



SKELETAL MUSCLE RELAXANTS

NCLEX-RN Pharmacology Infographic | NGN + NCJCMM Aligned

Class: Centrally-Acting Spasmolytics • Antispastics • Neuromuscular Blockers

System: Musculoskeletal / Neurological

1. DRUG OVERVIEW — Why We Give It

Key Indications

- Acute musculoskeletal pain & muscle spasms (low back pain, strains, sprains)
- Spasticity from UMN disorders: MS, cerebral palsy, spinal cord injury, stroke
- Malignant hyperthermia (MH) — **dantrolene is the antidote**
- Surgical paralysis / endotracheal intubation / mechanical ventilation (neuromuscular blockers)
- Adjunct to PT, rest, heat/cold — **NOT a cure, short-term use (2–3 weeks)**

Three Major Sub-Classes

- **Centrally-acting spasmolytics:** cyclobenzaprine, methocarbamol, carisoprodol, metaxalone
- **Antispastics:** baclofen, tizanidine, diazepam, dantrolene
- **Neuromuscular blockers:** succinylcholine (depolarizing), rocuronium / vecuronium / pancuronium (non-depolarizing)

2. MECHANISM OF ACTION

Simplified Pathways

- **Cyclobenzaprine** → brainstem depression → ↓ α & γ motor neuron activity → ↓ muscle tone
- **Baclofen** → GABA-B receptor agonist in spinal cord → ↓ excitatory neurotransmission → ↓ spasticity
- **Tizanidine** → central α -2 agonist → ↓ presynaptic motor neuron firing
- **Dantrolene** → blocks Ca^{2+} release from sarcoplasmic reticulum → ↓ muscle contraction (*acts directly on muscle — not CNS*)
- **Succinylcholine** → persistent depolarization at ACh receptor → fasciculations → flaccid paralysis
- **Rocuronium / Vecuronium** → competitive ACh antagonist at nicotinic receptor → paralysis (no depolarization)

3. THERAPEUTIC EFFECTS — What “Working” Looks Like

- ↓ Muscle spasm, pain, and tenderness
- ↑ Range of motion and functional mobility
- ↓ Spasticity / clonus / hypertonia on exam
- Improved sleep and participation in PT/OT



- **Dantrolene in MH:** ↓ temperature, ↓ rigidity, ↓ CO₂, normalizing HR & BP
- **Neuromuscular blockers:** flaccid paralysis enabling ventilation/surgery — NOT sedation or analgesia

4. SIDE EFFECTS & ADVERSE REACTIONS

Common

- **Drowsiness, sedation (HUGE — #1 side effect)**
- Dizziness, fatigue, weakness, ataxia
- Dry mouth, blurred vision, urinary retention (cyclobenzaprine — anticholinergic)
- Orthostatic hypotension (especially tizanidine, baclofen)
- Nausea, constipation



Serious / Life-Threatening

- **Respiratory depression** — amplified by opioids, benzos, alcohol
- **Hepatotoxicity** — tizanidine, dantrolene, metaxalone
- **Seizures & rebound spasticity** with abrupt baclofen withdrawal (esp. intrathecal pump)
- **Serotonin syndrome** — cyclobenzaprine + SSRI / SNRI / MAOI / tramadol / linezolid
- **Physical dependence / abuse** — carisoprodol (metabolized to meprobamate, a Schedule IV controlled substance)
- **Malignant hyperthermia** — triggered by succinylcholine (+ volatile anesthetics)
- **Hyperkalemia → cardiac arrest** — succinylcholine in burns (>24 hr), crush injury, paralysis, denervation
- **Prolonged paralysis / apnea** — pseudocholinesterase deficiency (succinylcholine)

5. PRIORITY NURSING CONSIDERATIONS

→ ASSESS

- Pain (0–10), ROM, muscle tone, spasticity, gait & fall risk
- Baseline LOC, RR, O₂ sat, BP, HR
- Medication reconciliation — CNS depressants, SSRIs, MAOIs, opioids

→ MONITOR

- Sedation scale + respiratory status (especially first 24–72 hr)
- BP (orthostatic) with tizanidine, baclofen
- LFTs, BUN/Cr, K⁺, CK
- Train-of-four (TOF) for neuromuscular blockers

→ HOLD / NOTIFY HCP IF

- **RR < 12, O₂ sat < 92%, or excessive sedation**
- SBP < 90 mmHg or symptomatic hypotension
- AST/ALT ↑ > 3× upper limit (hepatotoxicity)
- Jaundice, dark urine, RUQ pain, rash
- Any sign of serotonin syndrome (fever, clonus, agitation, tremor, diaphoresis)

🚫 Contraindications / Interactions

- **Cyclobenzaprine:** MAOIs (within 14 days), acute MI, arrhythmias, heart block, hyperthyroidism
- **Baclofen:** NEVER stop abruptly — taper over 1–2 weeks (**seizures, hallucinations, hyperthermia**)
- **Tizanidine + ciprofloxacin/fluvoxamine:** CYP1A2 inhibition → severe hypotension → CONTRAINDICATED
- **Dantrolene + CCBs (verapamil):** hyperkalemia + cardiovascular collapse
- **Succinylcholine:** avoid in burns >24 hr, crush/spinal injury, malignant hyperthermia hx, muscular dystrophy
- **Neuromuscular blockers:** ALWAYS pair with sedation + analgesia — patient is paralyzed but AWAKE and feels everything

6. LABS & DIAGNOSTICS

Key labs and what abnormal means:

Lab	Normal	Critical / Abnormal =
AST / ALT (LFTs)	AST 10–40 U/L • ALT 7–56 U/L	↑ 3× baseline → HOLD tizanidine, dantrolene, metaxalone
Potassium (K ⁺)	3.5–5.0 mEq/L	> 5.5 → succinylcholine-induced hyperkalemia → cardiac arrest risk
BUN / Creatinine	BUN 10–20 • Cr 0.6–1.2 mg/dL	↑ → ↓ baclofen clearance → toxicity
Creatine Kinase (CK)	30–200 U/L	↑↑↑ in MH, rhabdomyolysis — trend CK in dantrolene patients
ABG / EtCO ₂	PaCO ₂ 35–45 mmHg	↑ EtCO ₂ = early MH sign; ↓ RR = oversedation
Baseline BP / HR	SBP ≥ 90 • HR 60–100	Hypotension = hold tizanidine/baclofen; ↑↑HR = MH sign
Train-of-Four (TOF)	4/4 twitches = no block	0–1/4 = deep block; titrate neuromuscular blocker

7. ADMINISTRATION & SAFETY

Routes & Timing

- **PO:** most centrally-acting agents — give at bedtime when possible (sedation)
- **Intrathecal baclofen pump:** severe spasticity; monitor pump function — pump failure = withdrawal emergency

- **Dantrolene IV:** mix with STERILE WATER ONLY (not NS, not D5W) — 2.5 mg/kg rapid IV push for MH; repeat q5–10 min up to 10 mg/kg
- **Succinylcholine IV:** onset 30–60 sec; duration 5–10 min — intubation readiness MANDATORY
- **Rocuronium/Vecuronium IV:** onset 1–3 min; reverse with sugammadex (roc/vec) or neostigmine + glycopyrrolate

High-Alert Precautions

- **Neuromuscular blockers are HIGH-ALERT — store separately, two-RN verification, ONLY administer to intubated or actively being intubated patients**
- Have bag-valve-mask, suction, intubation equipment, and reversal agent at bedside
- MH cart must include: dantrolene, sterile water, cooling supplies, ice packs, IV fluids, sodium bicarbonate, insulin/D50, calcium chloride
- Avoid alcohol and other CNS depressants during therapy
- Assess swallowing before PO doses if spasticity involves bulbar muscles

8. PATIENT EDUCATION

Teach the Patient / Family

- NO driving or operating heavy machinery until you know how the drug affects you
- Avoid alcohol, opioids, sleep aids, and any CNS depressants
- Rise slowly from sitting/lying (orthostatic hypotension)
- **NEVER stop baclofen abruptly — if doses missed, call provider immediately**
- Take with food if GI upset occurs
- Use for SHORT-TERM relief — continue PT, heat/cold, stretching, rest
- Dry mouth: ice chips, sugar-free gum, frequent sips of water

Call 911 / Go to ED for:

- Difficulty breathing, severe drowsiness, or unable to wake
- Yellowing of skin/eyes, dark urine, severe abdominal pain (hepatotoxicity)
- High fever, rigid muscles, confusion, racing heart (serotonin syndrome / MH)
- Baclofen pump alarm, missed intrathecal dose, or sudden return of spasticity
- Seizure or severe itching/swelling (allergic reaction)

9. NCLEX TEST TRAPS

- **TRAP:** Students pick “cooling” first for MH — WRONG. **Stop the triggering agent → give DANTROLENE → 100% O₂ → THEN cool.**
- **TRAP:** Cyclobenzaprine + SSRIs = serotonin syndrome (*not just MAOIs!*)
- **TRAP:** Stopping baclofen abruptly = **seizures, hallucinations, rebound spasticity, rhabdo — especially with intrathecal pump.**
- **TRAP:** Succinylcholine is SAFE in burns → FALSE. **AVOID after 24 hr post-burn (hyperkalemia risk).**

- **TRAP:** Neuromuscular blockers sedate the patient → FALSE. **They paralyze ONLY — always co-administer sedation + analgesia.**
- **TRAP:** Carisoprodol is a “safe” muscle relaxant → FALSE. **Metabolized to meprobamate (Schedule IV) — abuse potential.**
- **TRAP:** Dantrolene mixed with NS → WRONG. **STERILE WATER ONLY (incompatibility).**
- **TRAP:** Cyclobenzaprine in elderly = Beers Criteria violation (**anticholinergic** → falls, delirium, urinary retention).
- **TRAP:** Tizanidine + ciprofloxacin = severe hypotension (**CYP1A2 inhibition**) — contraindicated.
- **PRIORITY vs NON-PRIORITY:** “Patient is drowsy after first dose” = expected. “RR = 8” = priority airway/breathing intervention.

10. MEMORY BOOSTERS

🎯 Mnemonic: “FLEX” – what cyclobenzaprine causes

- **F** – Falls / Fatigue
- **L** – Lethargy (sedation)
- **E** – Elderly = BAD (Beers Criteria)
- **X** – eXtra serotonin = serotonin syndrome w/ SSRIs

🎯 MH Treatment: “Some Hot Dudes Can Cool”

- **S** – Stop the triggering agent
- **H** – Hyperventilate with 100% O₂
- **D** – Dantrolene 2.5 mg/kg IV push
- **C** – Cool the patient (ice packs, cold IVF)
- **C** – Correct acidosis & hyperkalemia

🎯 Baclofen Withdrawal: “SAFE is NOT safe”

- **S** – Seizures
- **A** – Autonomic instability / Agitation
- **F** – Fever (hyperthermia)
- **E** – Elevated rigidity / rhabdo

🎯 Quick Recall Pattern

- Any drug ending in “**-curonium**” or “**-curium**” = non-depolarizing neuromuscular blocker (rocuronium, vecuronium, cisatracurium)
- “**Flex-**” = Flexeril = cyclobenzaprine = acute MSK spasm
- “**Dan-**” = Dantrolene = Danger = MH antidote
- “**Zana-**” = Zanaflex = tizanidine = spasticity (liver caution)

💊 MOST TESTED DRUGS IN THIS CLASS — Key Differences

Drug (Generic / Brand)	Primary Use	⚠️ Key NCLEX Pearl
Cyclobenzaprine (Flexeril)	Acute MSK spasm / low back pain	Anticholinergic • avoid in elderly • NO MAOIs • serotonin syndrome risk w/ SSRIs
Baclofen (Lioresal)	Spasticity (MS, SCI, CP)	NEVER stop abruptly → seizures; intrathecal pump failure is an emergency
Tizanidine (Zanaflex)	Spasticity	Hepatotoxic; severe hypotension; AVOID with ciprofloxacin/fluvoxamine
Dantrolene (Dantrium)	MH antidote; severe spasticity	Mix IV with STERILE WATER only; monitor LFTs; given rapid IV push in MH
Methocarbamol (Robaxin)	Acute MSK spasm; tetanus	Harmless green/black/brown urine (teach patient); sedation
Carisoprodol (Soma)	Acute MSK spasm	Schedule IV • metabolized to meprobamate • abuse/dependence risk
Metaxalone (Skelaxin)	Acute MSK spasm	Hepatotoxic; hemolytic anemia; take with food for ↑ absorption
Diazepam (Valium)	Spasticity; muscle spasm	Benzodiazepine — respiratory depression; flumazenil reverses
Succinylcholine (Anectine)	RSI / intubation	Depolarizing • MH trigger • hyperK in burns/trauma • fasciculations then paralysis
Rocuronium (Zemuron)	Intubation / surgical paralysis	Non-depolarizing • REVERSE with sugammadex • requires ventilation + sedation



CLINICAL JUDGMENT SNAPSHOT — NGN / NCJMM

#1 PRIORITY RISK

- **RESPIRATORY DEPRESSION / AIRWAY COMPROMISE** — from CNS depression, potentiated by opioids, benzos, alcohol. For neuromuscular blockers, apnea is expected and ventilation is mandatory.

What Will HARM the Patient FIRST?

- **Oversedation** → hypoventilation → hypoxia → respiratory arrest
- **Abrupt baclofen withdrawal** → seizures, rhabdo, hyperthermia (within 24–48 hr)
- **Succinylcholine** → malignant hyperthermia or hyperkalemic cardiac arrest
- **Dantrolene + verapamil** → hyperkalemia + cardiovascular collapse

FIRST Nursing Action (by scenario)

- **Unresponsive / RR < 10:** Open airway → apply O₂ → call Rapid Response → prepare naloxone/flumazenil if relevant

- **Suspected MH ($\uparrow$ EtCO₂, rigidity, fever, tachycardia):** STOP triggering agent → call for DANTROLENE + MH cart → 100% O₂
- **Missed baclofen dose / pump failure:** Notify HCP IMMEDIATELY → restart drug → monitor for seizures
- **Serotonin syndrome signs on cyclobenzaprine:** HOLD drug → notify HCP → prepare cyproheptadine, cooling, benzodiazepines
- **AST/ALT > 3× normal:** HOLD tizanidine/dantrolene/metaxalone → notify HCP
- **Neuromuscular blocker given without sedation:** IMMEDIATELY add sedative + analgesic — patient is paralyzed but fully aware

✓ **NCJMM Layers (NGN Test Plan)**

- **Recognize cues:** RR, LOC, BP, rigidity, temperature, LFTs, K⁺
- **Analyze cues:** Is this expected sedation or respiratory depression? MH vs serotonin syndrome?
- **Prioritize hypothesis:** Airway/breathing first; then circulation; then safety (falls, withdrawal)
- **Generate solutions → Take action → Evaluate outcomes**

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