Cardiovascular Medications

Cardiovascular medications treat hypertension, heart failure, arrhythmias, and coronary artery disease. The main classes include antihypertensives (ACE inhibitors, ARBs), beta-blockers (metoprolol), diuretics, anticoagulants/antiplatelet agents (aspirin, DOACs), and nitroglycerin. They require close medical supervision due to potential side effects.

Here is an overview of the main classes of cardiovascular medications:

• Antihypertensives:
o Angiotensin-converting enzyme (ACE) inhibitors: Captopril, Enalapril, Ramipril (treat hypertension and heart failure).

o Angiotensin II receptor blockers (ARBs or Sartans): Losartan, Valsartan.

• Beta-blockers: Bisoprolol, Metoprolol (Seloken), Atenolol (Tenormine), Propranolol (Avlocardyl).

• Diuretics: Reduce blood pressure and water retention.

• Medications for heart failure and rhythm:

• Antiarrhythmics: Amiodarone, Flecainide.

• Digitalis glycosides: Digoxin (for heart rate).

• SGLT2 inhibitors (Gliflozins): Recently used for heart failure.
• Anticoagulants and Antiplatelet Agents (Blood Thinners):
o Antiplatelet agents: Aspirin, Clopidogrel (prevention of blood clots, particularly after stent placement).

o Direct oral anticoagulants (DOACs): Apixaban, Rivaroxaban.

o Vitamin K antagonists (VKAs): Prevention of blood clotting.

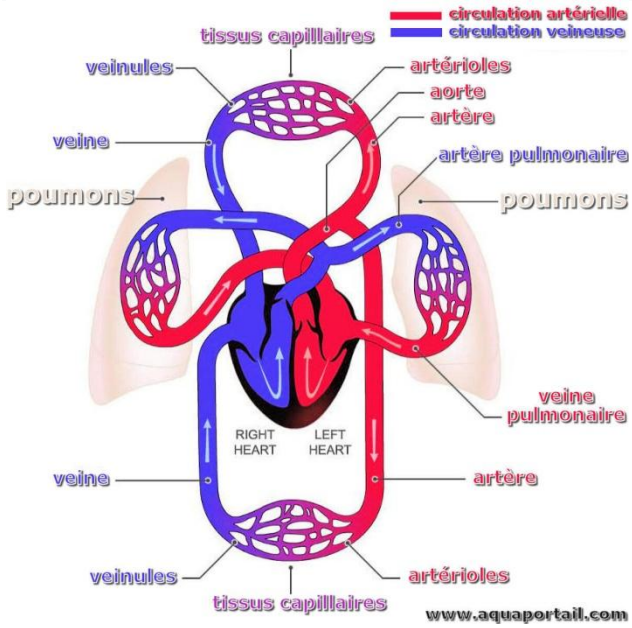
• Treatments for Angina Pectoris (Angina):
o Nitrates (Nitrate Derivatives): Nitroglycerin (trinitroglycerin) to dilate the coronary arteries.

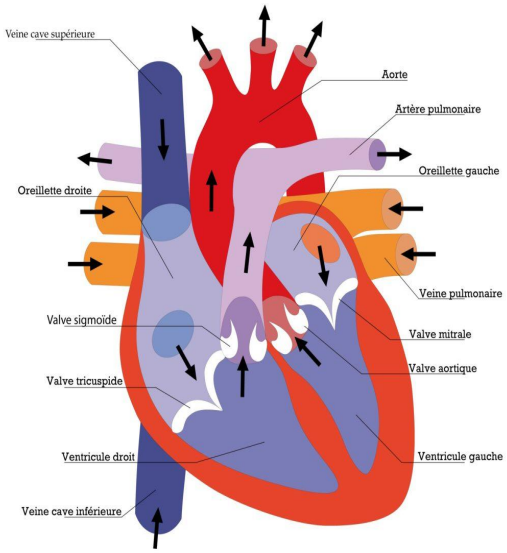
Important points:

• Never stop treatment without medical advice.

• Risks of side effects: bleeding (anticoagulants), dry cough (ACE inhibitors), dizziness or fatigue

Cardiovascular System





The cardiovascular system is a closed network composed of the heart (pump) and blood vessels (arteries, veins, capillaries). It ensures the distribution of oxygen and nutrients to the organs while eliminating their waste products, notably carbon dioxide, through blood circulation.

Components of the system:

• The heart: A hollow muscle (myocardium) with four chambers (2 atria, 2 ventricles) divided into two hearts (right and left).

• Arteries: Vessels carrying blood from the heart to the organs (oxygenated blood into the systemic circulation, deoxygenated blood to the lungs).

• Veins: Vessels returning blood from the organs to the heart.

• Capillaries: Fine vessels connecting arterioles and venules, where gas and nutrient exchange takes place.

Functioning (both circuits):
1. Pulmonary circulation: The right ventricle sends deoxygenated blood to the lungs via the pulmonary artery, where it is reoxygenated.

2. Systemic circulation: The left ventricle pumps oxygenated blood throughout the body via the aorta, ensuring tissue nourishment.
This system also regulates body temperature and hormone transport.
Cardiovascular Diseases
Cardiovascular diseases, the leading cause of death worldwide, affect the heart and blood vessels, often due to atherosclerosis (cholesterol deposits). They primarily include coronary artery disease (heart attack, angina), stroke, heart failure, hypertension, and arrhythmias.

According to Wikipedia, the main categories and examples of these diseases are:

• Coronary and arterial diseases: Myocardial infarction, angina, atherosclerosis.

• Cerebrovascular diseases: Stroke.

• Heart muscle diseases (cardiomyopathies): Conditions that impair the heart's pumping function.

• Rhythm disorders (arrhythmias): Atrial fibrillation, tachycardia.

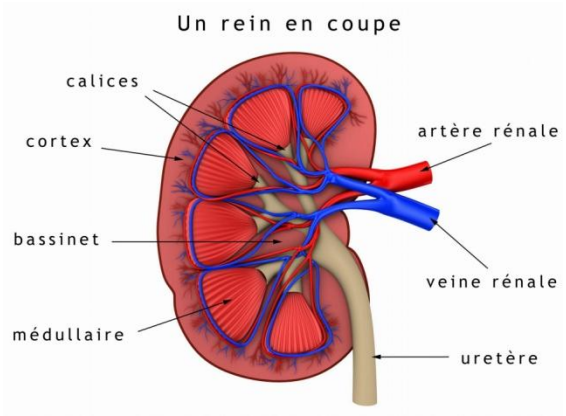
• Valve diseases (valvulopathies): Aortic stenosis.

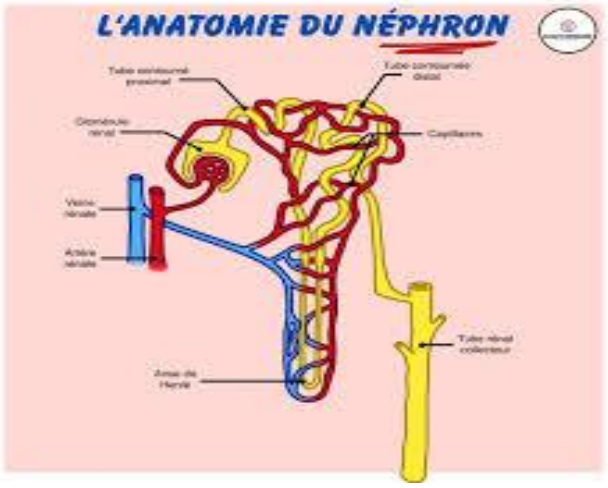
• Peripheral vascular diseases: Peripheral artery disease, phlebitis.

• Diseases of the pericardium: Pericarditis.

Risk factors and prevention:
The major causes are smoking, poor diet, lack of physical activity, and hypertension. Prevention relies on a healthy lifestyle, a balanced diet, and regular medical checkups.

Renal system





The renal system, composed primarily of the two kidneys, is essential for blood purification, filtering approximately 190 liters per day to eliminate metabolic waste products (urea, creatinine) via urine. It maintains homeostasis by regulating water, electrolytes (sodium, potassium), and blood pH, while also producing key hormones (renin, erythropoietin).

Here are the key aspects of the renal system:
• Anatomy: Located in the posterior abdomen, each kidney contains more than one million nephrons, the functional units composed of a glomerulus (filter) and tubules.

• Main functions:
o Filtration: Removal of toxic waste products from the blood.
o Fluid and mineral balance: Regulation of water volume and mineral salts (potassium, sodium).

o Acid-base balance: Maintenance of blood pH.

• Endocrine function: Synthesis of hormones regulating blood pressure (renin) and red blood cell production (erythropoietin), as well as activation of vitamin D.

• Urine formation: Blood is filtered in the glomerulus, then useful substances are reabsorbed in the tubules while waste products are concentrated into urine, which is then transported to the bladder via the ureters.

• Urinary tract: Includes the calyces, renal pelvis, ureters (transport), bladder (storage), and urethra (elimination).

On average, 1.5 to 2 liters of urine are produced daily to maintain the body's health.

Relationship between the cardiovascular and renal systems

The cardiovascular and urinary systems are closely linked by a functional interdependence (cardiorenal relationship) essential for homeostasis. The heart pumps blood, rich in waste products, to the kidneys via the renal arteries. The kidneys filter this blood to form urine, thus regulating blood volume (blood pressure) and eliminating metabolic waste.

Key Interactions and Functions:
• Filtration and Blood Pressure: The cardiovascular system delivers pressurized blood to the kidneys, allowing for the filtration of waste products (urea, creatinine).

• Regulation of Blood Volume: The kidneys adjust the amount of water and sodium eliminated in the urine, directly controlling blood pressure and the workload of the heart.

• Control of Blood Pressure: The kidneys produce enzymes (renin) that regulate blood pressure, influencing the health of blood vessels.

• Waste management: The kidneys filter nitrogenous waste and toxins transported by the circulatory system.

Consequences of kidney failure (Cardiorenal Syndrome):

• Heart and kidney failure: A weak heart (heart failure) can lead to poor blood flow to the kidneys (hypoperfusion), causing kidney failure.
Kidney congestion: Heart failure can increase pressure in the renal veins, causing congestion that damages the kidneys.

• Impact of hypertension: High blood pressure, a cardiovascular disease, can damage the renal vessels, impairing filtration function.

In summary, the kidneys maintain fluid balance and blood purity for the circulatory system, while the heart provides the perfusion necessary for kidney function.

Cardiovascular medications affect the renal system.

The relationship between the cardiovascular and urinary systems is close; many medications that act on the heart and blood vessels (diuretics, ACE inhibitors, ARBs) have direct effects on the kidneys, and vice versa. These treatments regulate blood pressure.
arterial pressure and blood volume. Their management requires adjustment in cases of renal insufficiency.

Key Points of Drug Interactions:
• Diuretics (Furosemide, thiazides): They increase urinary excretion of water and salt to treat hypertension and heart failure, but their overdose can cause functional renal failure.

• Angiotensin-converting enzyme (ACE) inhibitors and angiotensin II receptor blockers (ARBs): Essential in cardiorenal syndrome, they protect the kidneys in the long term, but require monitoring of renal function and serum potassium levels.

• Dosage adjustment: Many cardiovascular medications require dose adjustment based on creatinine clearance (renal function) to avoid toxicity.

• Risks: Combining certain medications (e.g., NSAIDs + ACE inhibitors + diuretics) can cause acute renal failure.

• Diuretics: • Detection: Testing for cardiovascular molecules in urine helps monitor treatment adherence in hypertensive patients.

In short, a combined (cardiorenal) therapeutic approach is essential to balance cardiac function and renal filtration.