Chemotherapeutic Agent Toxicities

ONCOLOGY PHARMACOLOGY · NGN NCLEX HIGH-YIELD · 2026 TEST PLAN

1 · DEFINITION & OVERVIEW — AT-A-GLANCE DRUG → ORGAN MAP

Cytoxan	Cisplatin	Bleomycin	Adriamycin	Vincristine	Methotrexate
Bladder Hemorrhagic Cystitis	Nerves / Ears Neuropathy + Ototoxicity	Lungs Pulmonary Fibrosis	Heart Cardiotoxicity	Nerves / Gut Neuropathy + Ileus	Multi-organ (NOT heart)

2 · PATHOPHYSIOLOGY (SIMPLIFIED)

→ Chemo agents target **rapidly dividing cells** — but cannot distinguish cancer cells from healthy fast-dividing cells (GI lining, bone marrow, hair follicles, nerves)

→ Each drug has a **specific organ affinity** for toxicity based on its mechanism: alkylating agents damage DNA broadly; anthracyclines generate free radicals in cardiac muscle; vinca alkaloids disrupt nerve microtubules

→ **Neurotoxicity** → demyelination of peripheral nerves → peripheral neuropathy → disrupts autonomic gut motility → paralytic ileus → constipation (not just "slow gut")

→ Bone marrow depression = universal risk → ↓WBC (infection), ↓RBC (anemia), ↓platelets (bleeding)

3 · DRUG-BY-DRUG TOXICITY PROFILE

Cy Cytoxan

Cyclophosphamide · Alkylating agent

Bladder

Primary toxicity: Hemorrhagic cystitis
Metabolite *acrolein* irritates bladder mucosa → bloody urine

Key nursing actions:
· Monitor urine for blood (hematuria)
· Encourage high fluid intake (2–3 L/day)
· Administer **Mesna** (bladder protectant) as ordered
· Empty bladder frequently

Hematuria = stop drug, notify MD

Ci Cisplatin

Platinol · Platinum compound

Nerves · Ears · Kidneys

Primary toxicities: Peripheral neuropathy, ototoxicity, nephrotoxicity, constipation

Key nursing actions:
· Audiometry before and during therapy
· Monitor BUN, creatinine (nephrotoxic)
· Vigorous IV hydration before/after infusion
· Assess for tingling, numbness, tinnitus, hearing loss
· Assess bowel sounds (paralytic ileus)

Tinnitus or hearing loss → hold drug, notify MD

Bl Bleomycin

Antitumor antibiotic

Lungs

Primary toxicity: Pulmonary fibrosis
Causes irreversible scarring of lung tissue → progressive dyspnea

Key nursing actions:
· Assess breath sounds every shift
· Monitor for dry cough, dyspnea, crackles
· Pulmonary function tests (PFTs) before/during therapy
· Limit **supplemental O2** — high O2 worsens pulmonary toxicity
· Cumulative dose limit monitored closely

New dry cough + dyspnea = pulmonary

toxicity until proven otherwise

Ad Adriamycin
Doxorubicin · Anthracycline

Heart

Primary toxicity: Cardiotoxicity (cardiomyopathy, CHF)
Free radical damage to cardiac myocytes; dose-dependent

Key nursing actions:
· Baseline and periodic echocardiogram (ECHO) / MUGA scan
· Monitor for S3 gallop, peripheral edema, JVD, SOB
· Cumulative lifetime dose limit strictly observed
· Assess ejection fraction (EF) — hold if EF drops
· Urine turns **red/orange** — warn client (normal, not blood)

New dyspnea + edema on Adriamycin = cardiac emergency

Vi Vincristine
Oncovin · Vinca alkaloid

Nerves GI

Primary toxicities: Peripheral neuropathy, constipation (paralytic ileus), foot drop
Disrupts microtubule formation → nerve damage

Key nursing actions:
· Assess deep tendon reflexes (diminished = early sign)
· Monitor for foot drop, paresthesia, jaw pain, hoarseness
· Assess bowel sounds — absent = paralytic ileus
· Stool softeners/laxatives prophylactically
· Fall risk — impaired gait from foot drop

Absent bowel sounds = paralytic ileus — NPO + notify MD

Mx Methotrexate
Antimetabolite · Folate antagonist

Multi-organ

Primary toxicities: Stomatitis, mucositis, hepatotoxicity, nephrotoxicity, bone marrow suppression
Toxic to nearly every organ — **except the heart**

Key nursing actions:
· Assess oral mucosa daily (stomatitis)
· Monitor LFTs, BUN, creatinine
· Avoid **aspirin/NSAIDs** — drastically increases toxicity
· **Leucovorin rescue** (folinic acid antidote) as ordered
· Adequate hydration to protect kidneys

Aspirin + Methotrexate = severely enhanced toxicity — do NOT combine

NEUROTOXICITY & PERIPHERAL NEUROPATHY — CISPLATIN & VINCRISTINE

Signs & Symptoms
- Numbness & tingling (paresthesia)
- Foot drop
- Jaw pain
- Hoarseness
- Constipation → paralytic ileus
- Diminished deep tendon reflexes
- Tinnitus / hearing loss (Cisplatin)

Why Constipation?
- Neurotoxicity damages autonomic nerve fibers in gut wall
- Gut motility depends on intact nerve signals
- Damaged nerves → peristalsis fails → paralytic ileus
- This is NOT just "slow bowel" — it's neurologically driven
- Absent bowel sounds = ileus, not just constipation

Nursing Priority
- Auscultate bowel sounds every shift
- Assess gait — fall prevention for foot drop
- Prophylactic stool softeners ordered early
- Report absent bowel sounds immediately
- Audiometry for Cisplatin patients
- DTR assessment each visit

5 · UNIVERSAL CHEMO SIDE EFFECTS 🚨

→ **Bone marrow suppression** — leukopenia, thrombocytopenia, anemia (all chemo agents)

→ **Leukopenia** → infection risk → neutropenic precautions, monitor temp, avoid crowds

→ **Thrombocytopenia** → bleeding risk → no IM injections, soft toothbrush, fall precautions

→ **Anemia** → fatigue, pallor, dyspnea on exertion

→ **Alopecia** — hair loss; reversible after therapy

→ **Nausea/vomiting** — administer antiemetics prophylactically

→ **Mucositis/stomatitis** — assess oral cavity daily; frequent rinses

6 · NCLEX TEST TRAPS ⚠️

TRAP #1 — ADRIAMYCIN URINE COLOR

Red/orange urine on Adriamycin is **normal** — warn client in advance. Not hematuria. Hematuria = Cytoxan.

TRAP #2 — METHOTREXATE + ASPIRIN

Aspirin blocks renal excretion of MTX → toxicity skyrockets. A very high-yield drug interaction on NCLEX.

TRAP #3 — CHEMO CONSTIPATION

Constipation from Vincristine/Cisplatin is **neurological** (paralytic ileus), not dietary. Priority = bowel sounds.

TRAP #4 — BLEOMYCIN + O2

High-flow O2 **worsens** Bleomycin pulmonary toxicity. Do not liberally increase O2 — notify MD first.

TRAP #5 — METHOTREXATE ORGAN SPARING

MTX is toxic to nearly everything **except the heart**. Adriamycin = heart. Don't mix these up.

7 · CLINICAL JUDGMENT (NCJMM)

RECOGNIZE CUES	ANALYZE CUES	PRIORITY ACTION	EXPECTED OUTCOME
Hematuria? Red urine? Dyspnea/dry cough? Absent bowel sounds? Tinnitus? New edema? Paresthesia? Oral ulcers?	Match symptom to drug: Blood in urine → Cytoxan Dyspnea → Bleomycin Edema/SOB → Adriamycin Foot drop → Vincristine	Hold the drug. Notify MD. ABCs first. Assess severity. Document findings. Initiate specific interventions (Mesna, Leucovorin, hydration).	Toxicity identified early, drug adjusted/held, organ damage minimized, client remains hemodynamically stable.

8 · MEMORY BOOSTERS

C-B-A-V-M — "Can Bladder Always Vary Much?"

Cytoxan → Bladder · **B**leomycin → Lungs · **A**driamycin → Heart · **V**incristine → Nerves · **M**ethotrexate → Multi-organ

Adriamycin — "A for Anthracycline, A for Arrhythmia"

The "A" drug hits the heart. Red/orange urine = normal — tell the client before it happens or they'll panic.

Methotrexate antidote = Leucovorin ("Leu-co-vorin Rescue")

Leucovorin (folinic acid) bypasses the folate blockade and "rescues" normal cells. Given after high-dose MTX.

Neurotoxic Pair = "Cis-Vine" (Cisplatin + Vincristine)

Both cause peripheral neuropathy + constipation via neurotoxicity. Cisplatin also adds ototoxicity. Vincristine also adds foot drop + jaw pain.