NCLEX-RN • 2026 TEST PLAN • PHARMACOLOGY

Dopaminergics

CLASS Dopamine Precursors · Agonists · COMT-I · MAO-B-I · NMDA

SYSTEM Central Nervous System (Neuro) **PRIMARY USE** Parkinson's Disease

1 Drug Overview — Why We Give It

KEY INDICATIONS

- **Parkinson's Disease** — PRIMARY use (↓ tremor, rigidity, bradykinesia)
- Restless Leg Syndrome *(pramipexole, ropinirole)*
- Hyperprolactinemia *(bromocriptine, cabergoline)*
- Neuroleptic Malignant Syndrome *(bromocriptine)*
- Influenza A prophylaxis *(amantadine — rarely used now)*

HIGH-YIELD CLINICAL USE

- PD = loss of **dopaminergic neurons** in substantia nigra (basal ganglia)
- Goal = restore dopamine / ACh balance in the brain
- Does NOT cure — **slows** symptoms, improves ADLs
- First-line picks by age: **<65** = dopamine agonist · **>65** = levodopa-carbidopa

CORE CONCEPT

Parkinson's = too little dopamine + too much acetylcholine. Dopaminergics fix the dopamine side. Cardinal signs = **TRAP**: *Tremor (resting) · Rigidity · Akinesia/bradykinesia · Postural instability.*

2 Mechanism of Action — Simplified

LEVODOPA-CARBIDOPA (SINEMET) — THE GOLD STANDARD

Levodopa → crosses **blood-brain barrier** → converted to **DOPAMINE** in brain → ↑ motor control

Carbidopa → BLOCKS peripheral decarboxylase → ↑ levodopa reaching brain → ↓ peripheral SE (N/V)

(Carbidopa alone = useless. Dopamine alone = can't cross BBB.)

DOPAMINE AGONISTS

Directly stimulate **dopamine receptors** in the brain — bypass the need for conversion.

Pramipexole, ropinirole, rotigotine, bromocriptine, apomorphine

COMT INHIBITORS

Block **catechol-O-methyltransferase** → ↓ levodopa breakdown → more levodopa reaches brain.

Entacapone, tolcapone — always given WITH levodopa

MAO-B INHIBITORS

Block **monoamine oxidase-B** → ↓ dopamine breakdown in brain → prolonged dopamine action.

Selegiline, rasagiline, safinamide

AMANTADINE

Triggers **dopamine release** + NMDA antagonism → helps tremor and drug-induced dyskinesias.

Also historically antiviral for Influenza A

3 Therapeutic Effects — "It's Working"

- ✓ ↓ **Resting tremor** (often first improvement noted)
- ✓ ↓ **Muscle rigidity** — smoother passive ROM, less cogwheeling
- ✓ ↓ **Bradykinesia** — faster movement initiation, longer steps
- ✓ Improved **facial expression** (↓ masked facies)
- ✓ Improved **speech** (louder, less monotone)
- ✓ Improved **handwriting** (↓ micrographia) and fine motor tasks
- ✓ Improved **gait** — ↓ shuffling, ↓ freezing episodes
- ✓ Better ADLs, ↑ independence, ↑ safety

REALISTIC TIMING

Improvement is **GRADUAL** — may take **SEVERAL WEEKS** for full effect. Teach patients NOT to expect immediate results. Missing even one dose can cause noticeable symptom return.

4 Side Effects & Adverse Reactions

COMMON

- **Orthostatic hypotension** (huge fall risk)
- Nausea, vomiting, anorexia
- Dry mouth, constipation
- **Darkening of urine/sweat** (levodopa — harmless, but teach!)
- Drowsiness, dizziness
- Vivid dreams, insomnia
- Headache
- **Livedo reticularis** (purplish skin mottling — amantadine)

SERIOUS / LIFE-THREATENING

- ⚠ **Dyskinesias** = involuntary writhing movements (sign of TOO MUCH dopamine / long-term use)
- ⚠ **On-off phenomenon** / wearing off — sudden loss of motor control
- ⚠ **NMS-like syndrome** if ABRUPTLY stopped (hyperthermia, rigidity, AMS, autonomic instability)
- ⚠ **Hallucinations, psychosis, confusion**
- ⚠ **Impulse control disorders** — gambling, hypersexuality, compulsive shopping/eating (dopamine agonists)
- ⚠ **Sudden sleep attacks** — fall asleep without warning (pramipexole, ropinirole) → NO driving
- ⚠ **Severe hypotension/arrhythmias**
- ⚠ **Melanoma risk** — screen skin annually
- ⚠ **Hepatotoxicity** (tolcapone — black box warning)
- ⚠ **Serotonin syndrome** (MAO-B + SSRI/meperidine)
- ⚠ **Hypertensive crisis** (MAO-B at high doses + tyramine foods)

DYSKINESIAS VS TREMOR — DON'T CONFUSE

TREMOR

= PD symptom (rhythmic, resting, worsens with stress) → drug helps.

DYSKINESIA

= writhing, twisting, involuntary movements → sign of TOO MUCH drug. Dose needs to be adjusted (NOT increased).

5 Priority Nursing Considerations

→ ASSESS / MONITOR

- BP **lying, sitting, standing** (orthostasis → falls)
- Motor function — tremor, gait, rigidity, bradykinesia
- Mental status — confusion, hallucinations, mood
- **Impulsive behaviors** — ask directly about gambling/spending
- Signs of dyskinesia (involuntary movements)
- Skin — annual melanoma screening
- Swallowing safety (aspiration risk in PD)
- LFTs with tolcapone

→ HOLD / NOTIFY HCP

- ✕ Severe, disabling dyskinesias
- ✕ Chest pain, palpitations, arrhythmias
- ✕ SBP < 90 or severe orthostatic drop
- ✕ New psychosis, hallucinations, suicidal ideation
- ✕ Signs of NMS (fever, rigidity, AMS)
- ✕ Signs of serotonin syndrome
- ✕ LFTs ↑ 2–3× baseline (tolcapone)
- ✕ **NEVER abruptly stop** — taper only

⚠ CONTRAINDICATIONS & DRUG INTERACTIONS

⚠ **MAOIs + levodopa** → hypertensive crisis. Must stop MAOI **14 days** before starting levodopa.

⚠ **Antipsychotics** (haloperidol, phenothiazines) block dopamine → worsen PD. AVOID.

⚠ **Vitamin B6 (pyridoxine)** reverses levodopa alone. (Safe with carbidopa-levodopa — carbidopa blocks this.)

⚠ **High-protein meals** compete with levodopa at the BBB → ↓ absorption.

⚠ **Apomorphine + ondansetron** (or any 5-HT3 antagonist) → profound hypotension/LOC. Use trimethobenzamide instead.

⚠ **MAO-B + SSRI, SNRI, TCA, meperidine, tramadol, St. John's wort** → serotonin syndrome.

⚠ **Selegiline** at doses > 10 mg/day loses MAO-B selectivity → tyramine reaction (aged cheese, cured meats, wine).

⚠ **Narrow-angle glaucoma, melanoma history, severe cardiac/psychiatric disease** — use with extreme caution.

6 Labs & Diagnostics

- **LFTs (AST, ALT)** — baseline + periodic, ESPECIALLY with tolcapone (black box hepatotoxicity). Hold if ↑ 2–3× baseline.
- **CBC** — watch for leukopenia, thrombocytopenia
- **BUN / Creatinine** — renal function (dose adjust amantadine, pramipexole if impaired)
- **BP + orthostatic vitals** — at every visit
- **Urine ketone dipsticks** may give *false positive* with levodopa (teach diabetic patients!)
- **Coombs test** may be falsely positive — usually not clinically significant
- No specific therapeutic drug level monitoring for most PD drugs

> **LAB TRAP TO KNOW**
>
> Levodopa can cause **FALSE-POSITIVE URINE KETONES** and may **LOWER URIC ACID**. Know these — the NCLEX loves to ask about unexpected lab changes.

7 Administration & Safety

- **Give on time, every time** — PD drugs are time-sensitive. Missing doses = sudden return of symptoms. Dose at home schedule, even in hospital.
- **Levodopa-carbidopa**: take on empty stomach OR with a low-protein snack. Avoid high-protein meals (separate protein from dose).
- **ER / CR formulations** (Sinemet CR, Rytary): **do NOT crush, chew, or split**.
- **Rotigotine patch (Neupro)**: apply daily, rotate sites, **REMOVE before MRI** (metal backing → burns).
- **Apomorphine (Apokyn)**: SQ injection, rescue therapy for "off" episodes. **Pretreat with trimethobenzamide** (antiemetic). NEVER with ondansetron.
- **Selegiline orally disintegrating tab (Zelapar)**: place on tongue, no liquid for 5 min.
- **Entacapone**: always paired with each levodopa dose; may stain urine brownish-orange.
- **Fall precautions** — orthostatic hypotension + gait issues + sudden sleep attacks = high fall risk.
- **Taper, never stop abruptly** — risk of NMS-like crisis.

8 Patient Education

MUST KNOW

- **Rise slowly** from bed/chair (orthostatic hypotension)
- **Urine & sweat may darken** — harmless, but may stain clothes
- **Effects take weeks** — don't stop if no immediate change
- **Never stop abruptly** — dangerous withdrawal
- Take doses at **exact scheduled times**
- Avoid **high-protein meals** with levodopa doses
- Avoid **Vit B6 supplements** with levodopa alone
- Limit **tyramine foods** with high-dose MAO-B (aged cheese, cured meats, tap beer, red wine, soy sauce)

SEEK HELP IMMEDIATELY IF

- ⚠ Fever + rigidity + confusion (NMS)
- ⚠ Involuntary writhing movements (dyskinesia)
- ⚠ New/worsening hallucinations, paranoia, depression
- ⚠ New gambling, shopping, sexual compulsions
- ⚠ Falling asleep without warning — stop driving
- ⚠ Chest pain, fainting, severe dizziness
- ⚠ New skin lesions or mole changes (melanoma)
- ⚠ Yellow skin/eyes, dark urine (hepatotoxicity)

SAFETY TEACHING ESSENTIALS

Wear a medical alert bracelet. Get annual skin exams. Home safety — remove rugs, bright lighting, grab bars. Physical therapy and regular exercise are as important as the medication itself.

9 ⚠ NCLEX Test Traps — What Students Miss

⚠ **TRAP #1 — Abrupt stop ≠ simple withdrawal.** It causes an **NMS-like crisis** (fever, rigidity, AMS). Even hospitalized NPO patients need doses given via alternate route.

⚠ **TRAP #2 — Carbidopa does NOTHING alone.** It must be combined with levodopa. Its sole purpose = block peripheral conversion so more levodopa reaches the brain.

⚠ **TRAP #3 — Vitamin B6 (pyridoxine)** reverses *levodopa alone* but is **safe with carbidopa-levodopa**. The answer depends on which drug is in the stem.

⚠ **TRAP #4 — High-protein meals block levodopa.** The classic wrong answer: "Take with a high-protein snack." Correct = empty stomach or low-protein snack.

⚠ **TRAP #5 — Dyskinesia ≠ worsening Parkinson's.** Dyskinesia means TOO MUCH dopamine. Answer is often "hold/notify," not "give next dose."

⚠ **TRAP #6 — On-off phenomenon** is often managed by giving the drug **more frequently**, not necessarily a higher single dose.

⚠ **TRAP #7 — Sleep attacks are sudden, warningless sleep** — not just drowsiness. Patient MUST stop driving. Pramipexole & ropinirole are the classic culprits.

⚠ **TRAP #8 — Impulse control disorders** (gambling, hypersexuality) are real, drug-induced side effects of dopamine agonists — NOT a "character flaw." Ask directly; patients won't volunteer it.

⚠ **TRAP #9 — Apomorphine + ondansetron = deadly hypotension.** Use trimethobenzamide for nausea instead.

⚠ **TRAP #10 — Selegiline** is *selective* MAO-B only at LOW doses (≤ 10 mg/day). Higher doses = hypertensive crisis with tyramine.

⚠ **TRAP #11 — Tolcapone requires LFT monitoring** (black box). Entacapone does NOT — they look similar, but only tolcapone is hepatotoxic.

⚠ **TRAP #12 — Antipsychotics worsen PD.** If a PD patient hallucinates, typical neuroleptics block dopamine and worsen symptoms. Atypicals (quetiapine, clozapine, pimavanserin) are preferred.

⚠ **TRAP #13 — Darkened urine/sweat = harmless.** Don't mark it as "notify HCP." It's teaching, not a complication.

⚠ **TRAP #14 — Amantadine can cause livedo reticularis** (purplish skin mottling on legs) — benign, but often mistaken for a serious complication on exams.

10 Memory Boosters — Quick Recall

PD CARDINAL SIGNS

T · **R** · **A** · **P**

Tremor (resting, pill-rolling) · **R**igidity (cogwheel) · **A**kinesia/bradykinesia · **P**ostural instability

DOPAMINE AGONIST SIDE EFFECTS

D · **A** · **L** · **E**

Drowsiness (sleep attacks) · **A**ddictive/impulsive behaviors · **L**ow BP (orthostatic) · **E**dema + hallucinations

DRUG-CLASS SPELLING PATTERNS

-capone = COMT inhibitors (ent**acapone**, tol**capone**)
-giline = MAO-B inhibitors (sele**giline**, rasa**giline**)
-pexole / -nirole = Dopamine agonists (prami**pexole**, ropi**nirole**)

NEVER STOP SUDDENLY

"P · D = Please Don't Stop"

Abrupt withdrawal of ANY dopaminergic can trigger an **NMS-like crisis**. Always taper; dose even NPO patients.

FOODS TO AVOID WITH LEVODOPA

Think **"Protein Prevents Parkinson's Pills"** — high-protein meals block levodopa absorption at the BBB. Separate protein from dosing time.

SINEMET LOGIC

Sin (without) + **emet**ic (vomiting) = "without vomiting." Carbidopa prevents the nausea/vomiting that levodopa alone would cause peripherally.

Most Tested Drugs — Class Comparison

DRUG (GENERIC / BRAND)	CLASS	KEY POINT	#1 NCLEX PEARL
Levodopa-Carbidopa *Sinemet, Rytary*	Dopamine Precursor	Gold standard for PD. Crosses BBB → dopamine.	Avoid high-protein meals. Never stop abruptly.
Pramipexole *Mirapex*	Dopamine Agonist (non-ergot)	First-line in younger PD patients; also RLS.	Sleep attacks + impulse control disorders.
Ropinirole *Requip*	Dopamine Agonist (non-ergot)	Similar to pramipexole; also RLS.	Sudden daytime sleep → no driving.
Rotigotine *Neupro patch*	Dopamine Agonist (transdermal)	Continuous 24-hr delivery; good for dysphagia.	**Remove before MRI** (metal backing → burns).
Bromocriptine *Parlodel*	Dopamine Agonist (ergot)	Also for hyperprolactinemia + NMS treatment.	Ergot SE: fibrosis (pulmonary, cardiac), vasospasm.
Apomorphine *Apokyn*	Dopamine Agonist (SQ rescue)	Rescue for severe "off" episodes.	**NEVER with ondansetron** → profound hypotension.
Entacapone *Comtan, in Stalevo*	COMT Inhibitor	Extends levodopa action. Always paired.	Safe LFT-wise. Brown-orange urine discoloration.
Tolcapone *Tasmar*	COMT Inhibitor	Rarely used — reserved for refractory PD.	**BLACK BOX: hepatotoxicity** — monitor LFTs.
Selegiline *Eldepryl, Zelapar*	MAO-B Inhibitor	Selective for MAO-B at low doses.	> 10 mg/day → tyramine reaction risk.
Rasagiline *Azilect*	MAO-B Inhibitor	Once-daily; monotherapy or adjunct.	Avoid SSRIs, meperidine, tramadol → serotonin syndrome.

DRUG (GENERIC / BRAND)	CLASS	KEY POINT	#1 NCLEX PEARL
Amantadine *Symmetrel, Gocovri*	NMDA antagonist + dopamine releaser	Helps with drug-induced dyskinesias and tremor.	**Livedo reticularis** (purple skin mottling) — benign.

KEY CLASS DIFFERENCES

Levodopa = most effective but causes dyskinesias over time. Dopamine agonists = milder motor benefit but MORE sleep attacks + impulse issues. COMT-I = extends levodopa (tolcapone = hepatotoxic). MAO-B-I = mild, serotonin-syndrome risk. Amantadine = adjunct for dyskinesias.

Clinical Judgment Snapshot (NCJMM)

#1 PRIORITY RISK

Abrupt discontinuation → NMS-like syndrome (hyperthermia, muscle rigidity, altered mental status, autonomic instability). Dopaminergics must **never be stopped suddenly** — even in NPO, pre-op, or ICU patients. Arrange alternate route.

WHAT HARMS FIRST

Orthostatic hypotension → fall → hip fracture. This is the earliest, most common, most underestimated harm. Combined with PD gait disorder and possible sleep attacks, falls are the dominant near-term safety threat.

FIRST NURSING ACTION

In a scenario → **Assess first**: check BP lying/sitting/standing, assess mental status, motor symptoms, and last dose timing. Implement **fall precautions** and **hold + notify HCP** if signs of NMS, severe dyskinesia, hypotension, psychosis, or hepatotoxicity. Never give the next dose blindly — ***recognize cues → analyze → prioritize → act → evaluate.***

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