NGN NCLEX 2026 · VISUAL STUDY LIBRARY · PHARMACOLOGY / CARDIAC

Calcium Channel *Blockers* (CCBs)

Amlodipine · Nifedipine · Nicardipine · Felodipine · Verapamil · Diltiazem — a high-yield comparison covering mechanism, indications, routes, onset/peak, nursing care, side effects, and patient teaching.

CARDIAC PHARM | ANTIHYPERTENSIVES | ANTIANGINALS | ANTIDYSRHYTHMICS | DHP VS NON-DHP | NCJMM READY

Source transparency: This topic was not present in Student's uploaded notes. Content drawn from standard NGN NCLEX 2026 references — Saunders Comprehensive Review, ATI Pharmacology Made Easy, Lippincott Pharmacology, AHA/ACC Hypertension Guidelines, and current FDA prescribing information.

01 What Are Calcium Channel Blockers?

DEFINITION · OVERVIEW

- **Drug class** that blocks the L-type calcium channels in **cardiac muscle** and **vascular smooth muscle**, preventing calcium entry needed for contraction.
- Result: **vasodilation** (↓ BP, ↓ afterload), **↓ myocardial contractility**, and (for non-DHPs) **↓ SA/AV node conduction**.
- Used for **hypertension, angina, supraventricular dysrhythmias, Raynaud's, migraine prophylaxis**, and prevention of cerebral vasospasm.
- Two major subclasses with very different cardiac vs vascular selectivity — confusing them is a top NCLEX trap.

Two Subclasses

DIHYDROPYRIDINES (DHP) · "the -dipines"
Amlodipine · Nifedipine · Nicardipine · Felodipine
→ *Vascular selective — vasodilators*

NON-DIHYDROPYRIDINES (NON-DHP)
Verapamil · Diltiazem
→ *Cardiac selective — slow HR & conduction*

02

PATHOPHYSIOLOGY · MECHANISM

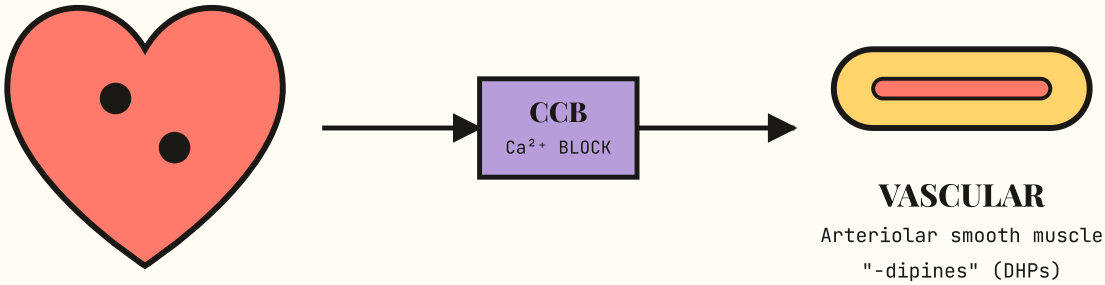
How CCBs Work — Step by Step

1 **Calcium normally enters** cardiac and vascular smooth muscle cells through L-type calcium channels during depolarization.

2 CCBs **bind the L-type channel** and block calcium entry into the cell.

3 Without intracellular calcium, **actin–myosin cross-bridging is reduced** → less contraction.

4 Effects diverge based on **tissue selectivity** of the drug subclass:



DHPs "-DIPINES"

- Strong **arterial vasodilation** → ↓ SVR → ↓ BP
- Coronary artery dilation → ↑ O_2 delivery
- **Reflex tachycardia** from BP drop
- **Peripheral edema** from precapillary vasodilation
- Minimal cardiac depression

Non-DHPs VERA · DILT

- **↓ SA node firing** → bradycardia
- **↓ AV node conduction** → controls SVT, A-fib rate
- **Negative inotrope** → ↓ contractility
- Mild vasodilation (less edema)
- **Verapamil** → **constipation** (smooth muscle of gut)

03

EFFECTS · SIDE EFFECTS · ADVERSE

What You'll See Clinically

Expected / Mild

Common

- **Hypotension** (therapeutic + side effect)
- **Headache** (vasodilation)
- **Dizziness** · lightheadedness
- **Flushing** (DHPs)
- **Peripheral edema** (ankles — esp. DHPs, dose-related)
- **Reflex tachycardia** (DHPs, esp. short-acting nifedipine)
- **Constipation** (verapamil — significant)
- **Gingival hyperplasia** (nifedipine, verapamil — long-term)
- **Nausea** , fatigue

Red Flags / Severe

REPORT

- ▲ **HR < 60 bpm** with verapamil/diltiazem — hold & call HCP
- ▲ **SBP < 90 mmHg** or symptomatic hypotension
- ▲ **New or worsening heart failure** — dyspnea, crackles, weight gain ↑2 lb/day
- ▲ **2nd- or 3rd-degree AV block** on ECG
- ▲ **Severe hypotension / shock** — esp. IV verapamil/diltiazem too fast
- ▲ **Worsening angina** — paradoxical reaction with immediate-release nifedipine
- ▲ **Hepatotoxicity** — jaundice, ↑ liver enzymes
- ▲ **Stevens-Johnson syndrome** (rare, diltiazem)
- ▲ **Pulmonary edema** (especially with HFrEF + non-DHP)

04

PRIORITY NURSING INTERVENTIONS · ABC FRAMEWORK

What the Nurse Does

A

AIRWAY

- Assess for **dyspnea, crackles** — signs of pulmonary edema / HF exacerbation
- Monitor **SpO_2**, RR, lung sounds — especially with non-DHPs in HF risk
- Position **HOB ↑** if respiratory distress

B

BREATHING & CIRCULATION

- **HR & BP before every dose** — hold if HR < 60 or SBP < 90 (verify parameters)
- **Continuous ECG** for IV verapamil / diltiazem — watch for AV block, asystole
- Assess for **peripheral edema**, weight, JVD daily
- Monitor **apical pulse 1 full minute**

C

COMFORT & SAFETY

- **Fall precautions** — orthostatic hypotension risk
- Rise **slowly**; sit on edge of bed before standing
- **Bowel regimen** for verapamil (fiber, fluids, stool softener)
- Mouth care & **dental visits q 6 mo** (gingival hyperplasia)

SAFETY RULES

1. **Never crush extended-release (ER/XL/SR) tablets** — dose dumping causes severe hypotension.
2. **Hold & notify HCP** if HR < 60 bpm (non-DHP) or SBP < 90 mmHg (any CCB).
3. **IV push verapamil/diltiazem must be slow** (over 2–3 min) — rapid push = asystole/hypotension.
4. **Do not give non-DHP + IV beta-blocker together** — additive bradycardia, heart block, asystole.
5. **Avoid grapefruit juice** — inhibits CYP3A4 → toxic drug levels (especially felodipine, nifedipine).
6. **Immediate-release nifedipine is NOT for hypertensive crisis** — risk of MI/stroke from precipitous BP drop.

05

PHARMACOLOGY · DRUG-BY-DRUG COMPARISON

The Six CCBs Side-by-Side

DRUG	INDICATIONS	ROUTE	ONSET / PEAK	KEY ADVERSE EFFECTS	HALLMARK NURSING PEARL
Amlodipine Norvasc DHP	HTN, chronic stable angina, vasospastic (Prinzmetal's) angina	PO only	Onset 30–50 min Peak 6–12 h t½ 30–50 h (long)	Peripheral edema (very common), flushing, headache, dizziness, reflex tachycardia	Long half-life — **once-daily dosing**. Take with or without food. Watch ankle edema; not HF.
Nifedipine Procardia, Adalat DHP IR NOT FOR HTN CRISIS	HTN, angina, Raynaud's phenomenon	PO (IR & XL/CC)	IR onset 20 min, peak 30 min XL onset 6 h	Marked reflex tachycardia (IR), flushing, edema, **gingival hyperplasia**, headache	**Never crush XL/CC** tablets. Avoid grapefruit. Use ER form for chronic dosing.
Nicardipine Cardene, Cardene IV DHP	HTN (incl. **hypertensive emergency IV**), chronic stable angina	PO, **IV infusion**	IV onset 5–15 min PO peak 30 min–2 h	Headache, flushing, edema, hypotension, **phlebitis at IV site**	**Change peripheral IV site q 12 h** to prevent phlebitis. Continuous BP & ECG monitoring with IV.
Felodipine Plendil DHP	Hypertension	PO (ER only)	Onset 2–5 h Peak 2.5–5 h	Headache, edema, flushing, gingival hyperplasia	**Grapefruit juice dramatically ↑ levels** (avoid strictly). Avoid high-fat meals (alters absorption). Swallow whole.
Verapamil Calan, Isoptin, Verelan NON-DHP	HTN, angina, **SVT**, atrial fibrillation/flutter rate control, migraine prophylaxis	PO, IV	PO onset 30 min, peak 1–2 h IV onset 1–2 min	**Bradycardia, AV block**, ↓ contractility, **constipation (HALLMARK)**, hepatotoxicity, gingival hyperplasia	↑ **Digoxin levels** (toxicity risk). Avoid in HFrEF, 2°/3° AV block, sick sinus syndrome. **Fiber + fluids** for constipation.
Diltiazem Cardizem, Tiazac NON-DHP	HTN, angina, **SVT**, atrial fibrillation/flutter rate control	PO, IV (bolus & drip)	PO onset 30–60 min IV onset 3 min	Bradycardia, AV block, hypotension, edema, headache (less constipation than verapamil)	IV drip titrated for A-fib rate control. **Monitor ECG continuously**. Less GI effect than verapamil.

⚡ Special Considerations Per Drug

AMLODIPINE — TEACHING

Take at same time daily. Report swelling, palpitations. Effect builds over 1–2 weeks due to long half-life.

NICARDIPINE IV — NURSING

Dilute per protocol. Use dedicated line if possible. Monitor BP q 5 min during titration. Rotate site q 12 h.

NIFEDIPINE — TEACHING

Use ER form. Avoid grapefruit. Brush/floss daily — schedule dental cleaning q 6 mo. Do not chew/crush XL.

FELODIPINE — TEACHING

Empty stomach or light meal. Strict NO GRAPEFRUIT

. Swallow whole — never split/crush.

VERAPAMIL — CRITICAL INTERACTIONS

↑ Digoxin levels · ↑ Statin levels (simvastatin max 10 mg) · Beta-blockers → severe bradycardia · Grapefruit ↑ levels.

DILTIAZEM — CRITICAL INTERACTIONS

Same CYP3A4 cautions as verapamil. ↑ cyclosporine, carbamazepine levels. Use with beta-blocker only with close monitoring.

06

NCLEX TEST TRAPS · WRONG VS RIGHT

Where Students Lose Points

WRONG

"The patient on amlodipine has ankle edema — must be heart failure. **Stop the drug and assess for HF.**"

RIGHT

DHP-induced edema is from **precapillary vasodilation**, NOT volume overload. **Assess for HF signs (crackles, dyspnea, JVD); if absent, document, elevate legs, notify HCP for possible dose adjustment.**

WRONG

"Patient with hypertensive crisis needs rapid BP control — **give sublingual immediate-release nifedipine.**"

RIGHT

IR nifedipine is **contraindicated for hypertensive emergencies** — causes uncontrolled BP drops, MI, stroke. **Use IV nicardipine, labetalol, or nitroprusside instead.**

WRONG

"Pre-medication HR is 58 — but the patient feels fine, so **give the verapamil.**"

RIGHT

Hold the dose (HR < 60) and notify HCP. Non-DHPs slow the SA/AV node — giving with bradycardia risks heart block and arrest.

WRONG

"Patient takes verapamil and digoxin — **both are heart drugs, so the combination is appropriate.**"

RIGHT

Verapamil **↑ digoxin levels by 70–100%**. Monitor for **dig toxicity**: anorexia, N/V, yellow-green halos, bradycardia. HCP usually ↓ digoxin dose by half.

WRONG

"Patient on diltiazem ER asks to **crush the tablet** for easier swallowing."

RIGHT

Never crush ER/XL/SR/CD formulations — releases the entire 24-hour dose at once → profound hypotension, bradycardia, syncope. Switch to liquid or different form.

WRONG

"IV diltiazem is ordered — push it like other IV medications, **over 30 seconds.**"

RIGHT

Push slowly over at least 2 minutes (3 min in elderly). Have **continuous ECG and BP**. Have IV calcium gluconate and atropine available for severe bradycardia/hypotension.

WRONG

"Patient with HFrEF needs HTN control — **start verapamil since it's a strong antihypertensive.**"

RIGHT

Non-DHPs are **contraindicated in HFrEF** — negative inotropic effect worsens systolic dysfunction. Use **amlodipine** (DHP, neutral in HF) if a CCB is needed.

07

PATIENT & FAMILY EDUCATION

What to Teach Before Discharge

Avoid grapefruit juice
Inhibits CYP3A4 → toxic drug levels. Especially critical for felodipine and nifedipine.

Rise slowly
Sit on the edge of the bed before standing. Orthostatic hypotension can cause falls.

Never stop abruptly
Rebound hypertension or angina. Taper under HCP guidance only.

Swallow ER tablets whole
Do not crush, chew, or split. If swallowing is hard, ask HCP for alternative.

Check BP & pulse at home
Record daily. Report HR < 50, SBP < 90, or readings outside HCP-set range.

Fiber, fluids, walk
For verapamil-related constipation: ↑ fiber to 25–30 g/day, 8 glasses water, daily ambulation.

Dental hygiene q 6 months
Brush, floss, professional cleanings — prevents gingival hyperplasia (nifedipine, verapamil).

Report immediately
Swelling that doesn't resolve with leg elevation, dyspnea, fainting, weight gain ↑ 2 lb/day, chest pain.

Tell every provider
Many drugs interact with CCBs (statins, digoxin, beta-blockers, antifungals, antibiotics). Always bring a med list.

Lifestyle still matters
Low-sodium diet (< 2,300 mg/day), DASH eating pattern, ≥ 150 min/wk moderate exercise, no smoking, alcohol in moderation.

08

MEMORY BOOSTERS · MNEMONICS

Quick Pattern Recognition

"-DIPINE = DILATE"

D · D · D

Any drug ending in "**-dipine**" is a DHP — they **D**ilate vessels and cause **D**ependent edema and **D**izziness.

"Very Nice Drugs"

V · N · D

The non-dihydropyridines slow the heart: **V**erapamil + diltiaze**m** work on **N**odes (SA, AV).

VERAPAMIL = "VERY CONSTIPATED"

CON-STI-PA-TION

Of all the CCBs, verapamil is the king of constipation. It blocks smooth-muscle Ca^{2+} in the gut too.

"ABCD" of Side Effects

A·B·C·D

- **A** nkle edema (DHPs)
- **B** radycardia (Non-DHPs)
- **C** onstipation (verapamil)
- **D** izziness / hypotension

Hold Rules — "6090"

HR < 60 · SBP < 90

Hold non-DHPs (verapamil/diltiazem) if pulse below 60; hold any CCB if SBP below 90.

GRAPEFRUIT = GROUND

CYP3A4 STOP

Grapefruit "grounds" the metabolism enzyme — drug levels skyrocket. Especially with **felodipine & nifedipine**.

09

NCJMM · NEXT GENERATION CLINICAL JUDGMENT

Full 6-Step Clinical Judgment Walkthrough

📋 Scenario

A 72-year-old female with a history of hypertension and atrial fibrillation was started on **verapamil 80 mg PO TID** three days ago. She arrives at the clinic reporting **dizziness when standing**, has not had a bowel movement in 4 days, and feels "wiped out." She also takes digoxin 0.125 mg daily and metoprolol 25 mg BID.

BP	HR	RR	SpO_2
98/58 mmHg	48 bpm, irregular	18	96% RA

1 RECOGNIZE

Recognize Cues

Identify relevant data from the assessment:

- → **Bradycardia** (HR 48) — well below the hold parameter
- → **Hypotension** (BP 98/58) and orthostatic symptoms
- → **Constipation** × 4 days
- → Fatigue ("wiped out")
- → **High-risk combination:** verapamil + digoxin + metoprolol

2 ANALYZE

Analyze Cues

Connect cues to underlying pathophysiology:

- → Verapamil + metoprolol → **additive negative chronotropy** = severe bradycardia / AV block risk
- → Verapamil ↑ digoxin levels → **possible digoxin toxicity** compounding bradycardia
- → Verapamil's smooth-muscle effect on bowel → constipation
- → Hypotension + bradycardia → ↓ cardiac output → fatigue, dizziness

3 PRIORITIZE

Prioritize Hypotheses

Most likely → least likely (life-threat first):

- → **#1 Drug-induced bradycardia & AV conduction impairment** (verapamil + beta-blocker combo) — risk of complete heart block
- → **#2 Possible digoxin toxicity** from verapamil interaction
- → **#3 Symptomatic hypotension** with fall risk
- → **#4 Adverse drug effect — constipation** (uncomfortable but not immediately dangerous)

4 SOLUTIONS

Generate Solutions

Expected goals for this patient:

- → HR > 60 bpm, BP within HCP-set range
- → Resolution of dizziness; no syncope or falls
- → Effective rate control for A-fib without bradycardia

→Daily bowel movement with non-stimulant softener if needed

→Therapeutic digoxin level (0.5–0.9 ng/mL for HF; < 2.0 ng/mL)

5 ACTIONS

Take Action

Nurse implements (in priority order):

→**Hold** the next dose of verapamil and metoprolol — notify HCP **immediately**

→Obtain **12-lead ECG** — assess for AV block

→Draw **digoxin level**, BMP (K^+, Mg^{2+}, renal function)

→Establish IV access; have atropine and IV fluids ready

→Place on continuous cardiac monitor; reassess VS q 15 min

→Anticipate orders: ↓ verapamil dose, ↓ or hold digoxin, possible switch to diltiazem ER or alternative rate-control

→Educate on safe ambulation; constipation management (fiber, hydration, docusate)

6 EVALUATE

Evaluate Outcomes

Effectiveness criteria within 24–48 hours:

→HR sustained > 60 bpm; SBP > 100 mmHg

→No syncope, no further dizziness on standing

→ECG shows no new AV block

→Digoxin level within therapeutic range

→Bowel movement within 24 h of intervention

→Patient verbalizes understanding of hold parameters, grapefruit avoidance, and when to call HCP