

NCLEX-RN 2026 • NGN • PHARMACOLOGY REVIEW

INSULIN — *the hormone that saves lives & kills fast.* ^{Rx}

DRUG CLASS: ANTIDIABETIC HORMONE

SYSTEM: ENDOCRINE

HIGH-ALERT MEDICATION ⚠️

ISMP TOP MED-ERROR DRUG

01 • OVERVIEW

DRUG OVERVIEW

Why we give it

- ▶ **Type 1 DM** — required (pancreas makes NONE)
- ▶ **Type 2 DM** — when oral agents fail, during illness, surgery, pregnancy, steroids
- ▶ **DKA / HHS** — Regular insulin IV drip (*only Regular can go IV*)
- ▶ **Hyperkalemia** — shifts K⁺ into cell (given with D50)
- ▶ **Gestational DM** — safe in pregnancy (does NOT cross placenta)
- ▶ **Hyperglycemia** from TPN, steroids, critical illness

02 • MECHANISM

MECHANISM OF ACTION

How it works

Insulin binds receptor on muscle, fat, liver cells → **GLUT-4** transporters move to cell surface → Glucose **INTO** cells → blood glucose ↓

→ ↑ glycogen storage (liver) → ↑ fat storage → ↑ protein synthesis

→ **K⁺ shifts INTO cells** (Δ hypokalemia risk) → ↓ lipolysis = ↓ ketones

- ▶ **Anabolic hormone** — builds & stores
- ▶ Opposes glucagon, cortisol, epinephrine, GH (counter-regulatory hormones)

03 • THERAPEUTIC

WHAT "WORKING" LOOKS LIKE

Signs it's working

04 • ADVERSE EFFECTS

SIDE EFFECTS

What can go wrong

05 • PRIORITY NURSING

NURSING ACTIONS

Think like a nurse

- ✓ Fasting BG **80–130 mg/dL**
- ✓ Post-prandial BG **<180 mg/dL**
- ✓ **HbA1c <7%** (goal for most diabetics)
- ✓ Resolution of polyuria, polydipsia, polyphagia
- ✓ Weight stabilizing, energy improving
- ✓ DKA: anion gap closing, ketones clearing

COMMON

- ▶ Weight gain (anabolic)
- ▶ Injection site reactions
- ▶ **Lipohypertrophy** — from not rotating sites
- ▶ Lipoatrophy (rare with modern insulins)

SERIOUS ☠

- ☠ **HYPOGLYCEMIA** (<70 mg/dL) — #1 killer
- ⚠ **Hypokalemia** — K⁺ shifts into cells
- ⚠ **Somogyi effect** — rebound AM hyperglycemia after nocturnal hypo
- ⚠ **Dawn phenomenon** — AM hyperglycemia from GH/cortisol surge
- ☠ Anaphylaxis (rare)

- ▶ **ASSESS** BG before every dose — always
- ▶ **MONITOR** for hypoglycemia at **peak** times
- 👉 **HOLD** if BG <70 mg/dL → notify & give carbs
- 👉 **HOLD** if patient NPO or not eating → clarify order
- ⚠ **NEVER** give insulin without food source available (except basal)
- ▶ **ROTATE** sites within same region (abdomen fastest)
- ▶ **2-nurse verification** for IV insulin & pediatric doses
- ▶ **Interactions:** β-blockers **mask** hypoglycemia (no tachycardia!); steroids
↑ BG; alcohol ↓ BG

06 • LABS & DIAGNOSTICS

LABS TO KNOW COLD

Numbers that matter

- ▶ **Blood glucose:** normal fasting 70–110 mg/dL · **hypo <70** · **critical <54**
- ▶ **HbA1c:** <5.7% normal · 5.7–6.4% pre-DM · ≥6.5% diabetes · goal <7%
- ▶ **Potassium:** 3.5–5.0 mEq/L — **watch for drop with insulin**
- ▶ **Ketones** (urine/serum) — DKA monitoring
- ▶ **ABG** — DKA: pH <7.35, HCO₃ <18, anion gap >12
- ▶ **C-peptide** — differentiates Type 1 (low) vs Type 2 (normal/high)
- ⚠ **Critical action:** K⁺ must be **≥3.3 mEq/L** before starting IV insulin in DKA

07 • ADMINISTRATION & SAFETY

HOW TO GIVE IT SAFELY

Routes, timing, traps

- ▶ **Routes:** SubQ (standard), IV drip (Regular ONLY), insulin pump, inhaled (Afrezza)
- ▶ **Syringe:** use **insulin syringe only** (U-100) — never tuberculin
- ▶ **Sites:** abdomen (fastest) > arm > thigh > buttock — rotate within region
- ▶ **Angle:** 90° (or 45° if thin); **do not aspirate, do not massage**
- ▶ **Storage:** unopened vials → refrigerate; in-use vial → room temp ×28 days
- ▶ **Mixing (Regular + NPH):** CLEAR → CLOUDY "R" BEFORE "N" air into NPH first, air into R, draw R, then N

- ⚠ **NEVER mix** glargine (Lantus), detemir (Levemir), or degludec (Tresiba) with ANY other insulin
- ⚠ NPH is the **only cloudy** insulin — all others should be clear
- ⚠ **Roll, don't shake** cloudy insulin between palms

08 • PATIENT EDUCATION

WHAT THE PATIENT MUST KNOW

Teach to survive

- ▶ **Hypoglycemia s/sx:** " **cold & clammy, need some candy**" — shaky, sweaty, tachycardic, confused, hungry
- ▶ **Rule of 15:** 15 g fast carbs (4 oz juice, 3 glucose tabs) → wait 15 min → recheck → repeat if still <70
- ▶ If unconscious/can't swallow → **glucagon IM** at home, **D50 IV** in hospital
- ▶ Carry ID + fast-acting sugar at **all times**
- ▶ **Sick day rules:** do NOT stop insulin — BG rises with illness; check BG & ketones q4h
- ▶ Take **with food** for mealtime insulins; rapid-acting within 15 min of eating
- ▶ Rotate injection sites to prevent lumps (lipohypertrophy slows absorption)
- ▶ Alcohol: causes delayed hypoglycemia — eat with drink, check BG at bedtime
- ▶ Exercise ↓ BG — snack if prolonged

09 • NCLEX TRAPS

WHAT THEY'LL TRY TO FOOL YOU WITH

Trap watchlist ⚠

- ⚠ **ONLY Regular insulin can go IV.** All others are SubQ only.
- ⚠ **β-blockers MASK hypoglycemia** — no tachycardia warning. Diaphoresis & hunger may be the ONLY clues.
- ⚠ **Cold/clammy → give candy · Hot/dry → sugar high**
- ⚠ BG 65 in a conscious patient → **juice/glucose tabs FIRST** (not D50, not glucagon)
- ⚠ BG 45 unconscious → **D50 IV** (or glucagon IM if no IV access)
- ⚠ Don't confuse **Humalog (lispro)** with **Humulin R (regular)** — sound-alike!
- ⚠ NPH peaks in **4-12 hrs** — hypoglycemia risk mid-afternoon if given at breakfast
- ⚠ **Somogyi** → decrease evening dose · **Dawn** → increase evening dose (opposite!)
- ⚠ DKA tx: **fluids FIRST**, then check K⁺, **then** insulin drip
- ⚠ Insulin causes **hypokalemia**, not hyperkalemia (it TREATS hyperK)
- ⚠ Never draw up Lantus with anything else — even if order says so, clarify

10 • MEMORY BOOSTERS

MNEMONICS & PATTERNS

Recall tricks that stick

HYPOGLYCEMIA S/SX

- ▶ **TIRED:** *T*achycardia, *I*rritable, *R*estless, *E*xcessive hunger, *D*iaphoresis/Depression
- ▶ "Cold & clammy → need some candy"
- ▶ "Hot & dry → sugar high" (hyperglycemia)

MIXING ORDER

- ▶ "RN" — draw *R*egular before *N*PH
- ▶ **Clear before cloudy**
- ▶ Air into NPH → air into R → draw R → draw N
- ▶ Give within 5–15 min of mixing

ONSET/PEAK/DURATION

- ▶ **Rapid** (lispro): *15 min / 1 hr / 3–5 hr*
- ▶ **Short** (Regular): *30 min / 2–4 hr / 5–8 hr*
- ▶ **Intermediate** (NPH): *1–2 hr / 4–12 hr / 14–24 hr*
- ▶ **Long** (glargine): *1 hr / no peak / ~24 hr*
- ▶ "Lispro eats with you, glargine sleeps with you"

Most-Tested Insulins on the NCLEX

KNOW ONSET • PEAK • DURATION • AND THE KILLER NUANCES

CATEGORY	GENERIC (BRAND)	ONSET	PEAK	DURATION	KEY NCLEX NUANCE
RAPID	Lispro (Humalog) Aspart (NovoLog) Glulisine (Apidra)	15 min	1 hr	3–5 hr	Give <i>with</i> meal or within 15 min. Food MUST be in front of patient. "Lispro eats with you."
SHORT	Regular (Humulin R, Novolin R)	30 min	2–4 hr	5–8 hr	⚡ ONLY insulin given IV (DKA, HHS, hyperkalemia). Give 30 min <i>before</i> meals SubQ. Clear.
INTERMEDIATE	NPH (Humulin N, Novolin N)	1–2 hr	4–12 hr	14–24 hr	Only <i>cloudy</i> insulin — roll, don't shake. Peak = greatest hypoglycemia risk. Can mix with R (R first!).
LONG	Glargine (Lantus, Basaglar, Toujeo) Detemir (Levemir)	1 hr	No peak	~24 hr	⚡ NEVER mix with other insulins. Once daily, same time. pH too acidic to combine. "Glargine sleeps with you."
ULTRA-LONG	Degludec (Tresiba)	1 hr	No peak	>42 hr	Flexible timing; still <i>never mix</i> . Once daily. Steady-state in ~3 days.

CATEGORY	GENERIC (BRAND)	ONSET	PEAK	DURATION	KEY NCLEX NUANCE
PRE-MIXED	70/30 (NPH/R) 75/25, 50/50	15–30 min	Dual peaks	10–16 hr	Convenience combo — but <i>two</i> hypoglycemia windows. Give with meal. Cloudy → roll.



NCJMM • CLINICAL JUDGMENT MEASUREMENT MODEL

Clinical Judgment Snapshot

#1 PRIORITY RISK

Hypoglycemia.

The fastest killer. Brain has *no glucose reserves* — neuroglycopenia → seizures, coma, death within minutes. Recognize and treat **before** you finish charting.

WHAT HARMS FIRST

Silent hypo in a β -blocked patient.

No tachycardia, no tremor — just diaphoresis & confusion. Also: insulin given without food, wrong syringe (TB vs U-100), or mixing Lantus with Regular.

FIRST NURSING ACTION

Check the blood glucose.

Any change in LOC, behavior, or vitals in a diabetic → *fingerstick first*. If < 70 & conscious: 15 g fast carbs. If unconscious: D50 IV (or glucagon IM). Recheck in 15 min.