for hypotension · place on continuous pulse oximetry & cardiac monitor · initiate neutropenic precautions (private room, no plants, no raw foods, strict hand hygiene) · prepare for possible BAL and ICU transfer · educate client on importance of ART adherence once stable.

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Evaluate Outcomes

Expected within 1 hour: SpO₂ ≥ 92%, RR decreasing, MAP ≥ 65 after fluid bolus, cultures drawn, antibiotics infusing. **Within 24–48 hours:** fever trending down, lactate clearing, hemodynamically stable, weaning O₂ requirement. **Long-term:** ART resumed, TMP-SMX prophylaxis continued until CD4 > 200 for ≥ 3 months, adherence counseling, follow-up in HIV clinic, address barriers to ART adherence (cost, side effects, mental health, substance use).

NGN NCLEX 2026 Visual Study Library · Opportunistic Infections · Immunology + Infectious Disease

Remember: Fever in immunocompromised = emergency · CD4 200 / 100 / 50 thresholds · NO live vaccines · Cultures first, but antibiotics within 1 hour