NCLEX-RN 2026 | NGN + NCJMM ALIGNED | HIGH-YIELD | PHARMACOLOGY

Alpha-Adrenergic Agonists

Sympathomimetics acting on α1 and α2 receptors — vasoconstrictors & centrally-acting antihypertensives

System: Cardiovascular / Autonomic Nervous System / Neuro

1 Drug Overview

TWO BIG SUBCLASSES (KNOW THEM COLD)

- **α_1 Agonists (peripheral vasoconstrictors):** phenylephrine, pseudoephedrine, oxymetazoline, midodrine
- **α_2 Agonists (central, ↓ sympathetic outflow):** clonidine, methyldopa, tizanidine, dexmedetomidine, guanfacine, brimonidine

KEY INDICATIONS — WHY WE GIVE THEM

- **α_1 → Vasoconstriction:** hypotension/shock (esp. neurogenic, anesthesia-induced), nasal congestion, pupil dilation for exams, orthostatic hypotension (midodrine)
- **α_2 → Lower BP/sympathetic drive:** hypertension (clonidine, methyldopa — drug of choice in pregnancy), ADHD (clonidine, guanfacine), opioid & alcohol withdrawal, ICU sedation (dexmedetomidine), muscle spasticity (tizanidine), open-angle glaucoma (brimonidine drops)

Core concept: α_1 agonists work *peripherally* to squeeze vessels and raise BP. α_2 agonists work *centrally* in the brainstem to *lower* sympathetic outflow → lower BP. Opposite effects, same receptor family.

2 Mechanism of Action

A_1 AGONISTS (PHENYLEPHRINE, MIDODRINE)

Stimulate α_1 receptors on vascular smooth muscle → Vasoconstriction → ↑ SVR (afterload) → ↑ BP → Reflex bradycardia via baroreceptors

A_2 AGONISTS (CLONIDINE, METHYLDOPA, DEXMEDETOMIDINE)

Stimulate presynaptic α_2 receptors in CNS (brainstem) → ↓ Norepinephrine release → ↓ Sympathetic outflow → ↓ HR, ↓ SVR, ↓ BP → Sedation & analgesia (bonus effect)

Pearl: α_2 is a "brake pedal" on the sympathetic nervous system. Stimulating it *turns sympathetic activity down* — which is why α_2 agonists *lower* BP despite being "adrenergic agonists."

3 ✅ Therapeutic Effects

A_1 AGONISTS — EXPECTED IMPROVEMENTS

- ↑ **MAP & SBP** in hypotensive/shock patient (target MAP ≥ 65 mmHg)
- **Improved perfusion:** warm extremities, urine output ≥ 0.5 mL/kg/hr, improved LOC
- **Decreased nasal congestion** within minutes (topical)
- **Ability to stand without dizziness** (midodrine for orthostatic hypotension)

A_2 AGONISTS — EXPECTED IMPROVEMENTS

- ↓ **BP** gradually to goal (e.g., <130/80)
- ↓ **ADHD symptoms:** improved focus, reduced impulsivity (clonidine, guanfacine)
- ↓ **Withdrawal symptoms:** less anxiety, sweating, tachycardia, piloerection
- **Calm but arousable sedation** (dexmedetomidine — "conscious sedation" quality)
- ↓ **Muscle tone/spasticity** (tizanidine)
- ↓ **Intraocular pressure** (brimonidine)

4 ⚠ Side Effects & Adverse Reactions

✓ COMMON (A_1)

- Headache
- Reflex bradycardia
- Nasal dryness, rebound congestion
- Supine hypertension (midodrine)
- Piloerection ("goosebumps")
- Urinary retention (BPH patients)

🚨 SERIOUS (A_1)

- **Severe HTN / hypertensive crisis**
- **Tissue necrosis** from IV extravasation
- Organ ischemia (kidney, gut, fingers/toes)
- Dysrhythmias
- Rhinitis medicamentosa (Afrin > 3 days)

✓ COMMON (A_2)

- **Sedation / drowsiness**
- **Dry mouth** (xerostomia)
- Orthostatic hypotension
- Bradycardia
- Constipation
- Depression, fatigue
- Sexual dysfunction

🚨 SERIOUS (A_2)

- **REBOUND HYPERTENSION** if abruptly stopped (clonidine) — hypertensive crisis
- Severe bradycardia / heart block
- Methyldopa → **hemolytic anemia** (+Coombs test), hepatotoxicity
- Dexmedetomidine → hypotension, bradycardia, sinus arrest
- CNS depression (additive with opioids/alcohol)

Toxicity pattern (overdose): profound bradycardia, hypotension, pinpoint pupils, respiratory depression, CNS depression (looks like opioid overdose). Clonidine OD in peds is a classic case.

5 Priority Nursing Considerations

ASSESS / MONITOR

- **Assess** BP, HR, RR, LOC before every dose (baseline & ongoing)
- **Monitor** continuous ECG & BP for IV drips (phenylephrine, dexmedetomidine)
- **Assess** IV site q1h for phenylephrine drip — check for blanching, pallor, cool skin (extravasation)
- **Monitor** urine output (perfusion marker)
- **Assess** for depression, suicidal ideation (chronic clonidine, methyldopa)

WHEN TO HOLD / NOTIFY PROVIDER

- **HOLD** clonidine if HR < 60 or SBP < 90 (per parameters); **never stop abruptly**
- **HOLD** phenylephrine if severe HTN develops or reflex bradycardia < 50
- **HOLD** midodrine if supine BP is severely elevated — do **not** give within 4 hours of bedtime
- **NOTIFY** provider: extravasation, SBP >180, HR <50, signs of ischemia, jaundice/dark urine (methyldopa)

CONTRAINDICATIONS

- Severe CAD, recent MI, CVA, heart block (α_1 — risk of ischemia/arrhythmia)
- Pheochromocytoma (severe HTN potential)
- Methyldopa: active liver disease, hx of methyldopa-induced hepatitis
- Dexmedetomidine: advanced heart block without pacemaker
- MAOI use within 14 days

KEY DRUG INTERACTIONS

- **MAOIs + α_1 agonists** = severe hypertensive crisis
- **Beta-blockers + clonidine rebound** = *worsened* hypertensive crisis (taper beta-blocker FIRST before stopping clonidine)
- **TCAs** blunt clonidine's antihypertensive effect
- **CNS depressants** (opioids, benzos, alcohol) + α_2 agonists → profound sedation/respiratory depression
- **Digoxin + clonidine** → additive bradycardia

6 🧪 Labs & Diagnostics

- **BP & HR** (the "lab" that matters most — trend, not single value)
- **CBC:** methyldopa → watch for hemolytic anemia (↓H&H, ↑reticulocytes)
- **Direct Coombs test:** positive in up to 20% on methyldopa (usually asymptomatic, but flags hemolysis risk)
- **LFTs (ALT, AST, bilirubin):** baseline + periodic for methyldopa (hepatotoxicity)
- **BUN/Creatinine:** monitor kidney perfusion, especially on vasopressor drips
- **Blood glucose:** clonidine can mask hypoglycemia symptoms in diabetics (blunts tachycardia)
- **Lactate:** rising lactate on phenylephrine drip = under-perfusion → reassess shock type

Critical value flags: SBP > 180 or < 90, HR < 50, ALT/AST > 3× upper limit (methyldopa), Hgb drop > 2 g/dL (methyldopa hemolysis).

7 Administration & Safety

ROUTES BY DRUG

- **Phenylephrine:** IV (drip — central line preferred), IM, SubQ, topical (nasal), ophthalmic
- **Clonidine:** PO, transdermal patch (weekly), epidural
- **Methyldopa:** PO (pregnancy), IV
- **Dexmedetomidine:** IV continuous infusion (ICU only, with continuous monitoring)
- **Midodrine:** PO — 3 times daily during **daytime only** (last dose 4+ hours before bedtime)
- **Oxymetazoline / pseudoephedrine:** intranasal / PO (OTC)

⚠ HIGH-ALERT PRECAUTIONS

- **Phenylephrine IV = HIGH-ALERT vasopressor** → central line preferred; if peripheral, use large vein and monitor q15–30 min
- **Extravasation antidote: PHENTOLAMINE** (α-blocker) infiltrated SubQ into the site — know this cold
- **Dexmedetomidine:** ICU only, continuous telemetry, have atropine available for bradycardia
- **Clonidine patch:** rotate sites, apply to hairless upper outer arm/chest, change weekly — **remove before MRI** (metallic backing → burn)
- **Never crush extended-release clonidine tablets**
- **Oxymetazoline/Afrin:** max 3 days to prevent rebound congestion (rhinitis medicamentosa)

8 Patient Education

- **DO NOT STOP CLONIDINE ABRUPTLY** — taper over days; abrupt stop = rebound HTN / stroke risk ⚠️
- **Change positions slowly** — orthostatic hypotension risk (especially methyldopa, clonidine)
- **Avoid alcohol and other CNS depressants** (additive sedation)
- **No driving** until sedation effects are known
- **Rinse mouth / use sugar-free gum** for dry mouth
- **Midodrine:** take during the day only; do *not* take before lying down or sleeping (supine HTN)
- **Afrin / oxymetazoline:** do not use > 3 days in a row
- **Methyldopa:** report yellow skin/eyes, dark urine, fatigue (liver/hemolysis)
- **Check OTC labels** — avoid pseudoephedrine/phenylephrine combos if on BP meds
- **Carry medical alert ID** for vasopressor/antihypertensive use
- **Seek emergency help if:** severe HA, chest pain, vision changes, fainting, or confusion

9 NCLEX Test Traps

- **Trap #1:** "Adrenergic agonist = raises BP" — FALSE for α_2 agonists. Clonidine/methyldopa *lower* BP. Don't confuse with α_1 agonists.
- **Trap #2:** Stopping clonidine because HR is 58 — *hold & notify*, but **never D/C abruptly**. Expect a taper order.
- **Trap #3:** Patient on beta-blocker + clonidine who stops clonidine — rebound HTN is *worse*. Beta-blocker must be *tapered first*.
- **Trap #4:** Extravasation of phenylephrine — first action is **STOP the infusion**, then notify (not "apply warm compress" which is wrong for α_1 extravasation — it's cold compress + phentolamine).
- **Trap #5:** Methyldopa in pregnancy — it's the *drug of choice* for chronic HTN in pregnancy. Don't pick ACE inhibitors or ARBs (teratogenic).
- **Trap #6:** Afrin rebound — patient says "my nose is worse now after a week" → *rhinitis medicamentosa*, not infection.
- **Trap #7:** Clonidine patch + MRI → **remove the patch** (aluminum backing → burn).
- **Trap #8:** Midodrine given at bedtime → supine HTN. Schedule is *daytime only*.
- **Trap #9:** Pediatric clonidine overdose looks like opioid OD (pinpoint pupils, bradycardia, respiratory depression). Classic pediatric ingestion question.
- **Trap #10:** Dexmedetomidine — patient appears sedated but is *arousable and follows commands*. That's the *expected* finding, not an adverse reaction.

10 🧠 Memory Boosters

🔤 **"A1 = ARTERIES FIRST"**

α_1 stimulation → **A**rteries constrict → BP goes up. Think peripheral squeeze.

🔤 **"A2 = ADRENALINE OFF"**

α_2 stimulation → turns **A**drenaline (NE) release **off** in the brain → BP goes down. Think central brake.

🔤 **"CLONIDINE = CLOSE THE FAUCET, DON'T SLAM IT SHUT"**

Must be **tapered**. Abrupt stop = rebound HTN crisis.

🔤 **"METHYLDOPA = MAMA'S DRUG"**

Methyldopa for **M**oms (pregnancy HTN drug of choice — safe in pregnancy).

🔤 **"PHENTOLAMINE FIXES PHENYLEPHRINE"**

Both start with "Phen-" — **Phent**olamine is the antidote for **Phen**ylephrine extravasation.

🔤 **"AFRIN FOR 3, NO MORE" (RULE OF 3)**

Nasal decongestant sprays (oxymetazoline, phenylephrine) ≤ **3 days** to prevent rebound congestion.

🔤 **"MIDODRINE IS A MORNING DRUG"**

Take during the day; last dose ≥ 4 hours before bed to avoid **supine hypertension**.

🔤 **TOP SIDE EFFECTS OF A_2 AGONISTS = "CDS"**

CNS depression (sedation), **D**ry mouth, **S**lowed HR/BP (bradycardia, orthostasis).

Most-Tested Drugs in This Class

A_1 AGONISTS (PERIPHERAL VASOCONSTRICTORS)

Phenylephrine

Neo-Synephrine, Sudafed PE

Use: Hypotension/shock (IV drip), nasal decongestion, mydriasis for eye exams. **Watch:** extravasation, reflex bradycardia, severe HTN.

Pseudoephedrine

Sudafed

Use: Oral nasal/sinus decongestant. **Watch:** HTN, insomnia, tachycardia; contraindicated in uncontrolled HTN.

Oxymetazoline

Afrin

Use: Topical nasal decongestant. **Watch:** ≤ 3 days only → rhinitis medicamentosa if longer.

Midodrine

ProAmatine, Orvaten

Use: Orthostatic hypotension. **Watch:** supine HTN — never within 4 hrs of bedtime.

A_2 AGONISTS (CENTRAL, SYMPATHOLYTIC)

Clonidine

Catapres, Kapvay

Use: HTN, ADHD, opioid withdrawal, tic disorders. **Watch:** rebound HTN if stopped abruptly — MUST taper.

Methyldopa

Aldomet

Use: HTN in pregnancy (drug of choice). **Watch:** +Coombs, hemolytic anemia, hepatotoxicity, depression.

Dexmedetomidine

Precedex

Use: ICU sedation (unique: sedated but arousable). **Watch:** bradycardia, hypotension, sinus arrest.

Tizanidine

Zanaflex

Use: Muscle spasticity (MS, spinal injury). **Watch:** hypotension, sedation, hepatotoxicity.

Guanfacine

Intuniv, Tenex

Use: ADHD (peds), HTN. **Watch:** sedation, hypotension, bradycardia; taper to stop.

Brimonidine

Alphagan P

Use: Open-angle glaucoma (eye drops). **Watch:** ocular irritation; systemic effects rare but possible in peds.

KEY DIFFERENCES AT A GLANCE

FEATURE	A_1 AGONISTS	A_2 AGONISTS
Site of action	Peripheral vascular smooth muscle	Central (brainstem, presynaptic)
Effect on BP	↑ BP (vasoconstriction)	↓ BP (↓ sympathetic outflow)
Effect on HR	Reflex bradycardia	Direct bradycardia
Sedation?	No (may cause anxiety)	Yes — prominent
Classic use	Shock, decongestion	HTN, ADHD, withdrawal, ICU sedation
Biggest danger	Extravasation → necrosis; severe HTN	Rebound HTN from abrupt D/C
Prototype	Phenylephrine	Clonidine

🧠 Clinical Judgment Snapshot

#1 PRIORITY RISK — A_1 AGONISTS

Extravasation → tissue necrosis and **severe hypertension with end-organ ischemia**. Phenylephrine IV drip must have continuous BP monitoring and a central line when possible.

#1 PRIORITY RISK — A_2 AGONISTS

Rebound hypertensive crisis from abrupt discontinuation of clonidine — can cause stroke, MI, and death. Always taper. This is the single most-tested α2 safety point.

WHAT WILL HARM THE PATIENT FIRST?

For **α1 drips:** extravasation injury within minutes → limb-threatening ischemia. For **clonidine/dexmedetomidine:** profound bradycardia, hypotension, and respiratory depression → airway and perfusion compromise.

FIRST NURSING ACTION — PHENYLEPHRINE EXTRAVASATION

① **STOP the infusion immediately** → ② leave the IV catheter in place & aspirate residual drug → ③ **notify provider** for **phentolamine infiltration** into the site → ④ elevate extremity, apply cold (not warm) compress → ⑤ document extensively.

FIRST NURSING ACTION — CLONIDINE REBOUND HTN

① Assess BP, HR, neuro status, symptoms (HA, chest pain, vision) → ② **notify provider immediately** → ③ anticipate resuming clonidine + short-acting antihypertensive (e.g., labetalol) → ④ never pair with beta-blocker taper concerns (beta-blocker should have been tapered BEFORE clonidine stopped).

FIRST NURSING ACTION — SUSPECTED CLONIDINE OVERDOSE (PEDIATRIC)

① **ABCs — airway & breathing first** (looks like opioid OD: bradycardia, hypotension, respiratory depression, pinpoint pupils) → ② call rapid response / poison control → ③ supportive care; naloxone may be tried, atropine for bradycardia → ④ continuous monitoring.