💧 DIURETICS — NCLEX Pharmacology Master Sheet

Drug Class: Diuretics (Loop · Thiazide · Potassium-Sparing · Osmotic)

Body System: Renal / Cardiovascular / Fluid & Electrolyte

Aligned with 2026 NCLEX-RN Test Plan · NGN · NCJMM Clinical Judgment

🟨 1. DRUG OVERVIEW — Why We Give Them

- **Primary goal:** ↑ urine output → ↓ fluid volume → ↓ BP & ↓ preload
- **Heart failure (HF):** relieve pulmonary edema & peripheral edema (Loop > Thiazide)
- **Hypertension (HTN):** first-line = Thiazides
- **Edema / ascites / cirrhosis:** Loop + Spironolactone combo
- **Increased ICP / cerebral edema / acute glaucoma:** Osmotic (Mannitol)
- **Hyperaldosteronism, resistant HTN, HF:** Spironolactone / Eplerenone

🟥 2. MECHANISM OF ACTION (Simplified by Class)

LOOP → Blocks $Na^+/K^+/2Cl^-$ in **Loop of Henle** → ↓↓↓ Na & water reabsorption → **massive diuresis**

THIAZIDE → Blocks Na^+/Cl^- in **Distal Convoluted Tubule** → moderate diuresis + vasodilation → ↓ BP

K-SPARING (Spironolactone) → Blocks **aldosterone** in collecting duct → Na^+ out, **K^+ stays in**

OSMOTIC (Mannitol) → ↑ plasma osmolarity → pulls water from tissues → ↓ ICP/IOP → excreted by kidney

🟧 3. THERAPEUTIC EFFECTS — "Is It Working?"

- ✅ ↑ **Urine output** (most reliable sign — monitor I&O)
- ✅ **Weight loss** (1 kg = ~1 L fluid) → daily weights same time, same scale, same clothes
- ✅ ↓ **Edema** (pitting, sacral, pulmonary crackles resolve)
- ✅ ↓ **Blood pressure** (for HTN indication)
- ✅ **Easier breathing, ↓ JVD, ↓ crackles** (HF patient)
- ✅ ↓ **ICP / ↓ IOP** (Mannitol — LOC improves)

4. SIDE EFFECTS & ADVERSE REACTIONS

COMMON

- Polyuria, thirst, dry mouth
- Orthostatic hypotension, dizziness
- Muscle cramps (↓ K^+, ↓ Mg^{2+})
- Weakness, fatigue
- Hyperglycemia (Thiazide/Loop)
- Hyperuricemia → gout flare

SERIOUS / LIFE-THREATENING

- **Hypokalemia** → lethal arrhythmias (Loop, Thiazide)
- **Hyperkalemia** → peaked T waves, arrest (K-sparing)
- **Ototoxicity** (Loop — esp. IV push fast or w/ aminoglycosides)
- **Severe dehydration & hypovolemic shock**
- **Sulfa allergy reaction** (Loop & Thiazide)
- **Stevens-Johnson Syndrome** (rare)
- **Digoxin toxicity** (↓ K^+ potentiates dig)
- **Lithium toxicity** (Thiazide ↓ Li excretion)

5. PRIORITY NURSING CONSIDERATIONS

- → **ASSESS** baseline: BP, HR, weight, lung sounds, edema, LOC, I&O
- → **MONITOR** electrolytes (K^+ priority), BUN/Cr, glucose, uric acid
- → **MONITOR** for orthostatic ↓ BP → assist with ambulation, fall precautions
- → **HOLD** Loop/Thiazide if **$K^+ < 3.5$** or SBP < 90 — notify provider
- → **HOLD** Spironolactone if **$K^+ > 5.0$**
- → **HOLD** if signs of dehydration, severe hypotension, or anuria
- → **NOTIFY** provider: urine output < 30 mL/hr, weight gain ≥ 2 lb/day or 5 lb/week
- → **NEVER** combine ACEi/ARB + K-sparing (hyperkalemia risk !!)

⚠ **Contraindications:** Anuria · severe electrolyte depletion · hepatic coma · sulfa allergy (loop/thiazide) · hyperkalemia (K-sparing) · active intracranial bleed (Mannitol)

⚠ **Drug Interactions:** Digoxin (hypoK → toxicity) · Lithium (Thiazide ↑ levels) · NSAIDs (↓ diuretic effect & AKI risk) · Aminoglycosides (↑ ototoxicity with loop) · ACEi/ARB + K-sparing = ⚠ HYPERKALEMIA · Corticosteroids (↑ K^+ loss)

6. LABS & DIAGNOSTICS

Lab	Normal	Critical Action
Potassium (K^+)	3.5–5.0 mEq/L	↓ → arrhythmia, dig tox · ↑ → peaked T, cardiac arrest
Sodium (Na^+)	135–145 mEq/L	↓ → confusion, seizures (esp. Thiazide)
Magnesium	1.3–2.1 mg/dL	↓ → cramps, torsades
Calcium	9.0–10.5 mg/dL	Loop ↓ Ca · Thiazide ↑ Ca
BUN / Creatinine	BUN 7–20 · Cr 0.6–1.2	↑ = dehydration or AKI — hold & notify
Glucose	70–110 mg/dL	↑ in diabetics (Loop/Thiazide)
Uric Acid	3.4–7.0 mg/dL	↑ → gout flare
Digoxin level	0.5–2.0 ng/mL	↑ risk of toxicity if K^+ low

7. ADMINISTRATION & SAFETY

- **Timing:** Give in **MORNING** (avoid nocturia); 2nd dose — no later than early afternoon
- **IV Furosemide:** push **slowly — no faster than 20 mg/min** → rapid push = **ototoxicity** (hearing loss)
- **Take with food** if GI upset (except Mannitol, IV only)
- **Mannitol: use in-line filter** (may crystallize); check bottle for crystals — warm if present
- **Bumetanide 1 mg ≈ Furosemide 40 mg** — do NOT confuse doses
- **High-alert in HF:** daily weight + strict I&O
- **Fall precautions:** orthostatic hypotension + night bathroom trips

8. PATIENT EDUCATION

- Take in the **morning**; if twice daily, second dose before 2 PM
- **Weigh daily** — same time, same scale, same clothes; report gain ≥ 2 lb/day or 5 lb/week
- **Rise slowly** (sit → stand) to prevent dizziness/falls
- **Eat K^+-rich foods** (banana, orange, potato, spinach, avocado) — if on Loop/Thiazide
- **AVOID salt substitutes (KCl) & K^+ supplements** if on Spironolactone → deadly hyperkalemia
- Report: muscle cramps, palpitations, severe weakness, confusion, hearing changes, rash
- Stay hydrated — but do not over-drink; follow fluid restriction if HF
- Carry **medical ID**; inform all providers about sulfa allergy risk
- Spironolactone: men may notice **gynecomastia**; women — menstrual changes (report)

9. NCLEX TEST TRAPS ⚠

- **"Banana for Spironolactone"** — WRONG. K-sparing patients should limit high-K^+ foods.
- **Loop + Digoxin** — hypokalemia causes dig toxicity *even at therapeutic dig levels*.
- **Thiazide in patients on Lithium** — ↑ Li levels → toxicity. Watch tremor, confusion.
- **"Sulfa allergy"** — Loop (furosemide) & Thiazide contain sulfa. Ethacrynic acid = sulfa-free alternative.
- **IV Lasix push** — pushing fast = hearing loss. Go SLOW.
- **Priority question:** The first sign Lasix is working = ↑ **urine output** (not ↓ BP).
- **Thiazide = calcium SPARING** (good for osteoporosis). Loop = calcium WASTING.
- **K < 3.5 + on Lasix** — do NOT give next dose; notify provider FIRST.
- **Spironolactone + ACEi/ARB** = classic trap → **hyperkalemia**.
- **Mannitol + crystals in bag** — do NOT discard; warm the solution & use filter.

10. MEMORY BOOSTERS & MNEMONICS

"LOOP loses K" → Loop & thiazide = K^+ wasters

"SPIRO spares K" → Spironolactone = K^+ saver (watch hyperK)

"FURO = FUR off the ears" → ototoxicity w/ fast IV push

"Thiazide calcium STAYS; Loop calcium GOES"

"HYPER GLUC" side effects of Thiazide:
Glucose ↑ · Lipids ↑ · Uric acid ↑ · Calcium ↑ (+ ↓ Na, ↓ K, ↓ Mg)

"MANNITOL = MAN IT PULLS" → pulls fluid out of brain & eyes

Morning dose rule: "Don't let the loop keep them up" — last dose before 2 PM

⭐ MOST TESTED DIURETICS — Class Comparison

LOOP Furosemide (Lasix) · Bumetanide (Bumex) · Torsemide · Ethacrynic Acid

- **Strongest/fastest diuretic** — "ceiling" effect much higher than thiazides
- **Use:** pulmonary edema, HF exacerbation, severe edema, HTN w/ renal impairment
- **Works even with low GFR** (CKD patients)
- **Watch:** ↓K^+, ↓Mg^{2+}, ↓Ca^{2+}, ↓Na^+, dehydration, ototoxicity, sulfa allergy
- **Ethacrynic acid** = only loop that's *sulfa-free*

THIAZIDE Hydrochlorothiazide (HCTZ) · Chlorthalidone · Metolazone

- **First-line HTN drug** — mild/moderate diuresis
- **Ineffective if GFR < 30** (except Metolazone)
- **Metolazone** often combined with Loop for resistant HF edema
- **Watch:** HYPER-GLUC (↑ glucose, lipids, uric acid, Ca^{2+}; ↓ Na, K, Mg)
- **Lithium trap:** ↑ lithium levels → toxicity

K-SPARING Spironolactone (Aldactone) · Eplerenone · Amiloride · Triamterene

- **Aldosterone antagonist:** Spironolactone, Eplerenone — used in HF (↓ mortality), cirrhosis/ascites, resistant HTN, hyperaldosteronism
- **Mild diuresis** — often paired with Loop/Thiazide to protect K^+
- **DEADLY trap:** combined with ACEi / ARB / ARNI / K^+ supplements → hyperkalemia → cardiac arrest
- **Spironolactone side effects:** gynecomastia, menstrual irregularities, ↓ libido (Eplerenone has fewer)
- **HOLD if $K^+ > 5.0$**

OSMOTIC Mannitol · Urea · Glycerin

- **Use:** ↑ ICP (TBI, stroke), acute glaucoma, drug overdose clearance
- **IV only** — requires **in-line filter** (crystals form); warm bag if crystals present
- **Watch:** pulmonary edema (pulls fluid into vessels!), HF exacerbation, hypernatremia, rebound ICP
- **Contraindicated:** anuria, active intracranial bleed, severe pulmonary edema, severe HF
- **Monitor:** neuro checks, ICP, serum osm (target 300–320 mOsm/kg), I&O q1h

SIDE-BY-SIDE QUICK REFERENCE

Feature	Loop	Thiazide	K-Sparing	Osmotic
Potency	Strongest	Moderate	Weak	IV-only, strong
K^+ effect	↓ (wastes)	↓ (wastes)	↑ (spares)	Variable
Ca^{2+} effect	↓ (wastes)	↑ (spares)	—	—
Sulfa allergy?	Yes (except ethacrynic)	Yes	No	No
Onset (PO)	~30–60 min	~2 hr	Days (aldo blockers)	IV: 15 min
Works in CKD?	Yes	No (except metolazone)	Caution — hyperK	Caution
Classic use	Pulm. edema, HF	HTN	HF, ascites, ↑aldo	↑ICP, glaucoma

HOLD OR GIVE? — Decision Rules

Situation	Action
K^+ = 3.0 on Lasix	**HOLD** — notify provider, replace K^+
K^+ = 5.8 on Spironolactone	**HOLD** — notify provider, check ECG
BP 88/52 before AM Lasix	**HOLD** — notify provider
Urine output 20 mL/hr x 2 hrs	**HOLD & NOTIFY** — possible AKI
Sulfa allergy, ordered HCTZ	**HOLD** — clarify with provider
Patient on ACEi + new Spironolactone order	**CLARIFY** — hyperK risk
Mannitol bag has crystals	**DO NOT discard** — warm & use filter
HF pt gained 4 lb in 2 days	**GIVE** — call provider if dose unclear; escalation needed

🧠 CLINICAL JUDGMENT SNAPSHOT (NCJMM)

❓ #1 Priority Risk with Diuretics:

➡ **ELECTROLYTE IMBALANCE** — specifically **hypokalemia (Loop/Thiazide)** or **hyperkalemia (K-sparing)** leading to **lethal cardiac arrhythmias**.

❓ What will harm the patient FIRST?

➡ **Cardiac arrhythmia** from K^+ derangement (peaked T waves ↑K^+ · U waves / flat T ↓K^+) — can progress to V-fib or asystole within minutes.
➡ Secondary early harm: **hypovolemia** → **hypotension** → **falls / AKI**.

❓ FIRST nursing action in a scenario?

➡ **ASSESS first:** K^+ level + apical pulse + BP + ECG rhythm + LOC.
➡ **HOLD the drug** if parameters out of range.
➡ **NOTIFY provider** and **place pt on cardiac monitor**.
➡ For acute **hyperkalemia** (K-sparing): **Calcium gluconate IV FIRST** (stabilizes myocardium) → then insulin/D50 → then Kayexalate/Lokelma.
➡ For acute **hypokalemia** (Loop): stop drug, replace K^+ (IV never IV push — ≤ 10 mEq/hr peripheral), continuous ECG.

❓ Most-tested NGN priority sequence (pulmonary edema on IV Lasix):

1️⃣ **Sit patient upright (HOB ↑)** → 2️⃣ O_2 → 3️⃣ Push IV Lasix *slowly* → 4️⃣ Foley / monitor I&O → 5️⃣ Reassess lung sounds & SpO_2 → 6️⃣ Recheck K^+ in a few hours.