NCLEX-RN 2026 · DAILY PHARMACOLOGY MASTERY

Day 9 — Sedation, Anesthesia & *Perioperative* Pharmacology

BENZODIAZEPINES · FLUMAZENIL · PROPOFOL · PARALYTICS · LOCAL ANESTHETICS · MODERATE SEDATION SAFETY

§ 01 Advanced Flashcards

Twenty application-level cards aligned to the 2026 NCLEX-RN Test Plan: Pharmacological & Parenteral Therapies, Reduction of Risk Potential, Safety & Infection Prevention and Control, and Physiological Adaptation.

Lorazepam

SAFETY-ALERT

ATIVAN · BENZODIAZEPINE

MECHANISM	Enhances GABA at the GABA-A receptor → increases chloride influx → CNS depression (sedation, anxiolysis, anticonvulsant).
INDICATION	Status epilepticus (1st-line IV), alcohol withdrawal, severe anxiety, pre-procedural sedation, chemo-induced nausea.
PRE-ASSESSMENT	RR, SpO_2, BP, LOC, fall risk, opioid co-administration, hepatic function (preferred in liver disease — no active metabolites), pregnancy (Category D).
LABS/MONITOR	Continuous SpO_2 & capnography if IV push; LFTs if chronic; LOC q15 min after IV; reverse Trendelenburg if hypotensive.
WORST AE	Respiratory depression / apnea — especially with concurrent opioids. Propylene glycol toxicity at high continuous IV doses (metabolic acidosis, AKI).
SIDE EFFECTS	Sedation, ataxia, paradoxical agitation (esp. elderly & children), anterograde amnesia, hypotension.
HOLD/NOTIFY	RR <10, SpO_2 <90%, SBP <90, GCS drop. Avoid in narrow-angle glaucoma, severe respiratory failure.
ANTIDOTE	**Flumazenil** 0.2 mg IV — caution: can precipitate seizures in chronic users.
TEACHING	Do not mix with alcohol or opioids; no driving; taper to stop (withdrawal seizures); avoid in pregnancy/lactation.
NURSING	Schedule II at federal level varies — count as controlled. Bedside O_2 + bag-valve-mask + reversal agent within reach for IV push.
NGN CUE	Post-dose RR 8, SpO_2 86%, sternal rub only response — escalate now.

Q: A nurse gives lorazepam 2 mg IV push for status epilepticus. Fifteen minutes later the client has RR 7, SpO_2 84%. What is the priority action?

A. Document the response and reassess in 15 minutes.

B. Administer flumazenil 0.2 mg IV per standing order.

Diazepam

SAFETY-ALERT

VALIUM · BENZODIAZEPINE, LONG-ACTING

MECHANISM	GABA-A potentiation; long-acting active metabolite (desmethyldiazepam, t½ up to 100 h).
INDICATION	Alcohol withdrawal (front-loading), muscle spasm, status epilepticus (alternative to lorazepam), pre-op anxiolysis.
PRE-ASSESSMENT	Hepatic function (metabolites accumulate), age (avoid in elderly — Beers list), respiratory status, concurrent opioids.
LABS/MONITOR	CIWA score for alcohol withdrawal; LFTs; sedation scale (RASS/POSS).
WORST AE	Respiratory depression; oversedation in elderly d/t metabolite accumulation; phlebitis with IV push (give slowly, large vein).
SIDE EFFECTS	Drowsiness, weakness, ataxia, paradoxical excitation.
HOLD/NOTIFY	RASS less than −2 when not indicated, RR <12, hepatic encephalopathy worsening.
ANTIDOTE	Flumazenil (same cautions).
TEACHING	Do not crush ER tabs; long half-life — effects may persist next day.
NURSING	Do not mix with other IV meds in same line (precipitates). Use slow IV push 5 mg/min max.
NGN CUE	Elderly client on day 3 of diazepam taper now confused and falling — accumulation of active metabolite.

Q: Which client is the *best* candidate for lorazepam rather than diazepam for alcohol withdrawal?

A. A 32-year-old with no comorbidities.

B. A 67-year-old with cirrhosis and elevated bilirubin.

C. A 45-year-old with a history of seizure disorder.

D. A 28-year-old with anxiety and insomnia.

Answer: B. Lorazepam undergoes glucuronidation (not CYP oxidation) and has no active metabolites — safer in hepatic dysfunction. Diazepam metabolites accumulate and worsen encephalopathy. Mnemonic: *LOT* drugs are liver-friendly — **L**orazepam, **O**xazepam, **T**emazepam.

★ *Test tip: "Cirrhosis" + benzo question = pick a "LOT" drug.*

C. Open the airway, provide bag-valve-mask ventilation, call rapid response.

D. Place the client in Trendelenburg position.

Answer: C. Airway + ventilation always precede pharmacologic reversal (ABCs > antidote). Flumazenil is appropriate after ventilation is supported and is contraindicated if the client has a seizure disorder being treated — it can re-precipitate status epilepticus. A delays a respiratory emergency; D worsens aspiration risk.

★ *Test tip: With benzo respiratory depression, oxygenate before you antagonize. Flumazenil is almost never the first answer.*

Midazolam

HIGH-RISK

VERSED · SHORT-ACTING BENZO

MECHANISM	Rapid-onset, short-acting GABA-A agonist. Onset 1–3 min IV, duration ~30–60 min.
INDICATION	Procedural/moderate ("conscious") sedation, ICU sedation drip, refractory status epilepticus, pre-op anxiolysis.
PRE-ASSESSMENT	NPO status, airway (Mallampati), baseline VS & SpO_2, IV patency, reversal agent at bedside, ASA class, opioid co-admin.
LABS/MONITOR	Continuous SpO_2, capnography ($EtCO_2$), HR, BP q5 min, sedation scale (Ramsay or AAS). Hold for opioid synergy.
WORST AE	Apnea, hypotension, laryngospasm — especially with concurrent fentanyl/propofol.
SIDE EFFECTS	Hiccups, anterograde amnesia (often desired), hypotension, paradoxical reaction in peds.
HOLD/NOTIFY	$EtCO_2$ >50 or <30, SpO_2 <92% off baseline, MAP <65.
ANTIDOTE	Flumazenil.
TEACHING	You will not remember the procedure (amnesia is expected). Need responsible adult driver. No driving/legal documents x 24 h.
NURSING	Dedicated RN monitors only the patient (cannot circulate). Equipment: *SOAPME* — Suction, O_2, Airway, Pharmacy reversal, Monitors, Equipment.
NGN CUE	During colonoscopy: RR 6, $EtCO_2$ 58, SpO_2 88% — stop infusion, jaw thrust, BVM.

Q: Which finding indicates the moderate-sedation client has reached the correct sedation depth (not over-sedated)?

A. Unresponsive to physical stimulation.

B. Responds purposefully to verbal commands; spontaneous ventilation maintained.

C. Requires jaw thrust to maintain airway.

D. $EtCO_2$ 55 mmHg.

Answer: B. Moderate sedation = depressed consciousness with *preserved* protective reflexes &

Alprazolam

TEACHING-HEAVY

XANAX · SHORT HALF-LIFE BENZO

MECHANISM	GABA-A agonist; rapid onset, high abuse potential.
INDICATION	Panic disorder, generalized anxiety (short-term).
PRE-ASSESSMENT	History of substance use disorder, concurrent opioids, age, CYP3A4 interactions (azoles, macrolides ↑ levels).
LABS/MONITOR	Symptom diary, opioid co-prescribing review (FDA boxed warning).
WORST AE	Withdrawal seizures with abrupt discontinuation; respiratory depression with opioids.
SIDE EFFECTS	Sedation, dependence, rebound anxiety, falls.
HOLD/NOTIFY	Do not stop abruptly; taper over weeks.
ANTIDOTE	Flumazenil (rarely used outpatient).
TEACHING	Avoid grapefruit juice (↑ levels). Don't share. Lock up. Don't combine with alcohol or opioids. Plan for taper.
NGN CUE	Client stopped alprazolam abruptly 48 h ago, now tachycardic, tremulous, hallucinating — withdrawal.

Q: Which statement by the client requires *further teaching*?

A. "I'll avoid grapefruit juice while taking this medication."

B. "If I feel anxious again, I'll just stop taking it for a few days."

C. "I won't drink alcohol with this medication."

D. "I'll keep this locked away from my teenager."

Answer: B. Abrupt discontinuation of any benzodiazepine — particularly short-acting alprazolam — can precipitate withdrawal seizures, severe rebound anxiety, and autonomic instability. Must be tapered. A, C, D are correct teaching.

★ *Test tip: Short-acting benzo = worst withdrawal. Long-acting (diazepam) = milder taper.*

spontaneous ventilation & purposeful response to verbal/light tactile stimulation. A and C describe deep sedation/general anesthesia; D is respiratory depression.

★ *Test tip: "Conscious sedation" is a misnomer — call it moderate. Purposeful response = right level.*

Flumazenil

EMERGENCY / ANTIDOTE

ROMAZICON · BENZO ANTAGONIST

MECHANISM	Competitive antagonist at benzodiazepine binding site of GABA-A receptor.
INDICATION	Reversal of benzodiazepine-induced respiratory depression or oversedation.
PRE-ASSESSMENT	Chronic benzo use? Seizure disorder? Mixed-drug overdose (TCAs)? — all are relative/absolute contraindications.
LABS/MONITOR	Continuous SpO_2, telemetry, LOC q5–15 min × 1–2 h; flumazenil half-life (~1 h) is shorter than most benzos → re-sedation risk.
WORST AE	Seizures (chronic users / TCA co-ingestion), arrhythmias, re-sedation.
SIDE EFFECTS	Agitation, nausea, dizziness, withdrawal symptoms.
HOLD/NOTIFY	Do not give if seizures present, status epilepticus being treated with benzo, suspected TCA overdose.
ANTIDOTE TO IT	None — supportive (re-dose benzo if needed for seizures).
TEACHING	Patient remains at risk of re-sedation; monitor in ED minimum 2 h before discharge.
NURSING	Dose: 0.2 mg IV over 15 sec, repeat q1 min up to 1 mg total. Always support airway/breathing FIRST.
NGN CUE	Overdose patient on home alprazolam x 5 yrs — flumazenil could trigger withdrawal seizures.

Q: In which client is flumazenil *contraindicated*?

A. A post-op client with isolated midazolam over-sedation.

B. A client with mixed overdose of alprazolam and amitriptyline (TCA).

C. A child who accidentally ingested grandmother's lorazepam.

D. A client over-sedated from a single dose of IV lorazepam in the ED.

Answer: B. TCAs lower seizure threshold; benzos may be the only thing preventing seizures in mixed overdose — reversing them with flumazenil unmasks arrhythmias

Propofol

HIGH-RISK / ICU

DIPRIVAN · IV ANESTHETIC

MECHANISM	GABA-A potentiator; very rapid onset (40 sec) and offset; sedative-hypnotic at low dose, anesthetic at high dose.
INDICATION	Induction of general anesthesia, ICU sedation (intubated patients only), procedural sedation by anesthesia provider.
PRE-ASSESSMENT	Allergies — **egg, soy, peanut** (lipid emulsion). BP (hypotension risk), age, lipid baseline if >48 h infusion, secured airway.
LABS/MONITOR	Triglycerides, CK, lactate, ABG/anion gap, urine output, daily sedation interruption.
WORST AE	Hypotension; **Propofol Infusion Syndrome (PRIS)** — metabolic acidosis, rhabdomyolysis, hyperkalemia, cardiac failure, lipemia. Risk ↑ with >4 mg/kg/h × >48 h.
SIDE EFFECTS	Injection-site pain, green urine, hypertriglyceridemia, bradycardia, apnea.
HOLD/NOTIFY	Rising triglycerides, unexplained acidosis, dark/green urine, rising CK.
ANTIDOTE	None — supportive: stop infusion, fluid resuscitation, vasopressors.
TEACHING	Family: white "milk" appearance is normal; rapid wake-up is expected when stopped.
NURSING	Lipid emulsion — change tubing/bottle q12 h (infection risk). Strict aseptic technique. Use ONLY in intubated/airway-secured patient outside OR.
NGN CUE	ICU pt on propofol 70 mcg/kg/min × 60 h: pH 7.21, K 6.0, CK 12,000, dark urine — stop infusion immediately (PRIS).

Q: A nurse caring for an intubated client on propofol infusion notes pH 7.18, lactate 7, K^+ 5.9, and CK 9,800. Which action is priority?

A. Decrease the rate by 25% and notify the provider.

B. Stop the propofol infusion and notify the provider immediately.

C. Send a triglyceride level and continue current rate.

D. Switch to dexmedetomidine without notifying anyone.

and seizures. A, C, D are appropriate isolated benzo exposures.

★ *Test tip: Flumazenil "Three NOs" — NO chronic benzo users, NO TCA co-ingestion, NO seizure patients on benzos.*

Answer: B. Findings are classic for Propofol Infusion Syndrome — life-threatening; the only intervention that addresses cause is stopping the drug. Then notify provider, support hemodynamics, and choose alternative (dexmedetomidine or midazolam). A delays a fatal complication; C is incomplete; D bypasses provider authorization.

★ *Test tip: "High-dose propofol + acidosis + ↑K + ↑CK" = PRIS. Memorize this triad.*

Etomidate

RSI / EMERGENCY

AMIDATE · INDUCTION AGENT

MECHANISM	GABA-A enhancer; minimal cardiovascular effect (hemodynamic stability).
INDICATION	Rapid-sequence intubation (RSI) — especially in unstable patients (trauma, shock).
PRE-ASSESSMENT	Adrenal status (suppresses cortisol synthesis), sepsis, allergies, IV access.
LABS/MONITOR	Cortisol if repeated dosing; BP (less hypotension than propofol).
WORST AE	Adrenal suppression (single dose can suppress for 24 h) — controversial in septic shock.
SIDE EFFECTS	Myoclonus during induction, nausea/vomiting, pain on injection.
HOLD/NOTIFY	Avoid continuous infusion; caution in known adrenal insufficiency.
ANTIDOTE	None.
TEACHING	Patient/family education usually limited (used in emergency).
NURSING	Have paralytic ready immediately after (etomidate alone does not relax muscles for intubation).
NGN CUE	Septic shock RSI: after etomidate consider stress-dose hydrocortisone if hypotension persists.

Q: Etomidate is preferred over propofol for induction in which client?

A. A hypertensive client with elevated ICP.
B. A hypotensive trauma client with SBP 78.
C. A septic client with adrenal insufficiency.
D. A client with known severe asthma.

Answer: B. Etomidate causes the least hypotension of induction agents — ideal for hemodynamically unstable trauma. C is the one population to AVOID (further adrenal suppression). A is reasonable but propofol or etomidate both work. D — ketamine preferred (bronchodilation).

★ *Test tip: Unstable BP → etomidate. Bronchospasm → ketamine. Calm sleep → propofol.*

Ketamine

PROCEDURAL / RSI

KETALAR · DISSOCIATIVE ANESTHETIC

MECHANISM	NMDA receptor antagonist → dissociative anesthesia; preserves airway reflexes & respiratory drive; bronchodilator; sympathomimetic.
INDICATION	Pediatric procedural sedation, RSI in asthma/bronchospasm, refractory pain, treatment-resistant depression (IV/IN at lower dose).
PRE-ASSESSMENT	BP & HR (raises both), psychiatric history (emergence reactions), ICP (controversial; generally OK now), eye injury (raises IOP).
LABS/MONITOR	HR, BP, SpO_2; emergence phenomenon assessment.
WORST AE	Emergence reaction (hallucinations, vivid dreams) — pre-treat or co-administer benzodiazepine. Laryngospasm in peds.
SIDE EFFECTS	↑ secretions (may pretreat with glycopyrrolate), hypertension, tachycardia.
HOLD/NOTIFY	Severe HTN, unstable angina, psychosis history, untreated hyperthyroidism.
ANTIDOTE	None — supportive; benzo for emergence reaction.
TEACHING	You may feel "outside your body" briefly. Quiet, dim recovery environment helps.
NURSING	Maintain calm, low-stimulation environment in recovery. Suction available.
NGN CUE	Status asthmaticus failing BiPAP — ketamine RSI preferred over propofol.

Q: After a ketamine procedural sedation, the school-age child wakes up screaming about "seeing monsters." Best intervention?

A. Brightly light the room and stimulate the child to "wake up."
B. Dim the lights, minimize stimulation, and consider IV midazolam per order.
C. Administer flumazenil.
D. Place the child in restraints.

Answer: B. Emergence phenomena from ketamine resolve with low-stimulus environment and a

benzodiazepine. A worsens hallucinations; C is wrong drug class; D is non-therapeutic and unsafe.

★ *Test tip: Ketamine emergence = "K-hole" dreams. Quiet + benzo, not bright + stimulate.*

Dexmedetomidine

TEACHING / ICU

PRECEDEX · A2-AGONIST

MECHANISM	Central α2-adrenergic agonist → sedation + analgesia without respiratory depression (preserves drive).
INDICATION	ICU sedation (extubation weaning), procedural sedation in non-intubated, awake fiberoptic intubation, alcohol withdrawal adjunct.
PRE-ASSESSMENT	HR (bradycardia risk), BP (biphasic — initial HTN, then hypotension), heart blocks, hepatic function.
LABS/MONITOR	Continuous telemetry, BP, RASS, sedation level (easy arousal expected).
WORST AE	Bradycardia, hypotension, sinus arrest. Withdrawal rebound HTN with abrupt discontinuation.
SIDE EFFECTS	Dry mouth, nausea, hypotension.
HOLD/NOTIFY	HR <50, SBP <90 (or off baseline), 2nd/3rd degree block without pacer.
ANTIDOTE	None — atropine for bradycardia; fluids/vasopressors for hypotension.
TEACHING	Family: patient may seem "asleep" but will rouse to voice — that is the goal (cooperative sedation).
NURSING	Do not bolus (precipitates bradycardia/hypotension) — load slowly or skip load entirely.
NGN CUE	HR 38, SBP 82 during loading dose — pause infusion, notify, fluid bolus.

Q: Which finding during dexmedetomidine infusion is *expected* and does *not* require intervention?

A. HR 35, sinus pause noted on monitor.
B. RR 16, easily arousable to verbal stimulation.
C. BP 78/40.
D. Symptomatic dizziness on waking.

Answer: B. Dexmedetomidine produces "cooperative sedation" — preserved respiratory drive and easy arousability are therapeutic. A, C are dose-limiting toxicities; D needs intervention.

★ *Test tip: Precedex = "sleepy but cooperative." Bradycardia is the #1 watch.*

Succinylcholine

RSI / HIGH-RISK

ANECTINE · DEPOLARIZING PARALYTIC

MECHANISM	Depolarizing ACh receptor agonist → sustained depolarization → fasciculations then flaccid paralysis. Onset 30–60 sec; duration 5–10 min.
INDICATION	Rapid-sequence intubation; rapid airway control.
PRE-ASSESSMENT	K^+ level (hyperK risk), burns >24 h old, crush/spinal cord injury >24 h, neuromuscular disease, MH family history, pseudocholinesterase deficiency, glaucoma.
LABS/MONITOR	K^+, baseline temp, $ETCO_2$, train-of-four (TOF), CK if prolonged paralysis.
WORST AE	**Malignant Hyperthermia (MH)** — hypermetabolic crisis: ↑↑$ETCO_2$, masseter rigidity, hyperthermia, tachycardia, rhabdo, hyperK. Also: lethal hyperkalemia in at-risk patients (burns, crush, paralysis).
SIDE EFFECTS	Fasciculations, post-op muscle pain, ↑intraocular/intragastric pressure, bradycardia (esp. kids — pre-treat atropine).
HOLD/NOTIFY	K^+ >5.5, burn/spinal cord injury 24 h–6 months, family MH history.
ANTIDOTE	None — supportive; **dantrolene** for MH (2.5 mg/kg IV bolus, repeat).
TEACHING	Post-extubation muscle aches are normal x 24–48 h. Family screening for MH if event occurred.
NURSING	Confirm advanced airway equipment, suction, mechanical ventilator, dantrolene available. Patient cannot breathe — must ventilate.
NGN CUE	Intra-op: $ETCO_2$ rising 45→62→78, temp 39.8°C, masseter rigid — call MH crisis, dantrolene NOW.

Q: Which client should *not* receive succinylcholine?

A. Adult with sudden status epilepticus requiring intubation.
B. Trauma client 6 hours after sustaining a crush injury, K^+ 4.6.
C. Burn client 5 days post-injury with 40% TBSA burns, K^+ 4.9.

D. Otherwise healthy adult requiring elective intubation, K^+ 4.2.

Answer: C. Burns 24 h to ~6 months post-injury upregulate extrajunctional ACh receptors → massive K^+ release with succinylcholine → fatal hyperkalemia. Avoid. B is within 24 h (still OK by most guidelines, but rocuronium preferred). A, D are appropriate uses.

★ *Test tip: "Old burn / old crush / old SCI" + sux = cardiac arrest. Use rocuronium instead.*

Rocuronium

RSI

ZEMURON · NON-DEPOLARIZING PARALYTIC

MECHANISM	Competitive ACh receptor antagonist at NMJ. Onset 60–90 sec at RSI dose; duration 30–60 min.
INDICATION	RSI alternative to succinylcholine; intraoperative paralysis; ICU paralysis.
PRE-ASSESSMENT	Hepatic function (cleared by liver), train-of-four baseline, secured airway, depth of sedation (paralytic does NOT sedate — must give sedation first).
LABS/MONITOR	Train-of-four (goal 1–2 of 4 twitches), continuous $ETCO_2$, SpO_2, sedation depth (BIS or RASS).
WORST AE	Awareness/recall under paralysis without sedation (ethical disaster); prolonged paralysis in liver failure; anaphylaxis.
SIDE EFFECTS	Tachycardia, transient hypertension.
HOLD/NOTIFY	No sedation running, no secured airway, no train-of-four monitoring.
ANTIDOTE	**Sugammadex** (encapsulates rocuronium/vecuronium); OR neostigmine + glycopyrrolate.
TEACHING	Family: paralytics do not provide sedation or pain relief — sedation is given continuously alongside.
NURSING	Never administer paralytic without sedation. Eye lubrication and protection (no blinking). Confirm ventilator settings.
NGN CUE	Paralyzed ICU pt with elevated HR/BP but RASS −5 — likely *under-sedated*, not pain-free; deepen sedation.

Q: A nurse is preparing to administer rocuronium to an intubated client. Before pushing, the priority safety check is:

A. Confirming the train-of-four baseline is recorded.
B. Confirming continuous sedation and analgesia are infusing.
C. Verifying the ventilator alarms are set.
D. Verifying eye lubrication is applied.

Answer: B. The most catastrophic preventable error is paralysis without sedation (awake paralysis). This is the safety check that supersedes all others. The other actions

Vecuronium

HIGH-ALERT / LOOK-ALIKE

NORCURON · NON-DEPOLARIZING PARALYTIC

MECHANISM	Same as rocuronium (non-depolarizing). Intermediate-acting.
INDICATION	Intraoperative paralysis; ICU paralysis (especially renal failure — hepatic clearance).
PRE-ASSESSMENT	Same as rocuronium. **Look-alike/sound-alike** with versed/midazolam — pharmacy double-check.
LABS/MONITOR	Train-of-four, sedation depth, hepatic function.
WORST AE	Awake paralysis if mistaken for sedative (real fatality cases). Prolonged neuromuscular blockade.
SIDE EFFECTS	Few histamine effects; minimal cardiovascular.
HOLD/NOTIFY	Same as rocuronium.
ANTIDOTE	Sugammadex or neostigmine + glycopyrrolate.
TEACHING	Same as rocuronium.
NURSING	**Pyxis override of paralytic is a sentinel-event setup.** Two-RN verification; barcode scan; never store in unsecured areas.
NGN CUE	Order for "Versed" pulled but vial reads "vecuronium" — STOP, do not administer, report near-miss.

Q: Which system-level practice *most* reduces the risk of confusing vecuronium with versed (midazolam)?

A. Storing paralytics in the same drawer as sedatives for convenience.
B. Removing paralytics from override capability in automated dispensing cabinets.
C. Posting a sign on the medication room door.
D. Using verbal-only orders for emergency intubations.

Answer: B. ISMP and Joint Commission specifically recommend removing neuromuscular blocking agents from override (no pharmacy review). Sentinel-event analyses of fatal vecuronium-for-Versed errors found override capability and adjacent storage as root causes.

★ *Test tip: Paralytics = high-alert. System safeguards (barcode, no override, segregated storage) outrank individual vigilance.*

are also done but B prevents psychological trauma and "awareness" — a sentinel event.

★ *Test tip: Never paralyze a patient who can feel. Sedation first, always.*

Sugammadex

REVERSAL

BRIDION · SELECTIVE RELAXANT BINDING AGENT

MECHANISM	Encapsulates rocuronium & vecuronium molecules in plasma → restores neuromuscular function within 2–3 minutes.
INDICATION	Reversal of rocuronium/vecuronium paralysis (NOT succinylcholine, NOT cisatracurium).
PRE-ASSESSMENT	Renal function (caution if CrCl <30), pregnancy (binds hormonal contraceptives — back-up x 7 days), allergy.
LABS/MONITOR	Train-of-four (confirm reversal ≥0.9 ratio), HR, BP.
WORST AE	Anaphylaxis, bradycardia/cardiac arrest (rare), oral contraceptive failure.
SIDE EFFECTS	Nausea, hypotension.
HOLD/NOTIFY	Severe renal impairment, prior allergic reaction.
ANTIDOTE	None — supportive.
TEACHING	Women on hormonal contraception need *back-up non-hormonal method × 7 days*.
NURSING	Verify which paralytic was used — sugammadex won't reverse succinylcholine or cisatracurium.
NGN CUE	Patient extubated after sugammadex, then 30 min later weak with shallow respirations — possible re-paralysis or wrong-drug.

Q: A 22-year-old client received rocuronium intra-op and is now receiving sugammadex for reversal. Which teaching is essential?

A. "Avoid leafy green vegetables for the next week."
B. "Use a back-up non-hormonal contraceptive method for 7 days."
C. "You may notice green urine for 24 hours."
D. "Take iron supplements with this medication."

Answer: B. Sugammadex binds progesterone in hormonal contraceptives — equivalent to missing 7 days of oral contraceptives. Patients must use non-hormonal backup for 7 days. A is warfarin; C is propofol; D is irrelevant.

★ *Test tip: Reproductive-age woman + sugammadex = contraception teaching.*

Neostigmine + Glycopyrrolate

PERIOPERATIVE

PARALYTIC REVERSAL COMBO

MECHANISM	Neostigmine = cholinesterase inhibitor → more ACh competes off paralytic. Glycopyrrolate = antimuscarinic to block neostigmine's parasympathetic side effects (bradycardia, secretions).
INDICATION	Reversal of non-depolarizing paralytics (rocuronium, vecuronium, cisatracurium) when sugammadex unavailable.
PRE-ASSESSMENT	Train-of-four (must have 1–2 twitches present — won't reverse deep block), bradycardia, asthma (cholinergic stimulation), bowel obstruction.
LABS/MONITOR	HR (watch for bradycardia from neostigmine), TOF ratio.
WORST AE	Cholinergic crisis if given alone (bradycardia, bronchospasm, secretions, vomiting) — that's why glycopyrrolate is co-given.
SIDE EFFECTS	Salivation, nausea, miosis, bradycardia (neostigmine); dry mouth, tachycardia (glycopyrrolate).
HOLD/NOTIFY	Deep paralysis (no TOF twitches), bowel/bladder obstruction, severe asthma.
ANTIDOTE	Atropine for severe bradycardia.
TEACHING	Family: "We are now reversing the paralysis — breathing should return shortly."
NURSING	Always give together (not neostigmine alone). Monitor for re-paralysis if duration of paralytic outlasts reversal.
NGN CUE	Post-reversal HR 38, SpO_2 94, copious secretions — under-dosed glycopyrrolate.

Q: Why is glycopyrrolate given with neostigmine?

A. To enhance the paralytic-reversal effect.
B. To prevent bradycardia, secretions, and bronchospasm caused by neostigmine.
C. To prolong the duration of neuromuscular blockade.
D. To reverse opioid-induced respiratory depression.

Answer: B. Neostigmine raises ACh everywhere — including muscarinic receptors causing bradycardia/secretions. Glycopyrrolate (antimuscarinic) blocks those nicotinic-sparing effects but does NOT cross BBB, so no central anticholinergic delirium.

★ *Test tip: "Neo + Glyco = pair." Stigmine without antimuscarinic = cholinergic crisis.*

Lidocaine

HIGH-ALERT

XYLOCAINE · AMIDE LOCAL ANESTHETIC

MECHANISM	Blocks Na^+ channels in nerves → blocks impulse conduction → local anesthesia. Also a Class IB antiarrhythmic IV.
INDICATION	Local infiltration, regional/epidural anesthesia, topical (mucosa), IV for ventricular arrhythmias.
PRE-ASSESSMENT	Allergy (amide vs ester), **weight-based max dose** (4.5 mg/kg plain, 7 mg/kg with epi), liver function, site of injection (NO epinephrine near end-arteries: fingers, toes, nose, ears, penis).
LABS/MONITOR	Levels if continuous IV (therapeutic 1.5–5 mcg/mL); LFTs; ECG if IV.
WORST AE	**LAST — Local Anesthetic Systemic Toxicity:** tinnitus → metallic taste → perioral numbness → tremor → seizures → coma → arrhythmias → cardiac arrest. Treat with **20% lipid emulsion (Intralipid)**.
SIDE EFFECTS	Dizziness, transient burning at site, methemoglobinemia (rare with high topical doses).
HOLD/NOTIFY	Heart block (IV), confirmed amide allergy, exceeding max dose, severe hepatic failure.
ANTIDOTE	20% lipid emulsion 1.5 mL/kg bolus, then 0.25 mL/kg/min infusion for LAST.
TEACHING	Numb area is at injury risk (heat, bite tongue). Sensation returns 1–4 h.
NURSING	Aspirate before injection (avoid intravascular). Label epinephrine-containing vs plain. Lipid emulsion stocked where lidocaine is used.
NGN CUE	During digital nerve block, pt reports ringing in ears, metallic taste — STOP injection, monitor, prepare lipid emulsion.

Q: A nurse assists with a wound repair using lidocaine. The client suddenly reports tinnitus and metallic taste, then begins twitching. Priority action?

A. Reassure the client these are normal sensations.

B. Stop the injection, call for help, administer 20% lipid emulsion per protocol, and prepare for seizure precautions and ACLS.

Bupivacaine

CARDIOTOXIC-ALERT

MARCAINE · LONG-ACTING AMIDE

MECHANISM	Long-acting Na^+ channel blocker; epidural/spinal/regional.
INDICATION	Epidural for labor/post-op, spinal anesthesia, peripheral nerve block, post-op infiltration.
PRE-ASSESSMENT	Allergy, max dose 2 mg/kg (175 mg max), pregnancy (avoid 0.75% for obstetric epidural — cardiotoxic), bleeding/coag for neuraxial blocks.
LABS/MONITOR	ECG, BP, sensory/motor level (epidural).
WORST AE	Cardiac arrest if intravascular — bupivacaine has *especially difficult-to-treat* cardiotoxicity (lipid emulsion is essential).
SIDE EFFECTS	Hypotension (sympathetic block), urinary retention, motor block, headache (spinal).
HOLD/NOTIFY	Recent anticoagulant + spinal/epidural (hematoma risk), hemodynamic instability.
ANTIDOTE	20% lipid emulsion (Intralipid).
TEACHING	Numbness/weakness may persist 4–8 h; do not stand alone until motor function returns.
NURSING	Check sensory level q hour for epidural; fall precautions until full motor return.
NGN CUE	Labor epidural placed → sudden hypotension, bradycardia, dyspnea — high spinal; bolus fluids, vasopressor, position lateral.

Q: A laboring client receives a bupivacaine epidural. Within 5 minutes BP drops to 82/48 and the fetal heart rate decelerates. Best intervention?

A. Position the client supine and call provider.

B. Place in left lateral, give IV fluid bolus, prepare ephedrine or phenylephrine per order, increase O_2.

C. Stop maternal IV fluids.

D. Begin chest compressions.

Answer: B. Epidural-induced sympathectomy → maternal hypotension → uteroplacental insufficiency → fetal distress. Left lateral relieves aortocaval compression, fluids restore preload, vasopressors restore tone, O_2 helps fetal oxygenation. A worsens compression; C, D are wrong.

C. Apply ice to the injection site.

D. Administer naloxone IV.

Answer: B. Tinnitus + metallic taste + twitching = early Local Anesthetic Systemic Toxicity (LAST). Intralipid binds free lidocaine, restoring cardiac function. Untreated → seizures, refractory cardiac arrest. A normalizes a sentinel event; C, D are wrong mechanism.

★ *Test tip: "Ringing & tasting metal" after local anesthetic = LAST. Drug: Intralipid 20%.*

★ *Test tip: "Epidural + hypotension + late decel" = aortocaval compression; turn the mother off her back.*

Ropivacaine

OBSTETRIC / REGIONAL

NAROPIN · LONG-ACTING AMIDE

MECHANISM	Long-acting Na^+ channel blocker; less cardiotoxic than bupivacaine; preferential sensory > motor block.
INDICATION	Labor epidural (preferred — preserves motor for pushing), regional blocks, post-op continuous wound infusion.
PRE-ASSESSMENT	Same as bupivacaine; cardiac history (still cardiotoxic at high dose).
LABS/MONITOR	BP, sensory/motor level, FHR if epidural.
WORST AE	LAST (less cardiac risk than bupivacaine but real).
SIDE EFFECTS	Hypotension, urinary retention.
HOLD/NOTIFY	Same as bupivacaine.
ANTIDOTE	Lipid emulsion.
TEACHING	"Walking epidural" — sensory block with preserved motor.
NURSING	Still confirm sensory level & assess motor before ambulation.
NGN CUE	Walking epidural pt requests to ambulate — assess motor (Bromage), orthostatic vitals, supervised walk only.

Q: Why is ropivacaine often preferred over bupivacaine for labor epidurals?

A. Faster onset.

B. Preferentially blocks sensory fibers while preserving motor for pushing; less cardiotoxic.

C. Doesn't cross the placenta.

D. It is an ester, not an amide.

Answer: B. Sensory-selective block + lower cardiotoxicity than bupivacaine = ideal obstetric profile. A is false (similar onset); C is false (all amides cross); D is false (ropivacaine is an amide).

★ *Test tip: "Walking epidural" → ropivacaine.*

Fentanyl

HIGH-RISK / SYNERGY

SUBLIMAZE · SYNTHETIC OPIOID (PROCEDURAL)

MECHANISM	μ-opioid agonist; 100× potency of morphine; rapid onset (1–2 min IV), short duration (30–60 min).
INDICATION	Procedural sedation analgesia (with midazolam), intraoperative analgesia, ICU sedation, severe acute pain.
PRE-ASSESSMENT	RR, SpO_2, baseline pain, opioid tolerance, concurrent benzo (synergistic resp. depression), MAO inhibitor in last 14 days.
LABS/MONITOR	Continuous SpO_2, capnography, RR, sedation score q5 min.
WORST AE	Respiratory depression, chest-wall rigidity ("fentanyl chest" — rapid IV bolus → cannot ventilate), bradycardia.
SIDE EFFECTS	Nausea, pruritus (esp. epidural), urinary retention, constipation.
HOLD/NOTIFY	RR <10, SpO_2 <92%, decreased LOC, chest-wall rigidity.
ANTIDOTE	Naloxone 0.04–0.4 mg IV titrated.
TEACHING	Sedation expected; do not drive 24 h; bowel regimen; lock up patch; no heat to patches (fatal overdose).
NURSING	Slow IV push over 1–2 min to prevent chest-wall rigidity; dispose of patches (still 50% drug); avoid CYP3A4 inhibitors.
NGN CUE	Mid-procedure: pt cannot ventilate, chest stiff, SpO_2 falling — chest-wall rigidity; naloxone, succinylcholine, BVM.

Q: During fentanyl + midazolam procedural sedation, the pulse oximeter reads 86%, $EtCO_2$ 56 mmHg, RR 6. Best first action?

A. Administer flumazenil and naloxone simultaneously.

B. Increase O_2, perform jaw thrust, stimulate, prepare bag-valve-mask.

C. Continue the procedure to avoid delay.

D. Place head of bed flat.

Answer: B. Airway/breathing always come first. Open the airway, deliver O_2, BVM if needed. If hypoventilation persists, then administer reversal (naloxone first for opioid; flumazenil only if not contraindicated).

★ *Test tip: ABCs before antidotes — always.*

Dantrolene

MH ANTIDOTE

DANTRIUM · SKELETAL MUSCLE RELAXANT

MECHANISM	Blocks Ca^{2+} release from sarcoplasmic reticulum (ryanodine receptor) → uncouples excitation-contraction → halts MH hypermetabolic crisis.
INDICATION	**Malignant Hyperthermia** (volatile anesthetics / succinylcholine trigger), Neuroleptic Malignant Syndrome, severe spasticity (oral form).
PRE-ASSESSMENT	Trigger anesthetic? Family Hx of MH? Genetic RYR1?
LABS/MONITOR	Core temp, $ETCO_2$, K^+, CK, urine myoglobin, ABG, coags.
WORST AE	Hepatotoxicity (chronic oral use); muscle weakness; phlebitis.
SIDE EFFECTS	Weakness, dizziness, drowsiness (oral).
HOLD/NOTIFY	Active liver disease (chronic use); confirm correct preparation.
ANTIDOTE TO IT	None.
TEACHING	Family MH counseling — first-degree relatives screened; MedicAlert bracelet.
NURSING	Dose 2.5 mg/kg IV bolus, repeat q5–10 min up to 10 mg/kg. **Use Ryanodex (newer)** — reconstitutes faster (1 vial vs ~36 vials of older dantrolene). Stop anesthetic, hyperventilate 100% O_2, cool aggressively.
NGN CUE	Intra-op $ETCO_2$ 75, temp 40°C, rigid jaw — MH; declare crisis, dantrolene 2.5 mg/kg STAT, cool, hyperventilate.

Q: An MH cart in the OR contains dantrolene. Which preparation requires *fewest* vials and reconstitution time for an MH crisis?

A. Dantrolene 20 mg/vial (older formulation).
B. Ryanodex 250 mg/vial (newer formulation).
C. Oral dantrolene 25 mg capsules.
D. IV propofol infusion.

Answer: B. Ryanodex 250 mg reconstitutes in ~20 seconds vs older dantrolene 20 mg requiring ~36 vials and several minutes — life-saving time difference. C is too slow; D treats nothing of MH.

★ *Test tip: MH = dantrolene + cool + hyperventilate + stop trigger. Speed of dantrolene reconstitution determines survival.*

Naloxone

REVERSAL / EMERGENCY

NARCAN · OPIOID ANTAGONIST (SEDATION CONTEXT)

MECHANISM	Pure μ-opioid receptor antagonist; reverses opioid-induced respiratory depression in 1–2 min.
INDICATION	Opioid overdose/over-sedation in procedural settings; PACU/ICU rescue.
PRE-ASSESSMENT	Confirm opioid (not pure benzo) cause; consider chronic opioid use (precipitated withdrawal).
LABS/MONITOR	RR, SpO_2, LOC q2–5 min. **Naloxone $t_{1/2}$ ≈ 30–90 min — shorter than most opioids → re-sedation likely.**
WORST AE	Acute withdrawal in chronic users (tachycardia, HTN, vomiting, agitation, pulmonary edema), arrhythmia.
SIDE EFFECTS	Pain return, anxiety, nausea/vomiting.
HOLD/NOTIFY	Maintain monitoring 2–4 h after dose (especially long-acting opioids like methadone, fentanyl patches).
ANTIDOTE TO IT	None.
TEACHING	Family/community: keep naloxone available; call 911 even after dose given; positioning, rescue breathing.
NURSING	Titrate slowly (0.04 mg increments) in chronic opioid users to preserve analgesia; full dose 0.4 mg only if airway compromise.
NGN CUE	30 min after naloxone given for PACU oversedation, patient's RR drops again — re-dose; consider continuous infusion.

Q: A nurse gives naloxone to a chronic-pain client over-sedated from PCA fentanyl. Twenty minutes later, RR is back down to 6. Best action?

A. The naloxone has worn off; redose and prepare for continuous naloxone infusion per order.
B. Resume the PCA without changes.
C. Give flumazenil.
D. Increase the PCA basal rate.

Answer: A. Naloxone's half-life (30–90 min) is shorter than fentanyl/morphine/methadone, so re-sedation is expected — repeat dose and start infusion if needed. B is dangerous; C wrong drug class; D worsens overdose.

★ *Test tip: "Naloxone wears off, opioids don't" — re-dose or run a drip.*

§ 02 Five "Must-Not-Miss" Safety Rules

High-frequency NCLEX safety principles for sedation, anesthesia, and the perioperative phase.

1

Sedation without an airway plan is malpractice.

For every moderate sedation case, verify SOAPME at bedside: **S**uction, **O**$_2$, **A**irway adjuncts, **P**harmacy reversal (naloxone + flumazenil), **M**onitor (SpO_2 + $EtCO_2$ + telemetry), **E**quipment (BVM, intubation tray). The RN administering sedation does not also circulate.

2

Never paralyze a patient who can feel.

Neuromuscular blockers (rocuronium, vecuronium, succinylcholine) cause paralysis only — **no sedation, no analgesia**. Continuous sedation and analgesia must be running before and during paralysis. Failure here is a sentinel event.

3

ABCs always beat antidotes.

In respiratory depression from benzos or opioids, the first interventions are airway opening + 100% O_2 + BVM. Flumazenil and naloxone come after the airway is secured. Pure-reversal-first answers are usually wrong on NCLEX.

4

Lipid emulsion lives where local anesthetics live.

20% Intralipid 1.5 mL/kg bolus is the antidote for Local Anesthetic Systemic Toxicity (LAST). Stock it wherever bupivacaine, ropivacaine, or high-volume lidocaine is used. First signs: tinnitus, metallic taste, perioral numbness, twitching.

5

Recognize Malignant Hyperthermia in seconds, not minutes.

Triggers: volatile anesthetics + succinylcholine. Early sign = **rising $EtCO_2$ unresponsive to ventilation**, masseter rigidity. Treat: stop trigger → 100% O_2 hyperventilation → dantrolene 2.5 mg/kg → active cooling → treat hyperK + acidosis + rhabdo. Call MHAUS hotline.

§ 03 Five Calculation & Dosage-Safety Questions

Weight-based, infusion rate, and concentration safety calculations relevant to sedation/anesthesia practice.

CALC 1 — DANTROLENE LOADING DOSE

An 82-kg adult develops MH in the OR. The provider orders dantrolene 2.5 mg/kg IV bolus. The drug is available as Ryanodex 250 mg/vial reconstituted to 50 mg/mL. How many mg and mL will you draw up?

▼ SHOW WORK

```
Step 1: 2.5 mg/kg × 82 kg = 205 mg
Step 2: 205 mg ÷ 50 mg/mL = 4.1 mL
Answer: 205 mg = 4.1 mL
Notes: Ryanodex is one-vial reconstitution (vs ~36 vials of old dantrolene 20 mg vials). Repeat q5–10 min up to cumulative 10 mg/kg.
```

CALC 2 — PROPOFOL INFUSION RATE

A 70-kg ICU patient is ordered propofol 30 mcg/kg/min. The bag is 10 mg/mL. What is the infusion rate in mL/hr? At what rate should you become concerned about Propofol Infusion Syndrome (PRIS)?

▼ SHOW WORK

```
Step 1: 30 mcg/kg/min × 70 kg = 2,100 mcg/min = 2.1 mg/min
Step 2: 2.1 mg/min × 60 min = 126 mg/hr
Step 3: 126 mg/hr ÷ 10 mg/mL = 12.6 mL/hr
PRIS risk: >4 mg/kg/hr × >48 h. For this pt that = 280 mg/hr ≈ 28 mL/hr sustained — monitor lactate, pH, CK, triglycerides daily.
```

CALC 3 — LIDOCAINE MAXIMUM DOSE

A 60-kg adult needs local infiltration with lidocaine 1% plain (no epinephrine). Maximum safe dose = 4.5 mg/kg. What is the max in mg and in mL?

▼ SHOW WORK

```
Step 1: 4.5 mg/kg × 60 kg = 270 mg
Step 2: 1% lidocaine = 10 mg/mL
Step 3: 270 mg ÷ 10 mg/mL = 27 mL maximum
With epinephrine, max is 7 mg/kg = 420 mg = 42 mL — but NEVER use epi on end-arteries (fingers, toes, nose, ears, penis).
```

CALC 4 — PEDIATRIC MIDAZOLAM (PROCEDURAL SEDATION)

An 18-kg child needs midazolam 0.1 mg/kg IV for sedation. Vial is 1 mg/mL. How many mg and mL? What is the maximum single dose?

▼ SHOW WORK

```
Step 1: 0.1 mg/kg × 18 kg = 1.8 mg
Step 2: 1.8 mg ÷ 1 mg/mL = 1.8 mL
Max single dose IV in peds: typically 0.05–0.1 mg/kg up to 2 mg per dose (institutional protocol).
Pearl: Watch for paradoxical agitation in children — flumazenil ready.
```

CALC 5 — NALOXONE TITRATION IN CHRONIC OPIOID USER

A chronic-pain patient on long-acting opioids has RR 6 after PCA fentanyl. The provider orders naloxone 0.04 mg IV q2 min titrated. Naloxone is 0.4 mg/mL. How many mL per dose? Why titrate slowly?

▼ SHOW WORK

```
Step 1: 0.04 mg ÷ 0.4 mg/mL = 0.1 mL per dose
Dilute to 10 mL with NS for accurate 0.04 mg increments.
Rationale: Full 0.4–2 mg dose in chronic opioid user → acute withdrawal (severe pain, agitation, pulmonary edema, HTN, tachycardia, arrhythmia).
Goal: restore RR ≥10, not full reversal.
```

§ 04 Five NGN-Style Items

Mixed formats: Matrix, Bow-tie, SATA, Ordered Response, Cloze/Drop-down — all clinical-judgment-anchored.

ITEM 1 · MATRIX A 58-year-old in the PACU received midazolam, fentanyl, and rocuronium intraoperatively. The patient was reversed with sugammadex. VS now: BP 92/58, HR 64, RR 8, SpO_2 89% on 4 L NC, RASS −3. Indicate whether each action is *Indicated*, *Non-essential*, or *Contraindicated*.

ACTION	INDICATED	NON-ESSENTIAL	CONTRAINDICATED
Open airway, increase O_2 to 100% non-rebreather, stimulate, prepare BVM	✅		
Administer flumazenil 0.2 mg IV		✅ (only if no improvement and not in chronic benzo user)	
Administer naloxone 0.04 mg IV titrated	✅		
Re-paralyze with additional rocuronium			✅
Reposition supine flat with no head support			✅
Recheck train-of-four and assess for residual neuromuscular blockade	✅		

Rationale: PACU triple-drug oversedation — airway/oxygenation first; titrated naloxone for opioid; flumazenil only if no improvement; check for residual paralysis (sugammadex is fast but rare incomplete reversal); never re-paralyze in respiratory depression; do not flatten the airway.

ITEM 2 · BOW-TIE A 24-year-old undergoes general anesthesia with sevoflurane and succinylcholine. Twenty minutes in, $EtCO_2$ has risen 38 → 70, temp 39.6 °C, masseter is rigid, K^+ 6.4. Drag the priority condition, the 2 priority actions, and the 2 monitoring parameters.

TAKE ACTIONS

1. Stop trigger agents (sevoflurane, succinylcholine) and hyperventilate with 100% O_2 on clean circuit
2. Administer dantrolene 2.5 mg/kg IV (Ryanodex) and treat hyperkalemia (calcium gluconate, insulin/D_{50}, bicarbonate)

Malignant Hyperthermia Crisis

MONITOR FOR

1. Core temperature, $EtCO_2$, ABG (acidosis), K^+, CK, urine myoglobin
2. Hemodynamic stability, urine output (rhabdomyolysis → AKI), coagulation (DIC risk)

Rationale: Rising $EtCO_2$ + rigidity + hyperthermia + hyperK with volatile anesthetic + sux is the classic MH triad. Dantrolene + cessation of trigger + cooling + hyperK treatment is life-saving. Call MHAUS hotline 1-800-MH-HYPER.

ITEM 3 · SATA Which actions are appropriate before administering vecuronium to an intubated ICU client? Select all that apply.

- ☑ Confirm continuous sedation (e.g., propofol or midazolam) is infusing.
- ☑ Confirm continuous analgesia (e.g., fentanyl) is infusing.
- ☑ Confirm advanced airway is secured and ventilator settings are correct.
- ☑ Establish baseline train-of-four (TOF) and connect peripheral nerve stimulator.
- ☑ Apply eye lubricant and tape eyelids closed.
- ☐ Administer vecuronium as IV push without barcode scan to save time. *(Wrong — paralytics require two-RN verify + barcode + segregated storage.)*
- ☐ Withhold sedation since vecuronium relaxes the patient. *(Wrong — paralytics provide NO sedation or analgesia. Awake paralysis = sentinel event.)*

Rationale: Five correct actions — sedation, analgesia, secured airway, TOF, eye protection — all prevent the catastrophic outcomes of awake paralysis and corneal abrasion.

ITEM 4 · ORDERED RESPONSE Order the following actions for a moderate-sedation client (midazolam + fentanyl) whose RR drops to 6, SpO_2 84%, with sternal rub only response.

1. Stop further sedative/opioid administration.
2. Open airway (chin lift/jaw thrust), apply 100% O_2 via non-rebreather.
3. Call for help / activate rapid response.
4. Provide bag-valve-mask ventilation if no spontaneous improvement.
5. Administer naloxone 0.04 mg IV titrated for opioid effect.
6. Consider flumazenil 0.2 mg IV after airway is stabilized and benzo effect remains.
7. Reassess RR, SpO_2, LOC; monitor for re-sedation; document.

Rationale: ABCs before antidotes. Stop the cause first, then oxygenate & ventilate, then reverse. Naloxone usually precedes flumazenil because opioids drive most synergistic sedation events; flumazenil carries seizure risk.

ITEM 5 · CLOZE (DROP-DOWN) Complete the case sentence.

> A laboring client receives a bupivacaine epidural. Within minutes she reports tinnitus and a metallic taste, then has a brief tonic-clonic seizure. The nurse anticipates the priority pharmacologic intervention will be **[20% lipid emulsion (Intralipid) 1.5 mL/kg bolus then 0.25 mL/kg/min infusion]**, because the toxicity is from **[Local Anesthetic Systemic Toxicity / LAST]** affecting the **[CNS first, then cardiovascular system]**. The maternal position should be **[left lateral with left uterine displacement]** to optimize fetal perfusion.

Rationale: LAST → Intralipid binds the lipophilic anesthetic. Bupivacaine has notoriously refractory cardiotoxicity. Left uterine displacement prevents aortocaval compression and supports fetal perfusion during the maternal emergency.

§ 05 NCJMM Mini Case Study

A six-step NCJMM walk-through applying recognize → analyze → prioritize → solutions → action → evaluate.

> ***Scene:*** *47-year-old female, 88 kg, day-surgery laparoscopic cholecystectomy. General anesthesia with sevoflurane + rocuronium + fentanyl + midazolam. PACU arrival 30 min ago. Sugammadex 200 mg IV given pre-extubation. Current: BP 88/52, HR 118, RR 7, SpO_2 87% on 6 L NC, temp 38.1 °C. RASS −3. Patient mumbles, doesn't follow commands. Urine 30 mL pink-tinged in 2 hours. K^+ 5.8, lactate 4.2, CK 4,200.*

1. RECOGNIZE CUES

- Hypoventilation (RR 7, SpO_2 87%) → respiratory failure risk
- Hypotension (88/52) + tachycardia (118) → shock
- Low-grade fever (38.1) trending up
- Decreased LOC (RASS −3, won't follow commands)
- Hyperkalemia (5.8), lactic acidosis (lactate 4.2), elevated CK (4,200), pink-tinged urine (myoglobinuria)
- Drug history: volatile anesthetic + paralytic — known MH triggers; opioid + benzo synergy

---

2. ANALYZE CUES

Two competing crises are layered:

(a) Residual sedation/respiratory depression from synergistic fentanyl + midazolam (and possible re-paralysis if rocuronium > sugammadex effect).

(b) Malignant Hyperthermia spectrum / rhabdomyolysis: fever, ↑K, ↑CK, ↑lactate, dark urine after volatile-anesthetic + paralytic exposure — late presentation possible.

Cardiogenic causes less likely given otherwise healthy patient. Sepsis improbable in 30 min.

---

3. PRIORITIZE HYPOTHESES

Highest-risk-most-treatable first:

1. Respiratory depression with synergistic over-sedation (airway/breathing is most-time-sensitive).
2. Possible late-onset MH / rhabdomyolysis (hyperK + CK + acidosis + temp).
3. Residual neuromuscular blockade (less likely after sugammadex, but possible).

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4. GENERATE SOLUTIONS

- Airway: jaw thrust, 100% O_2 via non-rebreather, BVM if no improvement.
- Reversal: naloxone 0.04 mg IV titrated for opioid; flumazenil only after airway stable.
- TOF check for residual paralysis — repeat sugammadex if <0.9 ratio.
- Suspected MH → call rapid response/anesthesia, dantrolene 2.5 mg/kg IV (≈ 220 mg) ready, active cooling.
- Treat hyperK: calcium gluconate (cardiac protection), insulin + D_{50}, bicarbonate; serial K^+.
- Aggressive IV fluids to flush myoglobin; foley with strict I&O.
- Continuous $EtCO_2$, telemetry, core temp, ABG.

---

5. TAKE ACTION

1) Call rapid response & anesthesia.
2) Open airway, NRB at 100%, BVM as needed.
3) Naloxone 0.04 mg IV q2 min titrated to RR ≥10.
4) TOF check; sugammadex re-dose if indicated.
5) Push calcium gluconate 1 g IV for K^+ 5.8 with ECG changes; insulin 10 units IV + D_{50} 25 g; bicarb if pH <7.20.
6) Have dantrolene at bedside; if temp climbs and $EtCO_2$ continues, give 2.5 mg/kg IV and cool.
7) LR bolus 30 mL/kg, target urine output >1 mL/kg/hr.
8) Notify charge nurse, document in real time, prepare for ICU transfer.

---

6. EVALUATE OUTCOMES

Expected within 10–30 minutes:

- RR ≥12, SpO_2 ≥94%, RASS −1 to 0.
- HR <110, SBP ≥100, MAP >65 after fluids.
- Temp trending down, $EtCO_2$ normalizing.
- K^+ trending toward 4.0; urine output ≥1 mL/kg/hr; clearing color.
- Lactate halving in 2 h; CK monitored q6 h.

Escalate to ICU; arrange MH genetic counseling and MedicAlert if MH confirmed.

§ 06 Red Flags — Stop, Hold, Call, Reverse

Findings that should trigger immediate action when sedation/anesthesia drugs are involved.

$ETCO_2$ RISING UNSTOPPABLY

+5–10 mmHg per minute despite ventilator changes → Malignant Hyperthermia. Stop trigger, dantrolene, cool. Call MHAUS.

TINNITUS + METALLIC TASTE

Earliest sign of Local Anesthetic Systemic Toxicity (LAST). Stop injection. Prepare 20% lipid emulsion + ACLS.

AWAKE BUT PARALYZED

Tachycardia/hypertension/tears in a paralyzed patient = under-sedation. Deepen sedation, do not increase paralytic.

RR <10 + SPO_2 <90% AFTER PROCEDURAL SEDATION

ABCs first: jaw thrust, 100% O_2, BVM, then naloxone/flumazenil per cause. Activate rapid response.

VECURONIUM & VERSED MIX-UP

Look-alike vial pulled from override → STOP, double-check barcode, file safety event. Sentinel event if administered.

PROPOFOL + ACIDOSIS + ↑K + ↑CK

Propofol Infusion Syndrome — stop drug immediately, escalate, support hemodynamics, transition to alternative sedative.

CHEST-WALL RIGIDITY AFTER FENTANYL BOLUS

Cannot ventilate; rapid IV opioid effect. Naloxone, BVM with succinylcholine if needed. Push fentanyl slowly next time.

HR <40 DURING PRECEDEX LOAD

Bradycardia → pause infusion, atropine, fluids. Skip loading dose in volume-depleted patients.

§ 07 Confusing Drugs — Side-by-Side

Side-by-side distinctions for medications NCLEX loves to swap.

FEATURE	MIDAZOLAM (VERSED)	VECURONIUM (NORCURON)
Class	Short-acting benzodiazepine — sedative/anxiolytic/amnestic	Non-depolarizing neuromuscular blocker — paralytic ONLY
Effect on consciousness	Sedates, causes amnesia	None — patient remains aware unless co-sedated
Effect on breathing	Slows but doesn't paralyze diaphragm	Paralyzes diaphragm — apnea, must ventilate
Reversal	Flumazenil	Sugammadex (or neostigmine + glycopyrrolate)
NCLEX trap	—	Look-alike/sound-alike — sentinel event medication. No override; barcode required.

FEATURE	FLUMAZENIL	NALOXONE
Reverses	Benzodiazepines (GABA)	Opioids (μ-receptor)
Contraindications	Chronic benzo users, TCA co-overdose, seizure disorder, ICP elevation	Rarely contraindicated; titrate carefully in chronic opioid users to avoid withdrawal
Half-life	~1 h (shorter than most benzos → re-sedation)	30–90 min (shorter than most opioids → re-sedation)
Risk after dose	Withdrawal seizures, arrhythmia	Acute withdrawal, pulmonary edema, severe pain, HTN/tachycardia
First answer on NCLEX?	Almost never — ABCs first	Rarely first — ABCs first; titrated dosing

FEATURE	SUCCINYLCHOLINE	ROCURONIUM
Mechanism	Depolarizing — sustained ACh receptor activation	Non-depolarizing — competitive ACh blockade
Onset / Duration	30–60 sec / 5–10 min	60–90 sec / 30–60 min
Avoid in	K^+ >5.5, burns >24 h old, crush/SCI >24 h, MH family Hx, NMS, glaucoma, neuromuscular disease	Hepatic failure (prolonged effect), known allergy
Side effects	Fasciculations, ↑K, MH, brady (peds), muscle aches	Few — tachycardia, transient HTN
Reversal	None — wait it out	Sugammadex (fast); or neostigmine + glycopyrrolate

FEATURE	PROPOFOL	DEXMEDETOMIDINE (PRECEDEX)
Class	GABA-A agonist anesthetic	Central α2-agonist sedative
Respiratory drive	Suppresses — requires secured airway outside OR	Preserves — can use in non-intubated
Hemodynamics	Hypotension, bradycardia	Bradycardia, hypotension (esp. with loading bolus)
Major toxicity	PRIS (acidosis, hyperK, rhabdo, lipemia)	Sinus arrest, rebound HTN on stopping

FEATURE	PROPOFOL	DEXMEDETOMIDINE (PRECEDEX)
Best for	Intubated ICU, OR induction	Extubation weaning, awake fiberoptic, EtOH withdrawal adjunct

FEATURE	LIDOCAINE (1%) PLAIN	BUPIVACAINE 0.5%
Onset / Duration	Fast / Short (1–2 h)	Slower / Long (3–8 h, up to 24 h with epi)
Max dose	4.5 mg/kg plain; 7 mg/kg with epi	2 mg/kg (max 175 mg)
Cardiotoxicity	Moderate	HIGH — cardiac arrest refractory to standard ACLS
Use	Lacerations, IV antiarrhythmic, regional	Epidurals (labor, post-op), nerve blocks, spinals
LAST antidote	20% lipid emulsion (Intralipid)	20% lipid emulsion — even more critical here

§ 08 Day 9 — One-Page Infographic Recap

SEDATION · ANESTHESIA · PERIOPERATIVE

THE BIG FIVE ANTIDOTES

- **Flumazenil** ← benzos (cautions ↑)
- **Naloxone** ← opioids (titrate)
- **Sugammadex** ← rocuronium/vecuronium
- **Neo + Glyco** ← any non-depolarizer
- **Dantrolene** ← Malignant Hyperthermia

LIPID EMULSION — LAST RESCUE

MODERATE SEDATION SOAPME

- **S**uction
- **O**xygen
- **A**irway adjuncts
- **P**harmacy reversal
- **M**onitors (SpO_2, $EtCO_2$, ECG)
- **E**quipment (BVM, intubation)

GOALPURPOSEFUL RESPONSE · SPONT. VENT

PARALYTIC SAFETY RULES

- Sedate & analgese BEFORE paralyzing
- Vecuronium ≠ Versed — no override
- Sux avoid: K^+ ↑, burn, crush, SCI, MH
- Sugammadex → contraception × 7 d
- TOF goal 1–2 / 4 twitches

AWAKE PARALYSIS SENTINEL EVENT

MALIGNANT HYPERTHERMIA

↑ $EtCO_2$

- Triggers: volatile + sux
- Signs: rigidity, hyperthermia, ↑K, rhabdo, acidosis
- Stop trigger → hyperventilate 100% O_2 → dantrolene 2.5 mg/kg → cool → treat hyperK

MHAUS — 1-800-MH-HYPER

LAST — LOCAL ANESTHETIC TOXICITY

- Tinnitus → metallic taste → perioral numbness
- → Twitching → Seizure
- → Arrhythmia → Arrest
- Rx: **20% Lipid Emulsion** 1.5 mL/kg bolus

WORST OFFENDER — BUPIVACAINE

PROPOFOL INFUSION SYNDROME

- High dose (>4 mg/kg/h) + >48 h
- Acidosis · Hyperkalemia · Rhabdo · Lipemia · Cardiac failure
- STOP infusion → support → switch to dexmed/midaz

EGG/SOY — CHECK ALLERGY

CIRRHOSIS-SAFE BENZOS: LOT

- **L**orazepam
- **O**xazepam
- **T**emazepam
- (Glucuronidation, no active metabolites)

AVOID DIAZEPAM IN ELDERLY/LIVER

ALWAYS BEFORE ANTIDOTE

- A — Airway open
- B — Breathing supported (BVM)
- C — Circulation, IV access
- Then — Reverse with the right antidote

NCLEX RULE — ABCS > ANTIDOTES

NCLEX-RN 2026 DAILY PHARMACOLOGY — DAY 9 OF THE SERIES · BUILT AROUND THE NCSBN 2026 TEST PLAN DOMAINS: PHARMACOLOGICAL & PARENTERAL THERAPIES · REDUCTION OF RISK POTENTIAL · SAFETY & INFECTION PREVENTION AND CONTROL · PHYSIOLOGICAL ADAPTATION