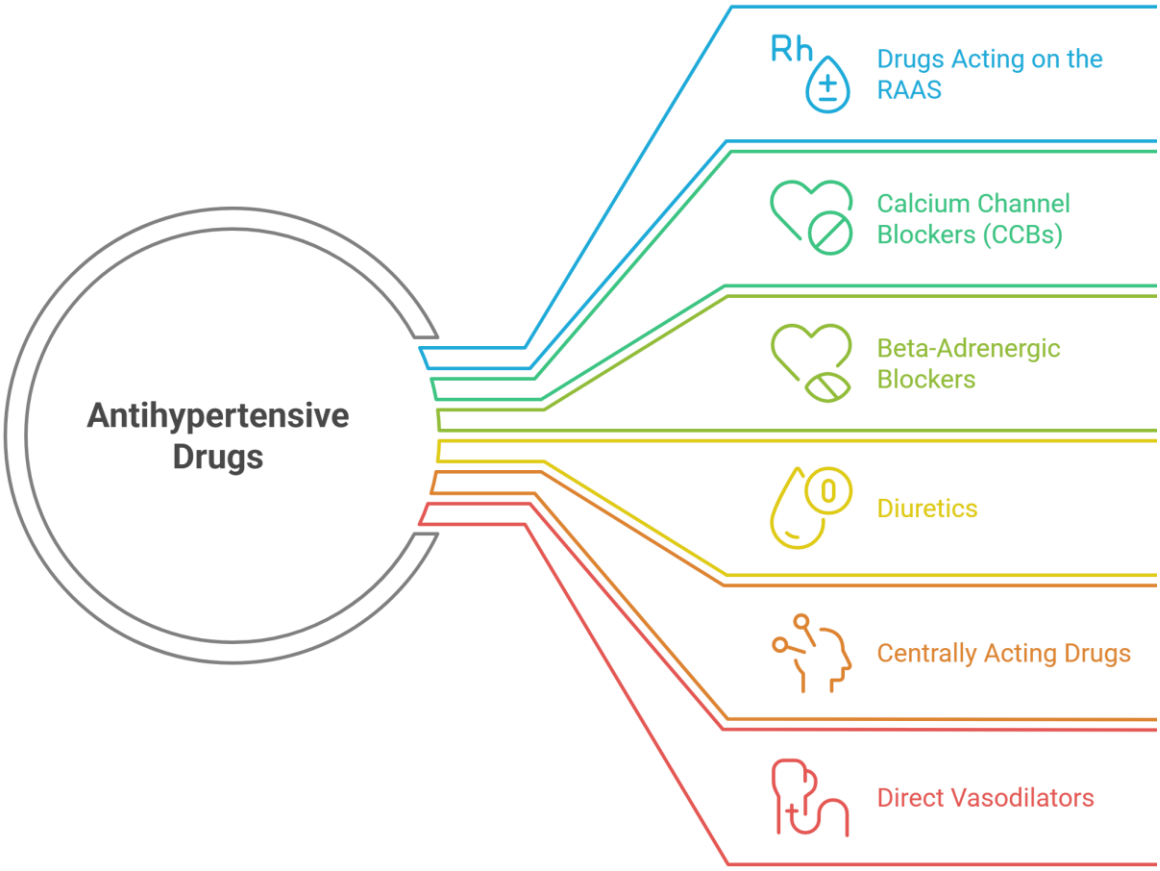
Drugs Acting on the Cardiovascular System

Anti-Hypertensive Drugs

Definition

- Antihypertensive drugs are medications that **lower elevated arterial blood pressure** to prevent complications like **stroke, myocardial infarction, renal failure, and heart failure**.

Classification



A. Drugs Acting on the Renin-Angiotensin-Aldosterone System (RAAS)

- **ACE inhibitors:** Enalapril, Lisinopril
- **Angiotensin II receptor blockers (ARBs):** Losartan, Telmisartan
- **Direct renin inhibitors:** Aliskiren
- **Aldosterone antagonists:** Spironolactone, Eplerenone

B. Calcium Channel Blockers (CCBs)

- *Dihydropyridines:* Amlodipine, Nifedipine (vascular-selective)
- *Non-dihydropyridines:* Verapamil, Diltiazem (cardiac + vascular)

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C. Beta-Adrenergic Blockers

- Non-selective: Propranolol
- β1-selective: Atenolol, Metoprolol
- With α-blocking activity: Labetalol, Carvedilol

D. Diuretics

- **Thiazide diuretics:** Hydrochlorothiazide, Chlorthalidone
- **Loop diuretics:** Furosemide (used in resistant hypertension)
- **Potassium-sparing diuretics:** Amiloride, Spironolactone

E. Centrally Acting Drugs

- **α2-agonists:** Clonidine, Methyldopa

F. Direct Vasodilators

- **Hydralazine, Minoxidil**

Pharmacological Actions

- **ACE inhibitors/ARBs:** ↓ Angiotensin II → vasodilation, ↓ aldosterone
- **CCBs:** Block L-type calcium channels → vasodilation, ↓ cardiac contractility
- **Beta-blockers:** ↓ HR, ↓ renin, ↓ cardiac output
- **Diuretics:** ↓ plasma volume and peripheral resistance
- **Central agents:** ↓ sympathetic outflow
- **Vasodilators:** Relax arterial smooth muscle → ↓ TPR

Dose *(Examples)*

Drug	Dose Range
Amlodipine	5–10 mg once daily
Losartan	50–100 mg/day
Enalapril	5–20 mg/day
Metoprolol	25–100 mg twice daily
Hydrochlorothiazide	12.5–25 mg/day
Clonidine	0.1–0.3 mg twice daily

Indications

- **Primary hypertension (essential)**
- **Secondary hypertension** (e.g., due to renal disease)

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- **Hypertensive emergencies** (e.g., IV Labetalol, Nitroprusside)
- **Heart failure, MI** (ACE inhibitors, beta-blockers)
- **CKD with proteinuria** (ACE inhibitors/ARBs)

Contraindications

Contraindications:

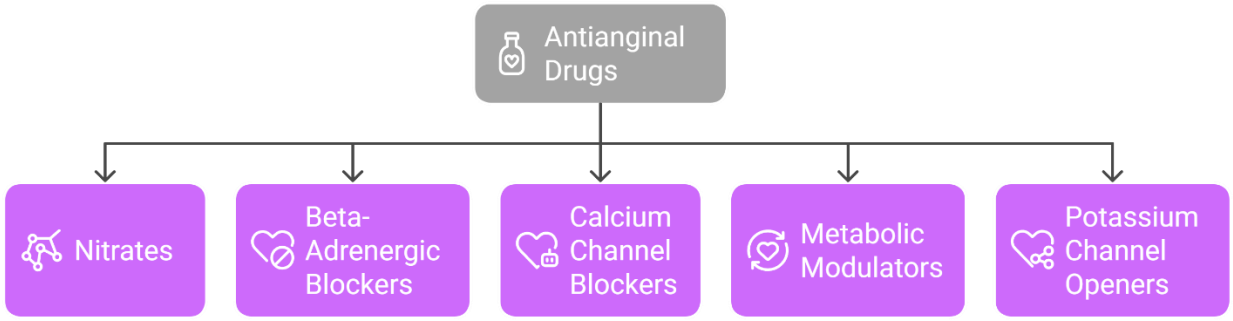
- **ACE inhibitors**: Pregnancy, bilateral renal artery stenosis, history of angioedema
- **Beta-blockers**: Asthma, bradycardia, atrioventricular (AV) block
- **CCBs (non-DHPs)**: Heart block, heart failure
- **Diuretics**: Gout (especially with thiazides), electrolyte imbalance
- **Alpha-2 agonists**: Depression (Clonidine), liver disease (Methyldopa)
- **Vasodilators**: Lupus-like syndrome (Hydralazine), hirsutism (Minoxidil)

Anti-Anginal Drugs

Definition

- Anti-anginal drugs are medications used to **prevent or relieve angina pectoris** (chest pain due to myocardial ischemia), by improving **oxygen supply** to the heart or **reducing oxygen demand**.

Classification



A. Nitrates

- *Short-acting:* Nitroglycerin (sublingual)
- *Long-acting:* Isosorbide dinitrate, Isosorbide mononitrate

B. Beta-Adrenergic Blockers

- Atenolol, Metoprolol, Propranolol

C. Calcium Channel Blockers

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- *Dihydropyridines:* Amlodipine, Nifedipine
- *Non-DHPs:* Verapamil, Diltiazem

D. Metabolic Modulators (Late sodium current inhibitors)

- Ranolazine, Trimetazidine

E. Potassium Channel Openers

- Nicorandil

Pharmacological Actions

- **Nitrates:** Venodilation → ↓ preload; arteriolar dilation → ↓ afterload; coronary vasodilation
- **Beta-blockers:** ↓ HR, ↓ contractility → ↓ O_2 demand
- **CCBs:** ↓ afterload (DHP), ↓ HR and contractility (non-DHP), coronary vasodilation
- **Ranolazine:** Improves cardiac metabolism without changing HR/BP
- **Nicorandil:** Nitrate + K^+ channel opening → vasodilation

Dose *(Examples)*

Drug	Typical Dose
Nitroglycerin (SL)	0.3–0.6 mg, repeat every 5 mins up to 3 doses
Isosorbide dinitrate	10–40 mg 2–3 times/day
Atenolol	25–100 mg/day
Amlodipine	5–10 mg/day
Ranolazine	500–1000 mg twice daily

Indications

- **Stable (exertional) angina**
- **Unstable angina** (part of acute coronary syndrome)
- **Variant (Prinzmetal's) angina** – CCBs and nitrates preferred
- **Post-MI** (Beta-blockers, nitrates)
- **Prophylaxis of exercise-induced angina**

Contraindications

- **Nitrates**: Hypotension, concurrent use of PDE-5 inhibitors (e.g., sildenafil) → risk of severe hypotension

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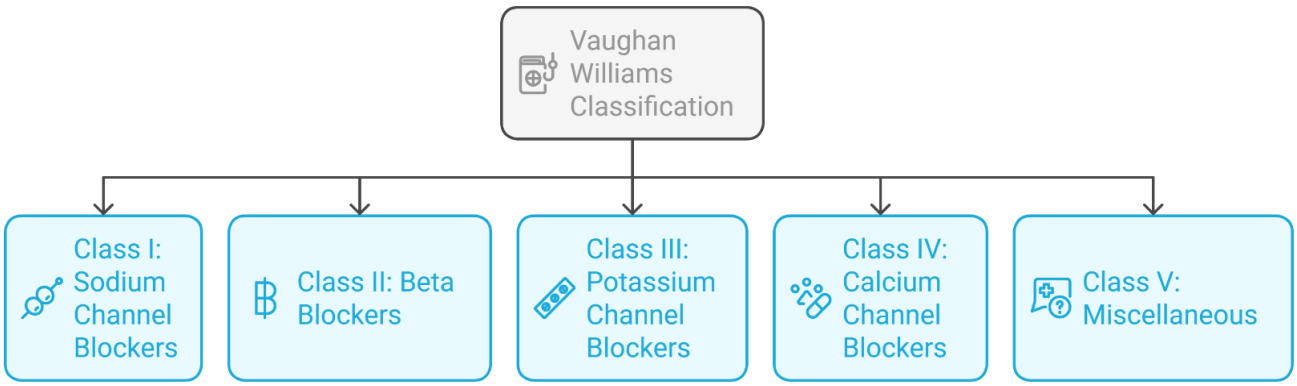
- **Beta-blockers**: Asthma, bradycardia, atrioventricular (AV) block
- **Non-DHP CCBs (Calcium Channel Blockers)**: Bradyarrhythmias, heart failure
- **Ranolazine**: Liver cirrhosis, QT prolongation
- **Nicorandil**: Hypotension, active peptic ulcer disease

Anti-Arrhythmic Drugs

Definition

- Anti-arrhythmic drugs are medications used to **suppress abnormal heart rhythms** (arrhythmias) and **restore normal sinus rhythm** or **control heart rate** by affecting cardiac **electrical conduction pathways**.

Classification (Vaughan Williams Classification)



Class I – Sodium Channel Blockers

- **IA:** Quinidine, Procainamide, Disopyramide
- **IB:** Lidocaine, Mexiletine
- **IC:** Flecainide, Propafenone

Class II – Beta Blockers

- Propranolol, Metoprolol, Esmolol

Class III – Potassium Channel Blockers

- Amiodarone, Sotalol, Dofetilide, Ibutilide

Class IV – Calcium Channel Blockers (non-DHP)

- Verapamil, Diltiazem

Class V – Miscellaneous

- Adenosine

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