CEPHALOSPORIN ANTIBIOTICS

NCLEX-RN Pharmacology Infographic | 2026 Test Plan

Class: Beta-Lactam Antibiotic (Bactericidal) • System: Infectious Disease / Immune

PROTOTYPE DRUGS BY GENERATION

1st: Cefazolin • 2nd: Cefuroxime, Cefotetan • 3rd: Ceftriaxone, Ceftazidime • 4th: Cefepime • 5th: Ceftaroline

1. DRUG OVERVIEW

Key Indications (WHY we give it)

- Bacterial infections — broad-spectrum coverage
- Surgical prophylaxis — Cefazolin is #1 pre-op choice (give within 60 min of incision)
- Respiratory infections (pneumonia, bronchitis), otitis media, sinusitis
- Skin/soft tissue infections (cellulitis, wound infections)
- UTIs, bone infections, meningitis (Ceftriaxone crosses BBB)
- Gonorrhea — Ceftriaxone IM is first-line
- Sepsis — 3rd/4th gen for gram-negative coverage (Cefepime covers Pseudomonas)

2. MECHANISM OF ACTION

Simplified Pathway

Cephalosporin → binds **penicillin-binding proteins (PBPs)** → inhibits **cell wall synthesis** → bacterial lysis → **BACTERICIDAL**

Generation Pattern

- Ascending generations → ↓ gram-positive ↑ gram-negative ↑ CNS penetration
- 1st gen = skin/surgical | 5th gen = MRSA coverage

3. THERAPEUTIC EFFECTS

What Tells You It's Working

- ↓ Fever (afebrile trend)
- ↓ WBC count toward normal (4,500–11,000)
- ↓ CRP / procalcitonin (inflammatory markers)
- Negative follow-up blood / wound / urine cultures
- Resolution of infection signs (↓ redness, drainage, cough, dysuria)
- Hemodynamic stability in sepsis (MAP ≥ 65, improving lactate)
- Patient reports symptomatic improvement within 48–72 hrs

🟩 4. SIDE EFFECTS & ADVERSE REACTIONS

Common Side Effects

- GI upset — nausea, vomiting, diarrhea
- Rash, pruritus
- Injection-site pain (IM cefazolin / ceftriaxone)
- Candida superinfection (oral thrush, vaginal yeast)

🚨 Serious / Life-Threatening

- **ANAPHYLAXIS — cross-reactivity with penicillin (~1–10%)**
- C. difficile colitis — watery/bloody diarrhea, fever, abdominal pain
- Stevens-Johnson Syndrome / TEN — skin sloughing, mucosal lesions
- Nephrotoxicity — especially combined with aminoglycosides
- Bleeding / ↑ PT/INR (cefotetan, cefoperazone — vitamin K interference)
- **Seizures — CEFEPIME in renal impairment (cefepime neurotoxicity)**
- Disulfiram-like reaction — CEFOTETAN + alcohol → flushing, tachycardia, vomiting
- **FATAL precipitate — CEFTRIAXONE + IV calcium in neonates** ⚠️
- Hemolytic anemia — rare, immune-mediated

🟪 5. PRIORITY NURSING CONSIDERATIONS

Assess

- PCN allergy BEFORE first dose (type of reaction matters — hives vs. anaphylaxis)

- Baseline renal function (BUN, Cr) and vital signs
- **Obtain cultures BEFORE first dose (priority action!)**

Monitor

- For anaphylaxis × 30 minutes after first dose (airway, BP, rash)
- Renal function (BUN, creatinine, I&O)
- PT/INR if on cefotetan; bleeding signs
- Stool for C. diff if diarrhea develops

HOLD & Notify HCP If

- **New rash, wheezing, hypotension, facial/tongue swelling**
- **Severe/bloody diarrhea (suspect C. diff)**
- **↓ Urine output, rising creatinine**
- **New confusion or seizures (cefepime)**

Contraindications / Interactions

- **NEVER mix Ceftriaxone with calcium-containing IV fluids (LR, TPN)**
- Cefepime — MUST renal-dose adjust or seizure risk
- Probenecid ↑ cephalosporin levels
- ↓ effectiveness of oral contraceptives
- Avoid antacids within 2 hrs of PO doses (↓ absorption)

6. LABS & DIAGNOSTICS

Critical Labs to Monitor

- BUN / Creatinine — nephrotoxicity (Cr > 1.3 = concerning)
- CBC — WBC trend (should ↓), eosinophilia = allergy, watch for hemolytic anemia
- PT / INR — ↑ bleeding risk with cefotetan
- LFTs — rare hepatotoxicity
- **Culture & Sensitivity (C&S) — ALWAYS obtain BEFORE first dose**
- C. diff toxin / stool PCR — if diarrhea develops
- Serum drug levels — not routine, monitor in renal impairment

Critical Values to Recognize

- Creatinine rising > 0.3 mg/dL from baseline = AKI alert
- INR > 3.0 with cefotetan = bleeding risk — notify HCP
- Platelets < 150K with continued antibiotic exposure = hematologic adverse effect

7. ADMINISTRATION & SAFETY

Routes & Timing

- Routes: PO, IM, IV
- IM: deep large muscle; Ceftriaxone may reconstitute with lidocaine (per order) to ↓ pain
- IV: infuse over 30 min; flush line before/after
- PO: take with food to ↓ GI upset (cefuroxime with food ↑ absorption)
- **Surgical prophylaxis: cefazolin within 60 min of incision**

High-Alert Precautions

- **CEFTRIAXONE + IV CALCIUM = NEVER (esp. neonates ≤ 28 days — fatal precipitate)**
- **CEFEPIME — renal dose adjustment MANDATORY (seizures if not)**
- Refrigerate reconstituted suspensions; shake well before use
- **Epinephrine + crash cart readily available at first dose**

8. PATIENT EDUCATION

What the Patient MUST Know

- **COMPLETE the FULL course — do not stop early, even if feeling better**
- **NO ALCOHOL × 72 hrs after cefotetan (disulfiram-like reaction)**
- Use BACKUP contraception × 7 days (cephalosporins ↓ OCP effectiveness)
- Take probiotics/yogurt (2 hrs apart from dose) to reduce GI upset and yeast
- Avoid antacids within 2 hrs of PO doses

Seek Help IMMEDIATELY If

- **Rash, itching, SOB, wheezing, or swelling of face/tongue → call 911**
- **Watery or bloody diarrhea with fever (possible C. diff)**

- Unusual bruising or bleeding (cefotetan)
- **Confusion, twitching, or seizure activity (cefepime)**
- Severe abdominal pain, yellowing of skin/eyes

9. NCLEX TEST TRAPS ⚠

Classic Traps Students Fall For

- PCN allergy is NOT an absolute contraindication — but HIGH-risk. Assess the TYPE of reaction (rash vs. anaphylaxis)
- **Post-antibiotic diarrhea ≠ normal if watery/bloody with fever — that's C. diff → STOP drug, isolate, report**
- **NEVER give antidiarrheals for C. diff (traps toxin in gut)**
- **Ceftriaxone + Lactated Ringer's = NEVER mix (calcium precipitate)**
- **Cultures BEFORE antibiotics — classic priority-order trap**
- Cefepime causing confusion in elderly = NEUROTOXICITY, not dementia
- **FIRST action for anaphylaxis = EPINEPHRINE IM → THEN stop infusion → THEN notify HCP**
- **Priority rule: ABC / allergy-anaphylaxis always TRUMPS infection control**

10. MEMORY BOOSTERS

Class & Generation Memory

- "CEF-" prefix = cephalosporin (easy class spotter)
- Generation ladder: 1st = skin/surgery • 2nd = respiratory • 3rd = serious/CNS • 4th = Pseudomonas • 5th = MRSA

Drug-Specific Mnemonics

- "Cef-TRI-axone crosses TRI-ple barriers" → BBB, placenta, gonorrhea
- "Don't CEF-otetan and sip" → NO alcohol (disulfiram)
- "Calcium + Ceftriaxone = Crystals = Cardiac arrest" (neonates)
- "Cefepime + Kidneys = Confusion & Convulsions"

🔑 The 5 C's of Cephalosporin Toxicity

- **Colitis (C. diff)**

- Crystals (ceftriaxone + IV calcium)
- Clotting issues (cefotetan — ↑ PT/INR)
- CNS seizures (cefepime in renal impairment)
- Cross-reactivity (penicillin allergy)

🚨 CLINICAL JUDGMENT SNAPSHOT 🧠

#1 Priority Risk

- **ANAPHYLAXIS — especially in patients with a prior penicillin allergy**

What Harms the Patient FIRST

- Airway compromise from allergic reaction → then C. diff colitis → then nephrotoxicity

FIRST Nursing Action in a Reaction Scenario

1. **STOP the infusion immediately**
2. **Maintain airway / call rapid response team**
3. **Administer EPINEPHRINE IM (per protocol)**
4. **Notify HCP, document, monitor VS q5 min**

💊 11. MOST TESTED DRUGS IN THIS CLASS

GEN	DRUG (Generic / Brand)	KEY NCLEX POINT
1st	**Cefazolin (Ancef)**	Surgical prophylaxis — give within 60 min of incision
1st	**Cephalexin (Keflex)**	PO — skin/soft tissue, UTI
2nd	**Cefuroxime (Ceftin)**	Respiratory, otitis media, sinusitis
2nd	**Cefotetan**	⚠️ Alcohol = disulfiram reaction; ↑ bleeding (↑ PT/INR)
3rd	**Ceftriaxone (Rocephin)**	Meningitis, gonorrhea, pneumonia — NO IV calcium / LR!
3rd	**Ceftazidime (Fortaz)**	Pseudomonas coverage

4th	**Cefepime (Maxipime)**	Pseudomonas + neutropenic fever — seizures in renal pts
5th	**Ceftaroline (Teflaro)**	MRSA coverage