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Cardiovascular Drugs

Pharmacology

Antihypertensives, antianginal drugs, antiarrhythmics, cardiac glycosides, diuretics, vasodilators, anticoagulants and antiplatelet drugs.

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CHAPTER 08 / PHARMACOLOGY 08. Cardiovascular Drugs

1. Introduction

Cardiovascular medicines act on blood pressure, cardiac contractility, electrical conduction, vascular tone, volume regulation, coagulation and lipid metabolism. Treatment selection depends on diagnosis, comorbidities, haemodynamics, laboratory results and patient preferences.

2. Antihypertensive drugs

Class / example	Mechanism and uses	Adverse effects and monitoring
ACE inhibitors - enalapril, ramipril	Reduce angiotensin II and aldosterone; hypertension, selected HF and CKD	Cough, hyperkalaemia, renal function changes, angioedema; avoid pregnancy.
ARBs - losartan, telmisartan	Block AT1 receptors; hypertension and selected HF/CKD	Hyperkalaemia, renal changes, hypotension; avoid pregnancy.
Dihydropyridine CCB - amlodipine	Arterial smooth muscle relaxation	Ankle oedema, headache, flushing.
Non-dihydropyridine CCB - verapamil, diltiazem	Slow AV conduction and reduce contractility	Bradycardia, AV block, constipation; caution in systolic HF.
Thiazide-like - chlorthalidone	Reduce sodium reabsorption distally	Hyponatraemia, hypokalaemia, gout; monitor electrolytes.
Beta-blockers - bisoprolol, metoprolol	Reduce cardiac stimulation and renin	Bradycardia, hypotension, bronchospasm; selected indications.
Central or direct agents - clonidine, hydralazine	Reduce sympathetic tone or vascular resistance	Sedation/rebound BP or reflex tachycardia; drug-specific monitoring.

A single measurement does not ordinarily establish chronic hypertension. Assess orthostatic symptoms; do not give an extra dose solely because of one elevated reading without clinical review. Severe BP elevation with acute organ injury requires emergency assessment.

3. Antianginal and vasodilator drugs

Nitrates (glyceryl trinitrate, isosorbide mononitrate) generate nitric oxide signalling, producing mainly venodilation and reducing cardiac preload. They relieve selected anginal symptoms. Headache, dizziness and hypotension are common. Combination with phosphodiesterase-5 inhibitors can produce profound hypotension and is contraindicated within product-specific intervals. Nitrate-free intervals may be prescribed to limit tolerance. Beta-blockers and calcium channel blockers reduce myocardial oxygen demand or improve coronary blood flow. Ranolazine has selected antianginal use with QT and interaction precautions. New or persistent chest pain requires urgent assessment for acute coronary syndrome rather than repeated unsupervised dosing.

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4. Antiarrhythmic drugs

Vaughan Williams class	Example and effect
I - Sodium-channel blockers	Lidocaine (IB), flecainide (IC); selected rhythm-specific indications.
II - Beta-blockers	Metoprolol, esmolol; reduce sympathetic and AV nodal effects.
III - Potassium-channel effects	Amiodarone, sotalol; prolong repolarization; mixed actions possible.
IV - Calcium-channel blockers	Verapamil, diltiazem; slow AV nodal conduction.
Other agents	Adenosine transiently blocks AV nodal conduction; digoxin slows AV conduction.

Antiarrhythmics may themselves provoke arrhythmias. Monitor rhythm, QT interval when appropriate, electrolytes and haemodynamics. Amiodarone can affect thyroid, liver, lungs and eyes and interacts with many medicines. Adenosine is used for selected regular tachycardias under monitored protocols, not for every fast rhythm.

5. Cardiac glycosides and heart failure drugs

Digoxin inhibits Na+/K+-ATPase, increasing intracellular calcium and contractility, and enhances vagal effects on the AV node. It has selected uses for symptomatic HF and ventricular rate control. Toxicity may present with nausea, visual changes, confusion, bradycardia or arrhythmias; renal impairment and hypokalaemia increase risk. Check rate/rhythm, renal function, potassium and appropriately timed levels when indicated. Severe toxicity may require digoxin immune Fab.

For selected heart failure with reduced ejection fraction, foundational medicine groups include an ARNI or ACE inhibitor/ARB, evidence-based beta-blocker, mineralocorticoid receptor antagonist and SGLT2 inhibitor. Loop diuretics relieve congestion. These require individualized initiation, titration and monitoring, not all at fixed doses.

6. Diuretics

Class	Examples	Key effect / risk
Loop	Furosemide (frusemide), torsemide	Potent natriuresis; dehydration, low potassium/magnesium; ototoxicity risk.
Thiazide / thiazide-like	Hydrochlorothiazide, indapamide	Distal sodium loss; low sodium/potassium, urate rise.
Potassium-sparing	Spironolactone, eplerenone, amiloride	Hyperkalaemia; spironolactone may cause endocrine effects.
Osmotic	Mannitol	Selected raised intracranial pressure; fluid shifts, renal and cardiac risks.

7. Anticoagulants and antiplatelets

Heparin and LMWH enhance antithrombin activity; warfarin reduces vitamin-K-dependent clotting factors; DOACs inhibit factor Xa or thrombin. They reduce clot formation and extension but do not directly dissolve existing clots. Aspirin inhibits platelet COX-1; clopidogrel inhibits P2Y12 receptors. Major shared risk is bleeding. See Chapter 09 for monitoring and reversal concepts.

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8. Lipid-lowering drugs

Statins inhibit HMG-CoA reductase, increasing hepatic LDL clearance; monitor muscle symptoms and relevant liver findings. Ezetimibe reduces intestinal cholesterol absorption. PCSK9-targeting agents increase LDL receptor availability. Fibrates mainly reduce triglycerides; combined treatment requires interaction review. The prevention goal is reduction of cardiovascular risk, not treating laboratory numbers alone.

9. Nursing responsibilities

Assess BP, pulse, ECG, perfusion, oedema, weight, renal function and electrolytes. Monitor dizziness, falls, bleeding, drug interactions and adherence. Teach home monitoring and symptom escalation. Verify agent-specific hold parameters rather than using one universal pulse or BP threshold.

10. Examination questions

Long answer questions

1. 1. Classify antihypertensive drugs with mechanisms and nursing care.
2. 2. Discuss antianginal, antiarrhythmic and heart failure medicines.

Short answer questions

- ACE inhibitors; nitrates; digoxin toxicity; loop diuretics; statins; anticoagulants versus antiplatelets.

Very short answer questions

- Common ACE inhibitor adverse effect? - Dry cough.
- Antidote for severe digoxin toxicity? - Digoxin immune Fab.
- Major risk with spironolactone? - Hyperkalaemia.

11. Quick revision

ACE inhibitors/ARBs require potassium and renal monitoring; nitrates interact with PDE5 inhibitors; digoxin has a narrow therapeutic window. Rhythm-specific drugs must be selected from the ECG and clinical condition. Observe bleeding risk with antithrombotics.

Conclusion

Cardiovascular drug administration depends on accurate haemodynamic assessment, interaction review, laboratory monitoring and recognition of urgent deterioration.

Practice questions

Choose one best answer. The answer key and explanations follow the questions.

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1. Which electrolyte disturbance requires monitoring with ACE inhibitors?

A. Hypocalcaemia

B. Hypernatraemia

C. Hypophosphataemia

D. Hyperkalaemia

2. Why is combining a nitrate with a phosphodiesterase-5 inhibitor dangerous?

A. It can produce profound hypotension

B. It reliably causes severe hypertension

C. It prevents all nitrate absorption

D. It eliminates the need for chest-pain assessment

3. Which action is characteristic of verapamil and diltiazem?

A. Promote fibrin clot breakdown

B. Slow AV conduction and reduce contractility

C. Increase cardiac beta-1 stimulation

D. Increase renal sodium reabsorption

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Answer key and explanations

1. D - Hyperkalaemia

ACE inhibitors can cause hyperkalaemia and renal function changes.

2. A - It can produce profound hypotension

The combination can markedly lower blood pressure and is contraindicated within product-specific intervals.

3. B - Slow AV conduction and reduce contractility

Non-dihydropyridine calcium-channel blockers slow AV conduction and reduce contractility.

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