

NCLEX-RN • PHARMACOLOGY INFOGRAPHIC • 2026 TEST PLAN

Potassium + Kayexalate + Dextrose

Three drugs clinically linked by the **hyperkalemia emergency pathway**. Master the replacement, the binder, and the shifter as one unit — the NCLEX will test the sequence.

FRAMEWORK

NGN • NCJMM Clinical Judgment

SHARED SYSTEM

Fluid / Electrolyte / Endocrine

PRIORITY CONCEPT

Cardiac Membrane Safety

WHY THESE THREE TOGETHER

POTASSIUM

corrects hypokalemia ($K^+ < 3.5$).

KAYEXALATE

removes excess K^+ from the body.

DEXTROSE

+ insulin shifts K^+ back into cells. When you understand all three, you own the entire K^+ map — the single most tested electrolyte on the NCLEX.

DRUG 01 • ELECTROLYTE REPLACEMENT

Potassium Chloride

KCl • K-Dur • Klor-Con • Micro-K

CLASS

Electrolyte (intracellular cation)

SYSTEM

Cardiac • Neuromuscular • Renal

NORMAL K^+

3.5 – 5.0 mEq/L

01



DRUG OVERVIEW

- **Indication:** Hypokalemia ($K^+ < 3.5$) — diuretic-induced loss, DKA recovery, vomiting/diarrhea, NG suction, refeeding
- **High-yield clinical use:** loop/thiazide diuretic users (furosemide, HCTZ), digoxin therapy ($\downarrow K^+ \rightarrow$ digoxin toxicity), post-op and ICU patients
- Also given prophylactically with potassium-wasting diuretics

02



MECHANISM OF ACTION

Replaces depleted $K^+ \rightarrow$ restores Na^+/K^+ ATPase pump $\rightarrow$ normalizes resting membrane potential $\rightarrow$ restores cardiac conduction, skeletal muscle contraction, smooth muscle tone, nerve transmission

03



THERAPEUTIC EFFECTS

- Serum K^+ returns to **3.5 – 5.0 mEq/L**
- ECG normalizes — U wave resolves, T wave normalizes
- Muscle weakness, leg cramps, paresthesias resolve
- Constipation, ileus, and weak pulse improve
- Digoxin level stabilizes ($\downarrow$ toxicity risk)

04



SIDE EFFECTS & ADVERSE REACTIONS

COMMON

- GI upset — nausea, vomiting, cramping
- Diarrhea (oral)
- IV site pain, phlebitis, burning
- Metallic taste with liquid form



SERIOUS / LIFE-THREATENING

- **HYPERKALEMIA** — tall peaked T waves, wide QRS, prolonged PR, flat P
- **Cardiac arrest** — ventricular fibrillation, asystole (esp. IV push)
- GI ulceration / perforation (extended-release if stuck)
- Severe extravasation → tissue necrosis

05



PRIORITY NURSING CONSIDERATIONS

- **Assess** — cardiac rhythm, ECG, muscle strength, bowel sounds, urine output
- **Monitor** — serum K⁺, Mg²⁺ (must correct Mg first or K⁺ won't rise), renal function (BUN/Cr), I&O
- **Verify urine output ≥ 30 mL/hr / 0.5 mL/kg/hr BEFORE giving** — no pee, no K⁺
- **Notify provider** — K⁺ > 5.0, urine output drops, new arrhythmias, muscle weakness



HOLD IF...

- K⁺ > 5.0 mEq/L
- Oliguria / anuria / AKI
- Patient on K⁺-sparing diuretic, ACE-I, ARB, ARNI without order review
- Severe tissue trauma, crush injury, burns (cellular K⁺ release)
- Addison disease, untreated adrenal insufficiency



GIVE IF...

- K⁺ < 3.5 mEq/L with adequate urine output
- Confirmed diuretic-induced loss
- Mg²⁺ level normal or being corrected concurrently
- ECG monitoring in place for IV infusion

06 LABS & DIAGNOSTICS

LAB	NORMAL	CRITICAL – WHAT IT MEANS
Serum K ⁺	3.5 – 5.0 mEq/L	< 2.5 or > 6.5 = life-threatening arrhythmia risk
Serum Mg ²⁺	1.5 – 2.5 mg/dL	Low Mg → refractory hypokalemia (correct Mg FIRST)
BUN / Cr	BUN 10–20 · Cr 0.6–1.2	Elevated = impaired K ⁺ excretion → hyperkalemia risk
ECG	NSR	Peaked T, wide QRS → hyperkalemia emergency

07 ADMINISTRATION & SAFETY

- **NEVER IV push.** Ever. IV push K⁺ = cardiac arrest. Hard-stop rule.
- **Always diluted, always on an infusion pump**
- Peripheral line max: **10 mEq/hr** · Central line max: **20 mEq/hr**
- Max concentration peripheral: 40 mEq/L · central: 80 mEq/L
- Oral: give with **full glass of water (8 oz)** + food to prevent GI irritation
- Do NOT crush, chew, or split extended-release tablets
- Continuous ECG monitoring for rates > 10 mEq/hr
- 🚑 **High-alert medication** — requires independent double-check

08

**PATIENT EDUCATION**

- Take with food and a full glass of water — never on empty stomach
- **AVOID salt substitutes** — they contain KCl (huge NCLEX trap)
- Limit high-K⁺ foods only if directed: bananas, oranges, potatoes, spinach, avocado, tomato
- Report: muscle weakness, irregular heartbeat, numbness/tingling, N/V, confusion
- Do not stop abruptly if on long-term therapy
- Swallow ER tablets whole — if too large, ask about liquid or effervescent form

09

**NCLEX TEST TRAPS**

TRAP 1: IV push order looks "convenient" on a test question — it's always wrong. IV potassium is *never* pushed.

TRAP 2: Patient asks about "salt substitute" at home — these contain KCl. Teach to avoid.

TRAP 3: Low K⁺ not improving? Check **Mg²⁺** — hypomagnesemia causes refractory hypokalemia.

TRAP 4: "Burning at IV site" is NOT expected — slow the rate, dilute more, consider central line.

TRAP 5: Don't give K⁺ without confirming urine output ≥ 30 mL/hr — anuria = hyperkalemia trap.

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MEMORY BOOSTERS

"MURDER" — HYPERKALEMIA SIGNS

Muscle weakness / cramps

Urine output ↓ (oliguria)

Respiratory failure (late)

Decreased cardiac contractility

ECG changes (peaked T, wide QRS)

Reflexes (hyperactive early → flaccid late)

- "No Pee, No K" — confirm urine output before giving
- "Low and Slow" — dilute concentration, slow infusion rate
- Hypo-K = **flat T, U wave** · Hyper-K = **peaked T** (pointy like a tent)

DRUG 02 • CATION EXCHANGE RESIN • K⁺ BINDER

Sodium Polystyrene Sulfonate

Kayexalate • SPS • (Kionex)

CLASS	SYSTEM	ONSET
Potassium-removing resin	GI • Renal	PO 2–6 hr • PR 30–60 min

01



DRUG OVERVIEW

- **Indication:** HYPERkalemia (K⁺ > 5.0 – 5.5 mEq/L), typically in CKD, AKI, or chronic stable hyperkalemia
- **High-yield clinical use:** subacute / non-emergent hyperkalemia — not first-line for life-threatening spikes
- Often used AFTER calcium gluconate + insulin/D50 have stabilized the heart and shifted K⁺

02



MECHANISM OF ACTION

Resin releases Na⁺ in the gut → binds K⁺ in exchange → K⁺ trapped in resin travels through bowel → excreted in stool (patient MUST have a BM for drug to work)

03



THERAPEUTIC EFFECTS

- Serum K⁺ drops **0.5 – 1.0 mEq/L in 4–6 hours**
- ECG changes of hyperkalemia resolve
- Bowel movement occurs (required for drug action)
- K⁺ excretion seen in stool — each dose binds ~1 mEq K⁺ per gram

04

⚠️ SIDE EFFECTS & ADVERSE REACTIONS

COMMON

- Constipation
- Nausea, vomiting, anorexia
- Diarrhea (if given with sorbitol)
- Fecal impaction
- Hypernatremia (Na^+ released in exchange)



SERIOUS / LIFE-THREATENING

- **Intestinal necrosis & bowel perforation** (BLACK BOX — esp. with sorbitol, in post-op / ileus patients)
- Ischemic colitis
- Hypokalemia (over-correction)
- Hypomagnesemia, hypocalcemia
- Fluid overload (Na^+ load — risk in HF, renal failure)
- Aspiration pneumonia if PO in at-risk patient

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🧑🏻 PRIORITY NURSING CONSIDERATIONS

- **Assess** — bowel sounds (MUST be present), abdominal distension, last BM, swallowing ability
- **Monitor** — K^+ q2–4hr during treatment, Na^+ , Ca^{2+} , Mg^{2+} , fluid status, BP
- **Document BM** — if no BM in 6 hrs, notify provider; drug doesn't work without stool
- **Notify provider** — abdominal pain, distension, absent bowel sounds, bloody stool, K^+ drops < 3.5



HOLD / CONTRAINDICATED

- Post-op patient (esp. bowel surgery)
- Ileus or bowel obstruction
- Absent bowel sounds
- Neonates with reduced gut motility
- Heart failure (Na^+ load)
- Hypernatremia already present
- Severe hypokalemia



GIVE IF...

- K^+ > 5.0 – 5.5 with active bowel sounds
- Patient can swallow safely (PO route)
- No GI contraindications
- Cardiac status stabilized if severe hyperkalemia

06 LABS & DIAGNOSTICS

LAB	NORMAL	WHAT TO WATCH
Serum K ⁺	3.5 – 5.0	Recheck q2–4hr; stop if < 4.0 (rebound hypokalemia risk)
Serum Na ⁺	135 – 145	May rise — watch for edema, HTN, HF exacerbation
Serum Ca ²⁺ / Mg ²⁺	Ca 8.5–10.5 · Mg 1.5–2.5	Resin may bind; watch for hypocalcemia, hypomagnesemia
ECG	NSR	Should normalize as K ⁺ drops

07 ADMINISTRATION & SAFETY

- **PO:** mix with water or juice (avoid orange juice — high K⁺); sorbitol increases perforation risk — use water when possible
- **PR enema:** retain **30 – 60 minutes**; then cleansing enema to remove resin
- Verify swallowing ability before PO dose (aspiration = necrotizing bronchitis)
- Elevate HOB 30–45° during and 1 hr after PO dose
- Assess bowel sounds *before each dose*
- Space from other oral meds by at least 3 hours — binds many drugs
- Slower onset than IV insulin/D50 — **NOT first-line for emergency hyperkalemia**

08 PATIENT EDUCATION

- "You must have a bowel movement for this drug to work."
- Report: abdominal pain, distension, blood in stool, vomiting, no BM in 24 hrs
- Continue low-K⁺ diet (no bananas, oranges, potatoes, tomatoes, salt substitutes)
- Don't take other oral meds within 3 hours of dose
- Expect gritty texture of PO suspension — can chill to improve taste

09



NCLEX TEST TRAPS

TRAP 1: Question says "K⁺ is 7.2, ECG shows peaked T waves" — Kayexalate is NOT the first answer. Priority = **calcium gluconate** first (stabilize myocardium), then insulin/D50 (shift), then Kayexalate (remove).

TRAP 2: Post-op day 1 patient → Kayexalate ordered → HOLD and call provider. Ileus risk → bowel necrosis.

TRAP 3: Patient has no BM after 2 doses — drug isn't working. Assess bowel sounds, notify.

TRAP 4: Heart failure patient — the Na⁺ load can worsen volume status. Priority assessment: lung sounds, weight, edema.

TRAP 5: Confusing "K⁺ binder" with "K⁺ supplement." Kayexalate REMOVES K⁺. It's the opposite of KCl.

10



MEMORY BOOSTERS

"KAYEXALATE KICKS K⁺ OUT THE BACK DOOR"

Kidneys can't — so the gut will
Assess bowel sounds before every dose
You need a BM — or it doesn't work
Exchange: Na⁺ in, K⁺ out
X = do not give in ileus or post-op
(Ka)lium Kicker — removes, not replaces

- Kayexalate = Kicks K⁺ out · KCl = K⁺ in (opposite drugs!)
- "No bowel, no binder" — absent bowel sounds = HOLD
- Newer alternative: **patiomer (Veltassa)**, **sodium zirconium (Lokelma)** — similar K⁺ binders, lower perforation risk

DRUG 03 • HYPERTONIC CARBOHYDRATE • CALORIC AGENT

Dextrose 50% in Water

D50W • D50 • "amp of D50" • Concentrated glucose

CLASS

Carbohydrate / hypertonic solution

SYSTEM

Endocrine • Metabolic • CNS

NORMAL BG

70 – 110 mg/dL (fasting)

01



DRUG OVERVIEW

- **Indication 1 – Severe hypoglycemia:** BG < 70 with altered mental status, unable to swallow, unconscious
- **Indication 2 – Hyperkalemia:** given *with* IV regular insulin to drive K⁺ into cells
- **Indication 3 – Caloric support / TPN base** (D5W, D10W for maintenance)
- Standard adult dose: **25 g (50 mL of D50W) IV push** for hypoglycemia

02



MECHANISM OF ACTION

For hypoglycemia: IV glucose → rapidly ↑ serum glucose → restores CNS fuel → LOC returns

For hyperkalemia: Insulin activates Na⁺/K⁺ ATPase → drives K⁺ from ECF into cells → dextrose prevents insulin-induced hypoglycemia (temporary shift – does NOT remove K⁺ from body)

03



THERAPEUTIC EFFECTS

- BG rises > 70 mg/dL within minutes
- Return of consciousness, resolution of diaphoresis, tremors, confusion
- For hyperkalemia: K⁺ drops **0.5 – 1.2 mEq/L within 15 – 30 min** (with insulin)
- ECG normalizes as K⁺ shifts intracellularly

04



SIDE EFFECTS & ADVERSE REACTIONS

COMMON

- Phlebitis, IV site burning
- Hyperglycemia (transient)
- Hypokalemia (shift)
- Fluid overload (with large volumes)
- Headache, flushing



SERIOUS / LIFE-THREATENING

- **Tissue necrosis / sloughing** if D50 extravasates (hypertonic — big vein / central line preferred)
- **Rebound hypoglycemia** (esp. in sulfonylurea overdose — short glucose half-life)
- Hyperosmolar state in diabetics
- Cerebral edema if corrected too fast in chronic severe hypoglycemia
- Electrolyte shifts — hypokalemia, hypophosphatemia (refeeding)

05



PRIORITY NURSING CONSIDERATIONS

- **Assess** — LOC, airway, BG before and 15 min after, IV patency (blood return), skin at IV site
- **Monitor** — BG q15min until stable > 70, then q1hr; K⁺ if given for hyperkalemia; fluid status
- **Large-bore IV / central line** preferred for D50 — hypertonic, vesicant if extravasated
- **Feed the patient** once awake and able to swallow — complex carb + protein (cheese and crackers, milk, PB sandwich) to prevent rebound
- **Notify provider** — no LOC improvement in 10 min, repeated hypoglycemia, IV infiltrate



CAUTION / HOLD

- Hyperglycemia (DKA/HHS) — don't give if BG high
- Diabetic coma unless hypoglycemia confirmed
- Intracranial hemorrhage (fluid shifts)
- Known corn allergy (some formulations)
- Peripheral IV with poor patency — risk of extravasation



GIVE IF...

- BG < 70 with AMS / unresponsive / unable to swallow
- Hyperkalemia with concurrent insulin order
- Patent IV with good blood return (large vein)
- Immediate post-seizure hypoglycemia

06 LABS & DIAGNOSTICS

LAB	NORMAL	WHAT TO WATCH
Blood glucose	70 – 110 fasting	< 70 = hypoglycemia · > 180 = hyperglycemia
Serum K ⁺	3.5 – 5.0	Drops during insulin/D50 therapy – watch for hypokalemia
Serum Na ⁺ / osmolality	Na 135–145 · osm 275–295	Hypertonic D50 can cause osmotic shifts
Phosphate	2.5 – 4.5 mg/dL	Drops with refeeding / insulin – watch in malnourished

07 ADMINISTRATION & SAFETY

- **D50W:** 25 g (50 mL) IV push slowly over 1–3 min into large patent vein or central line
- Always verify **blood return** before pushing – extravasation = tissue necrosis
- Follow with NS flush after push
- **Hyperkalemia protocol:** 10 units regular insulin IV + 25 g D50 IV push (or D10W infusion)
- If BG > 250 already, insulin may be given without dextrose (per protocol)
- For conscious patient who can swallow → oral glucose (15 g) first — **15/15 rule**
- D5W, D10W = maintenance / peripheral OK; D50 = central or large bore preferred

08 PATIENT EDUCATION

- **15/15 rule:** if conscious — take 15 g simple carb (4 oz juice, 3–4 glucose tabs, 1 tbsp honey), recheck BG in 15 min
- Follow with complex carb + protein once BG > 70 to prevent rebound
- Carry fast-acting carbs at all times; family should know glucagon IM for unconscious episodes
- Identify hypoglycemia triggers: missed meal, exercise, alcohol, insulin stacking
- Wear medical ID if diabetic
- Recheck BG 15 min after every treatment — hypoglycemia can recur

09



NCLEX TEST TRAPS

TRAP 1: Conscious hypoglycemic patient who can swallow → the answer is **oral glucose / juice**, not IV D50. IV D50 is for AMS/unconscious/NPO.

TRAP 2: In hyperkalemia, dextrose alone doesn't drop K⁺. You need **insulin + dextrose together**. Insulin is the shifter; dextrose prevents hypoglycemia.

TRAP 3: Dextrose + insulin **shifts** K⁺ — it does not remove it. Serum K⁺ will rebound. Need Kayexalate or dialysis for removal.

TRAP 4: After D50, patient "wakes up." Don't stop there — **feed them** (complex carb + protein) or BG will crash again.

TRAP 5: Sulfonylurea (glipizide, glyburide) overdose → prolonged hypoglycemia. One amp of D50 is NOT enough — anticipate infusion + octreotide.

TRAP 6: Always recheck BG in 15 minutes. "Patient appears better" is not an endpoint.

10



MEMORY BOOSTERS

"SUGAR — HYPOGLYCEMIA RESPONSE"

Sweating, Shakiness, Seizure

Unresponsive? → IV D50

Glucose check BEFORE and AFTER

Alert & swallowing? → PO 15/15 rule

Recheck in 15 min, then feed

- "Cold & clammy — need some candy. Hot & dry — sugar high."
- "Insulin shifts K⁺ in. Dextrose protects the brain."
- 15/15 rule = 15 g carb, recheck in 15 min



Clinical Judgment Snapshot

🔥 SEVERE HYPERKALEMIA EMERGENCY SEQUENCE — $K^+ > 6.5$ OR ECG CHANGES

STEP 01 • FIRST

Calcium Gluconate IV

Stabilizes cardiac membrane. Does NOT lower K^+ — it protects the heart while other meds work. Onset 1–3 min.

STEP 02 • SHIFT

Regular Insulin + D50W

Drives K^+ into cells. Onset 15–30 min. Dextrose prevents insulin-induced hypoglycemia.

STEP 03 • SHIFT

Albuterol (nebulized)

Beta-2 agonist also shifts K^+ intracellularly. Adjunct, not replacement.

STEP 04 • REMOVE

Kayexalate (or Lokelma / Veltassa)

Only step that actually removes K^+ from the body (via stool). Slower onset — not first-line.

STEP 05 • REMOVE

Hemodialysis

Definitive removal — indicated in renal failure or refractory hyperkalemia.

Q1

WHAT IS THE #1 PRIORITY RISK WITH THESE DRUGS?

Lethal cardiac arrhythmia. Both hypo- and hyperkalemia can cause ventricular fibrillation, asystole, and cardiac arrest. Every K^+ decision is a cardiac decision. Potassium errors are among the most frequent causes of preventable inpatient death.

Q2

WHAT WILL HARM THE PATIENT FIRST?

KCl: IV push or too-rapid infusion → cardiac arrest in minutes.

Kayexalate: bowel necrosis / perforation in post-op or ileus patients.

D50W: tissue necrosis from extravasation, or rebound hypoglycemia if not followed with food or glucose infusion.

Q3

WHAT IS THE FIRST NURSING ACTION?

Hyperkalemia emergency ($K^+ > 6.5$ with ECG changes): administer **IV calcium gluconate FIRST** — it's the only intervention that protects the heart immediately. Only AFTER that do you give insulin/D50, albuterol, and Kayexalate.

Hypokalemia with IV KCl ordered: verify urine output ≥ 30 mL/hr AND ECG monitoring before initiating infusion. Never push, always dilute, always on a pump.

Hypoglycemia + unconscious: check BG, ensure airway, give IV D50 (or glucagon IM if no IV). Recheck in 15 min, then feed.

Q4

RECOGNIZE → ANALYZE → PRIORITIZE (NCJMM)

Recognize cues: peaked T waves on ECG, $K^+ = 6.9$, CKD stage 5, no urine output $\times 6$ hr.

Analyze: hyperkalemia emergency — cardiac arrest imminent.

Prioritize: Ca gluconate → insulin + D50 → albuterol → Kayexalate/dialysis. Monitor continuously. Do NOT administer KCl-containing IV fluids, ACE-I, ARB, or K^+ -sparing diuretics.

QUICK RECALL — REMEMBER THESE THREE FOREVER

POTASSIUM CHLORIDE

Never IV push. Dilute + pump. Max 10 mEq/hr peripheral. Urine output before dosing. "No pee, no K."

KAYEXALATE

Kicks K^+ out via stool. Needs BM to work. Hold for ileus, post-op, absent bowel sounds. Black box: bowel necrosis.

DEXTROSE (D50W)

Shifts K^+ in (with insulin) OR treats hypoglycemia. Recheck BG in 15. Follow with food. Central line preferred.