

## Cardiovascular System

**Main Function:** to pump bloody through the body, thereby helping to

1. Supply tissues with vital nutrients
2. Facilitate excretion of waste products

### Functional components and their functions

Myocardium	Engine (pump)
Valves (part of endocardium)	Maintain unidirectional blood flow (channels blood in correct direction)
Conduction system	Maintain coordinated pumping rhythm.
Blood supply	Provides sufficient nutrients to heart – Coronary arteries (3 main: left anterior descending artery, left circumflex arteries, right coronary artery)

### Heart Failure

Heart failure is a multifactorial disease that is often the end point of many heart diseases.

**Definition:** Clinical condition where the heart is unable to meet the body's demands (despite compensatory mechanisms), although the venous filling pressure is normal or raised.

### Congestive heart failure

Heart failure involving both right and left ventricles. Left ventricle failure: fluid accumulates in the lungs. Right ventricle failure: fluid accumulates in the legs, abdominal cavity. Reduced flow of arterial blood from the heart can lead to peripheral circulatory failure (cardiogenic shock)

### Main causes of heart failure:

- Pump failure – ischaemic heart disease, cardiomyopathy etc
- Abnormal flow – pressure overload eg. systemic hypertension, aortic stenosis; volume overload (eg. valvular regurgitation)
- Abnormal conduction system (eg. atrial fibrillation)

### Aetiologic classification of Cardiovascular Disease:

- Vascular – eg. Coronary atherosclerosis and ischaemic heart disease
- Inflammatory/infectious – eg. infective endocarditis; rheumatic heart disease; viral myocarditis
- Traumatic/Mechanical or Toxic – eg. cardiac tamponade ; coarctation of the aorta
- Autoimmune
- Metabolic - infiltrative or storage diseases
- Iatrogenic or Idiopathic – eg. drug induced cardiotoxicity
- Neoplastic – eg. atrial myxoma
- Congenital – eg. congenital cardiac structural abnormalities – ventricular and atrial septal defects; tetralogy of Fallot etc.
- Degenerative – eg. calcific aortic stenosis

### Anatomical classification of cardiovascular disease:

Some diseases feature more commonly within each anatomical subsite.

Anatomical structure	Disease condition	Aetiological category
Pericardium	Pericarditis	Inflammatory
	Pericardial tamponade	Mechanical
Myocardium	Ischaemic heart disease	Vascular
	Myocarditis	Inflammatory; infectious
	Cardiomyopathies	Congenital/genetic; Toxic; Metabolic etc.
Blood vessels	Vasculitis	Inflammatory and immune-related
	Atherosclerosis	Inflammatory and degenerative
	Aneurysm	Mechanical
	Hypertension	Idiopathic
Endocardium (valves)	Rheumatic heart disease	Inflammatory (immune related)
	Infective endocarditis	Infectious
	Mitral valve prolapse	Congenital; Degenerative

(This is not a fully comprehensive list)

### Clinical Manifestations

(Refer to clinical text e.g. Tally and O'Connor for more details)

### Localized symptoms directly from cardiac pathology:

- Chest pain (nature of which is clinically important).
  - E.g. ischemia, pericarditis

- Palpitations (e.g. in arrhythmias)

### Signs/symptoms arising in other organs

- Renal induced water retention; renal impairment or failure
- Brain: cerebrovascular accident (infarct, haemorrhagic stroke – seen in poorly controlled hypertension or thromboembolism from atheromatous changes in carotid artery branches); hypertensive encephalopathy.
- Lower limbs: peripheral vascular disease (This is seen in patients with atheromatous changes and thromboembolic complications in the vessels supplying the lower limbs)

### Systemic signs/symptoms

- Eg. Heart failure
  - Systemic venous congestion – body cavity effusions, lower limb swelling, etc.
  - Symptoms arising from pulmonary congestion and oedema (in left heart failure) – dyspnoea and some specific types of dyspnoea, cough. (read up on these)
- Fatigue, dizziness, cool extremities
- Collapse from cardiogenic shock (eg. acute myocardial infarction, sudden cardiac death etc)
- Cyanosis
- High fever (infection) – e.g infective endocarditis

### Symptoms of aortic disease (thoracic, abdominal)

- Severe pain radiating to back, shock, rapid mortality. E.g. aortic dissection or rupture of aneurysm

### Mindmaps:

1. Main CVS diseases overview - Function and classification
2. Atherosclerosis and ischemic heart disease
3. Hypertension and heart failure

<https://medicine.nus.edu.sg/pathweb/pathology-demystified/cardiovascular-system/main-cvs-diseases/>

### Talking POTS and slides

<https://medicine.nus.edu.sg/pathweb/pathology-demystified/cardiovascular-system/cvs-media-gallery/>

### Quiz

<https://medicine.nus.edu.sg/pathweb/pathology-demystified/cardiovascular-system/cvs-quiz/>