ICFAI
School of Pharmaceutical Sciences

MEDXPLORE

Vital Beats : Insights into Heart Health

THEME - HEART HEALTH

Bi-Annual
E-NEWS LETTER
2025 December | Vol.-1 | Issue-2

ABOUT ICFAI SCHOOL OF PHARMACEUTICAL SCIENCES (ISPS)

ICFAI School of Pharmaceutical Sciences (A Constituent School of the ICFAI University, Dehradun), a pioneer in pharmaceutical education, offers the Bachelor of Pharmacy **(B.Pharm)** Program. The ICFAI School of Pharmaceutical Sciences (ISPS) endeavors to deliver high-caliber education tailored to meet the demands of the pharmaceutical industry and address the broader healthcare needs of society, and achieve excellence in pharmaceutical education. The school embodies a student-centered educational model, fostering hands-on learning experiences and embracing a holistic approach to education.

The ICFAI School of Pharmaceutical Sciences features state-of-the-art laboratories, highly qualified, dedicated, and experienced faculty members, an enriched library, an information Centre and modular labs with high-tech instruments, meeting the standards and **approval of the Pharmacy Council of India**, New Delhi, to fulfil the practical and research needs of students.

About Our B. Pharm Program

The program is a four-year undergraduate program that provides students with a comprehensive understanding of the principles of Pharmacy and prepares them for a career in the pharmaceutical sciences. Its curriculum covers a wide range of subjects, including **Anatomy, Physiology, Pharmaceutical analysis, Pharmaceutical Chemistry, Pharmacology, Clinical Pharmacy, Communication Skills, remedial mathematics, remedial biology, biochemistry, pathophysiology, and Pharmaceutical Management**. This course also includes practical training in various aspects of pharmacy, such as drug design, formulation development, quality control, and regulatory affairs. Students also learn about the legal and ethical aspects of pharmacy practice.

The course equips students with the skills required to work in various sectors of the pharmaceutical industry, including research and development, manufacturing, marketing, and sales.

MESSAGE
From The
VICE CHANCELLOR'S DESK

Dear Students, Faculty Members, and Esteemed Stakeholders,

It gives me immense pleasure to convey my warmest congratulations to the ICFAI School of Pharmaceutical Sciences on the release of this second issue of *MedXplore*, dedicated to the vital theme of **Heart Health**. This focus could not be more timely or significant, as cardiovascular diseases continue to be among the leading health concerns globally, affecting individuals and families across all age groups.

Heart health is a multifaceted domain that encompasses prevention, early diagnosis, lifestyle management, and the development of advanced therapeutic interventions. As we explore this crucial subject, we are reminded of the indispensable role that pharmaceutical sciences play in enhancing cardiovascular care and improving patient outcomes. The complexities associated with Heart Health demand rigorous research, interdisciplinary collaboration, and a continuous pursuit of innovation.

At ICFAI, we remain deeply committed to fostering an environment where scientific curiosity, collaborative learning, and path-breaking research thrive. Through *MedXplore*, we aim to disseminate valuable insights, highlight emerging advancements, and encourage meaningful dialogue that will empower our community to contribute to transformative solutions in heart health and beyond.

I extend my sincere appreciation to the editorial team, faculty members, and students whose dedication, creativity, and hard work have shaped this issue. Your unwavering commitment to knowledge and excellence continues to strengthen the ICFAI School of Pharmaceutical Sciences as a beacon of academic and research distinction.

My best wishes for the continued success of *MedXplore*. May this newsletter inspire greater awareness, deeper understanding, and informed action toward better heart health for all.

Prof. (Dr.) R. K. Singh
Vice Chancellor
The ICFAI University, Dehradun.

MESSAGE
from The
REGISTRAR

Dear Students, Faculty Members, and Esteemed Readers,

It gives me great pleasure to present this second issue of *MedXplore*, the newsletter of the ICFAI School of Pharmaceutical Sciences, centered on the vital theme of **Heart Health**. As cardiovascular diseases continue to rise globally, understanding the fundamentals of heart care has become more important than ever. This issue aims to shed light on the various dimensions of heart health, from prevention and early detection to advanced treatment approaches.

At the ICFAI School of Pharmaceutical Sciences, we remain dedicated to fostering a vibrant environment that encourages research, innovation, and collaboration in key areas of healthcare. Heart health, with its wide spectrum of challenges and opportunities, calls for concentrated efforts from researchers, clinicians, and the pharmaceutical community. Addressing this global concern requires a strong foundation of knowledge, the development of effective therapies, and a commitment to promoting healthy lifestyles.

Through this newsletter, our goal is to provide meaningful insights, highlight current research findings, and share emerging trends in cardiovascular care and pharmaceutical sciences. We hope that the information presented in this issue not only enhances awareness but also inspires deeper inquiry and active engagement in advancing heart health.

Let us continue to work together to expand knowledge, encourage innovation, and build a healthier future for all. May this issue of *MedXplore* spark valuable conversations, new ideas, and impactful contributions in the field of heart health.

With Best Wishes

Prof. (Dr) R.C. Ramola
Registrar
The ICFAI University, Dehradun.

MESSAGE
from The
PRINCIPAL

Dear Students, Faculty, and Valued Readers

It gives me immense pleasure to present the second issue of our newsletter *MedXplore*, which is dedicated to the profoundly important theme of "**Heart Health"**. As we navigate an era where lifestyle-related disorders are increasingly prevalent, it becomes essential for healthcare professionals, students, and the wider community to stay informed and proactive about cardiovascular wellness.

This issue aims to enlighten readers about the significance of maintaining a healthy heart through scientific insights, preventive strategies, and emerging therapeutic approaches. Heart health is not merely a medical concern; it is a collective responsibility that calls for awareness, timely intervention, and a commitment to healthier living.

I commend the editorial team, faculty members, and students whose efforts have enriched this issue with meaningful and research-oriented content. Their dedication reflects our school's continued pursuit of academic excellence and community-centric healthcare education.

I hope this issue inspires our readers to adopt heart-healthy habits and motivates our budding pharmacists to contribute effectively toward advancing cardiovascular health in society.

With Best Wishes

Prof. (Dr) Alka N Choudhary
Principal,
ICFAI School of Pharmaceutical Sciences
The ICFAI University, Dehradun.

MESSAGE *from The* EDITORIAL BOARD

Dear Students, Faculty Members, and Esteemed Readers,

It is an honor to present the second issue of *MedXplore*, the scholarly newsletter of the ICFAI School of Pharmaceutical Sciences. Inspired by the positive response to our inaugural edition, this issue focuses on the human heart, an organ vital to life and central to global health challenges.

With cardiovascular diseases on the rise, understanding cardiac physiology, pathology, treatment approaches, and preventive strategies is essential. This edition offers curated insights on risk factors, therapeutic progress, pharmacological developments, lifestyle considerations, and emerging research shaping cardiovascular science. Upholding academic excellence and evidence-based learning, we aim to empower readers with knowledge that supports informed, health-conscious decisions and meaningful scientific engagement.

With Best Wishes

Ms. Anzla Shirin
Assistant Professor
ICFAI School of Pharmaceutical Sciences
The ICFAI University, Dehradun.

Dear Students, Faculty Members, and Esteemed Readers,

It is with great excitement that we introduce the second issue of *MedXplore*, a newsletter from ICFAI School of Pharmaceutical Sciences, The ICFAI University, Dehradun.

Taking inputs from the previous issue of the newsletter, this time we have attempted to cover, in detail, the various aspects of Heart Health, keeping in mind the very motto, of the newsletter, to serve as a platform to highlight academic achievements, and research breakthroughs, industry trends.

Therefore, we invite you to explore this issue. Your insights and participation will be key in making *MedXplore* a valuable resource for all. Thank you for your support, and let's embark on this journey of learning and discovery.

With Best Wishes

Mrs. Myrnal Chamoli
Assistant Professor
ICFAI School of Pharmaceutical Sciences
The ICFAI University, Dehradun.

MESSAGE *from The* EDITORIAL BOARD

Dear Students, Faculty Members, and Esteemed Readers,

This second issue of *MedXplore* focuses on heart health, offering a clear overview of cardiac structure, function, and the major diseases affecting millions, including coronary artery disease, cerebrovascular events, peripheral artery disease, aortic atherosclerosis, cardiomyopathies, and pericarditis.

It outlines causes, symptoms, treatments, and advances spanning interventional cardiology, regenerative medicine, AI-driven diagnostics, wearables, and precision therapies, supported by key clinical trials and recent approvals. Practical tools such as the ABCDE guide, wellness checklists, and emergency plans help readers take proactive steps. The issue also addresses environmental impacts on cardiovascular risk and calls for global policy action. Its central message: protect your heart consistently and wholeheartedly.

With Best Wishes

Mr. Subhajit Hazra
Assistant Professor
ICFAI School of Pharmaceutical Sciences
The ICFAI University, Dehradun.

Dear Students, Faculty Members, and Esteemed Readers,

I am honored to present this comprehensive second issue of *MedXplore* from ICFAI School of Pharmaceutical Sciences, The ICFAI University Dehradun.

In this issue, we delve into the full spectrum of Heart health-related concerns, from fundamental insights to advanced treatments, encompassing both pharmacological and non-pharmacological approaches. Our goal is to empower individuals with a well-rounded understanding of available treatment options, enabling them to make informed decisions for better heart health and overall well-being.

At *MedXplore*, we strive to bridge the gap between medical advancements and public awareness, providing expert insights, research updates, and practical advice for maintaining healthy heart I hope this issue proves to be insightful and beneficial for you.

With Best Wishes

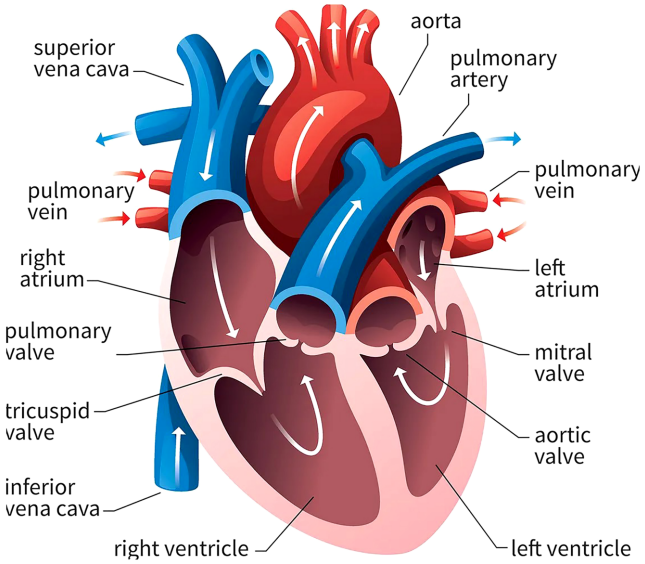
Mrs. Santoshi Shah
Assistant Professor
ICFAI School of Pharmaceutical Sciences
The ICFAI University, Dehradun.

HEART HEALTH

The human heart is a strong, muscular organ, roughly the size of a clenched fist, located in the chest cavity slightly to the left of the breastbone. It functions as a central pump of the circulatory system, ensuring the continuous flow of blood throughout the body. By pumping blood, the heart supplies tissues with oxygen and nutrients, removes waste products, and maintains overall homeostasis. Structurally, the heart is divided into four chambers: two upper chambers, called Atria, and two lower chambers, called Ventricles**,** which work together to efficiently circulate blood.

I. THE ROLE OF THE HUMAN HEART

1. **Pumps Blood**: The heart acts as a vital pump, ensuring that blood continuously circulates throughout the body, reaching every organ, tissue, and cell.
2. **Circulates Oxygen**: Oxygen-rich blood from the lungs is transported to the rest of the body, enabling cells to perform vital metabolic functions.
3. **Removes Waste**: It carries carbon dioxide and other metabolic waste products back to the lungs, kidneys, and liver for elimination from the body.
4. **Maintains Blood Pressure**: By generating rhythmic contractions, the heart produces the pressure needed to keep blood flowing smoothly through arteries, veins, and capillaries.
5. **Supports Nutrient Delivery**: Nutrients absorbed from the digestive system, such as glucose, amino acids, and fatty acids, are distributed by the heart to provide energy and support cell growth and repair.
6. **Regulates Body Temperature**: Through circulation, the heart helps in thermoregulation by distributing heat evenly and maintaining a stable body temperature.
7. **Hormone Transport**: The heart facilitates the transport of hormones secreted by glands, thus playing an indirect role in growth, metabolism, reproduction, and overall body communication.



8. **Dual Circulation**: The heart manages two crucial pathways of blood flow:
   A. **Pulmonary Circulation:** Movement of blood between the heart and lungs for oxygenation.
   B. **Systemic Circulation:** Movement of oxygenated blood from the heart to the entire body.
9. **Electrical Conduction System**: The heart has its own natural pacemaker, the sinoatrial (SA) node**,** which generates electrical impulses to regulate heart rate and rhythm, ensuring synchronized contractions.

II. PARTS OF A HUMAN HEART CHAMBERS OF THE HEART

1. **Right Atrium:** The right atrium is the upper right chamber of the heart. It receives deoxygenated blood (blood low in oxygen and rich in carbon dioxide) from the entire body. The blood enters through two large veins: the superior vena cava (from the upper body) and the inferior vena cava (from the lower body). From here, the blood is passed into the right ventricle.
2. **Right Ventricle**: The right ventricle is the lower right chamber. Its main role is to pump deoxygenated blood to the lungs. Blood travels from the right ventricle through the pulmonary artery to the lungs, where it undergoes gaseous exchange (i.e., carbon dioxide is released, and oxygen is absorbed).

The muscular wall of the right ventricle is thinner than the left ventricle, since it pumps blood only to the lungs (a short distance).

3. **Left Atrium**: The left atrium is the upper left chamber of the heart. It receives oxygenated blood from the lungs via the pulmonary veins (the only veins in the body that carry oxygenated blood). The oxygen- rich blood then moves into the left ventricle for systemic circulation.
4. **Left Ventricle**: The left ventricle is the lower left chamber and the strongest chamber of the heart. It pumps oxygenated blood to the entire body through the aorta, the largest artery in the body. The walls of the left ventricle are much thicker compared to the right ventricle, since it needs to generate high pressure to pump blood to all body organs and tissues.

VALVES OF THE HEART

1. Tricuspid Valve

- **Location:** Between the right atrium and the right ventricle**.**
- **Structure:** It has three cusps or flaps (hence the name "tricuspid").
- **Function:** Allows deoxygenated blood to flow from the right atrium into the right ventricle. Prevents backflow of blood into the right atrium when the right ventricle contracts.
- **Importance:** Maintains one-way blood flow and ensures smooth transfer of venous blood toward the lungs.

2. Bicuspid/Mitral Valve

- **Location:** Between the left atrium and the left ventricle.
- **Structure:** Has two cusps (hence the name "bicuspid").
- **Function:** Allows oxygenated blood from the left atrium to enter the left ventricle. Prevents blood from flowing backward into the left atrium during ventricular contraction
- **Importance:** Plays a vital role in systemic circulation**,** as it ensures that oxygen-rich blood moves efficiently toward the body's main pumping chamber.

3. Pulmonary Valve

- **Location:** Between the right ventricle and the pulmonary artery**.**
- **Structure:** It has three semilunar- shaped cusps**.**
- **Function:** Opens when the right ventricle contracts, allowing blood to move into the pulmonary artery. Closes after contraction, preventing blood from leaking back into the ventricle.
- **Importance:** Ensures proper pulmonary circulation, so that deoxygenated blood reaches the lungs for oxygenation.

4. Aortic Valve

- **Location:** Between the left ventricle and the aorta. It is also the largest artery in the body.
- **Structure:** It is a semilunar valve with three cusps.
- **Function:** Opens during ventricular contraction to allow oxygenated blood to flow from the left ventricle into the aorta.
- Closes once the ventricle relaxes, preventing backflow of blood from the aorta into the ventricle.
- **Importance:** It is crucial for maintaining systemic circulation, distributing oxygenated blood under high pressure to the entire body.

III. BLOOD VESSELS OF THE HEART

1. Aorta:

- The largest artery in the human body.
- Originates from the left ventricle.
- **Function**: Transports oxygenated blood from the left ventricle to all parts of the body (except the lungs).
- **Importance:** Its branches supply blood to the head, arms, abdomen, and lower body.

2. Pulmonary Artery:

- Originates from the right ventricle.
- **Function**: Carries deoxygenated blood from the right ventricle to the lungs for purification (exchange of carbon dioxide with oxygen).
- **Importance**: It is the only artery in the body that carries deoxygenated blood**.**

3. Pulmonary Vein:

- Four pulmonary veins (i.e., two from each lung) open into the left atrium.
- **Function**: Transport oxygenated blood from the lungs back to the heart.
- **Importance**: They are the only veins in the body that carry oxygen-rich blood.

4. Superior and Inferior Vena Cava:

- Large veins that empty into the right atrium.
- **Function**: The Superior vena cava brings deoxygenated blood from the upper body (head, arms, chest). Theinferior vena cava brings

deoxygenated blood from the lower body (abdomen, legs).

- **Importance:** They are the largest veins and serve as the main channels returning venous blood to the heart.

IV. OTHER STRUCTURES

1. Septum:

- A thick muscular wall that divides the right and left sides of the heart.
- **Function:** Prevents the mixing of oxygenated and deoxygenated blood.
- **Importance**: Ensures efficient double circulation (systemic and pulmonary).

2. Pericardium:

- A double-layered protective sac that encloses the heart.
- Contains pericardial fluid that reduces friction during heartbeat.
- **Importance:** Protects the heart from shocks, friction, and infections.

3. Myocardium:

- The thick muscular middle layer of the heart wall.
- **Function**: Responsible for the contraction and pumping action of the heart.
- **Importance**: Its strength allows the heart to pump blood under high pressure, especially in the left ventricle.

4. Endocardium:

- The thin, smooth inner lining of the heart chambers and valves.
- **Function**: Provides a smooth surface for blood flow and prevents clot formation.
- **Importance**: Protects the inner walls and supports heart valve function.

5. SA Node (Sinoatrial Node):

- Known as the natural pacemaker of the heart.
- Located in the right atrium.
- **Function**: Generates electrical impulses that initiate each heartbeat.
- Importance: Sets the rhythm and rate of the heart (normal heart rate: 70–75 beats/min).

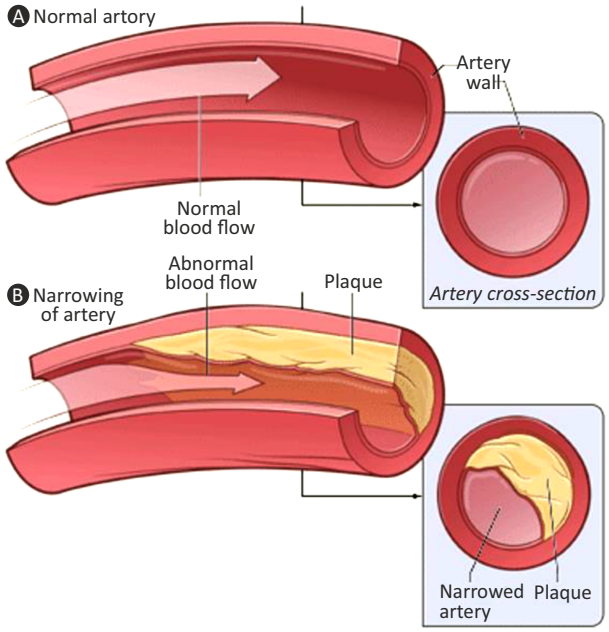
6. AV Node (Atrioventricular Node):

- Located at the junction of the atria and ventricles.
- **Function**: Receives impulses from the SA node and delays them slightly before passing to the ventricles.
- **Importance**: Ensures the atria contract before the ventricles, allowing proper filling of blood.

V. DISEASES OF THE HEART

A. CORONARY HEART DISEASE

Coronary Heart Disease is one of the most common and serious cardiovascular conditions. It occurs when the coronary arteries, which supply oxygen-rich blood to the heart muscle, become narrowed or blocked due to the buildup of fatty deposits (plaque) on the arterial walls. This condition is known as atherosclerosis**.** Over time, the narrowing restricts blood flow and reduces the supply of oxygen to the heart muscle, leading to ischemia (oxygen deficiency). If the blockage becomes severe or complete, it can cause angina (chest pain), a heart attack, arrhythmia, or heart failure.



CAUSES

The exact cause is the damage to the inner layer of the coronary arteries**,** leading to plaque buildup. Major causes and risk factors include:

- **High LDL cholesterol ("Bad cholesterol")**: Contributes to fatty deposits in arteries.
- **High blood pressure (Hypertension)**: Damages arterial walls and accelerates plaque buildup.
- **Diabetes and Insulin Resistance**: Increased risk of atherosclerosis.
- **Smoking and Tobacco Use**: Causes direct injury to blood vessels and reduces oxygen supply.
- **Physical inactivity and a Sedentary lifestyle**: Weakens cardiovascular fitness.

- **Obesity and Overweight**: Linked with high cholesterol, diabetes, and hypertension.
- **Unhealthy diet**: High in saturated fats, trans fats, salt, and processed foods.
- **Excessive alcohol consumption**: Damages heart muscles and raises blood pressure.
- **Family history and genetics**: Increase predisposition to CHD.
- **Stress and mental health factors**: Chronic stress can contribute to high blood pressure and unhealthy habits.
- **Advancing age and male gender**: Risk increases with age. Men are at higher risk earlier than women.

SYMPTOMS

The symptoms vary depending on the severity of the blockage and may sometimes be silent until complications arise. Common symptoms include:

- **Angina pectoris**: Pressure, heaviness, or chest pain, often triggered by exertion or stress.
- **Shortness of breath**: Especially during physical activity due to reduced oxygen supply.
- **Fatigue during exertion**: Tiredness
- or weakness even with routine activities.
- **Pain or discomfort**: Radiating to arms, shoulders, jaw, neck, or back.
- **Cold sweats**: A common sign of a
- heart attack.
- **Nausea, dizziness, or lightheadedness**: Resulting from poor circulation.

In some cases, especially in diabetics, **silent heart attacks** can occur without obvious symptoms.

B. CEREBROVASCULAR DISEASE

Cerebrovascular disease refers to a group of conditions that affect the blood vessels supplying the brain, leading to a reduction or interruption in blood flow. This results in decreased oxygen and nutrient delivery to brain tissue, causing damage to brain cells. The two most common outcomes of cerebrovascular disease are:

- **Stroke**: A sudden interruption of blood supply to the brain, which can be **ischemic** (caused by a clot) or **hemorrhagic** (caused by bleeding due to a ruptured vessel).
- **Transient Ischemic Attack (TIA)**: Often called a mini-stroke, it occurs when the blood flow is blocked temporarily, usually for a few minutes. While symptoms resolve on their own, a TIA serves as a warning sign for a future major stroke.

CAUSES

- Cerebrovascular diseases usually develop from conditions that damage or weaken blood vessels in the brain. Common causes include:
- **Atherosclerosis**: Narrowing of arteries due to plaque buildup, leading to reduced blood flow.
- **Hypertension (High blood pressure)**: Major cause of both ischemic and hemorrhagic strokes.
- **Diabetes Mellitus**: Increases risk of vascular damage and clot formation.
- **Hyperlipidemia**: High cholesterol levels promote plaque deposition in brain arteries.
- **Smoking**: Damages vessel lining, promotes clotting, and reduces oxygen delivery.
- **Excessive alcohol intake**: Can cause high blood pressure, irregular heart rhythms, and weakened blood vessels.
- **Obesity and sedentary lifestyle**: Increase the likelihood of hypertension, diabetes, and high cholesterol.
- **Cardiac diseases**: Such as atrial fibrillation, heart failure, or valvular disease, which increase the risk of clots traveling to the brain.
- **Age and family history**: Risk increases significantly after age 55; hereditary factors also play a role.
- **Other vascular conditions**: Such as aneurysms, arterial dissections, or vasculitis.

SYMPTOMS

- **Sudden weakness or numbness:** Affects face, arm, or leg (usually one side); facial droop, weak grip, or difficulty lifting arm.
- **Speechdifficulty (Aphasia/Dysarthria):** Slurred, unclear, or lost speech; may understand but be unable to respond.
- **Blurred or lost vision:** Sudden double, blurred, or lost vision in one or both eyes; may have blackout or tunnel vision.
- **Severe sudden headache:** "Thunderclap" headache, often in hemorrhagic stroke; may include vomiting or loss of consciousness.
- **Dizziness and imbalance:** Staggering gait, poor coordination, disorientation, or confusion.
- **Memory and cognitive issues:** Short-term memory loss, confusion, poor judgment, or sudden behavior change.
- **Other symptoms:** Trouble swallowing (dysphagia), tingling in limbs, or loss of consciousness.

C. PERIPHERAL ARTERY DISEASE (PAD)

Peripheral artery disease is a common circulatory problem in which narrowed arteries reduce the flow of oxygen-rich blood to the limbs, especially the legs and sometimes the arms. It occurs due to the buildup of fatty deposits (atherosclerosis) in the

arterial walls, which leads to partial or complete blockage of blood supply. Since the muscles and tissues of the legs require adequate oxygen for proper functioning, reduced blood flow causes pain, discomfort, and complications if untreated.

CAUSES

Several factors increase the likelihood of developing PAD:

- **Chronic Kidney Disease:** Impairs normal vascular function and promotes atherosclerosis.
- **Advancing Age:** Risk increases significantly after 50 years, especially in smokers or diabetics.
- **Hyperlipidemia (High cholesterol levels):** Leads to fatty deposits in arteries, narrowing the lumen.
- **Diabetes Mellitus:** High blood glucose damages blood vessels and accelerates plaque formation.
- **Family History:** Genetic predisposition plays a role in early- onset vascular problems.
- **Smoking and Hypertension (additional contributors):** Both cause significant arterial damage and hasten the progression of PAD.

SYMPTOMS

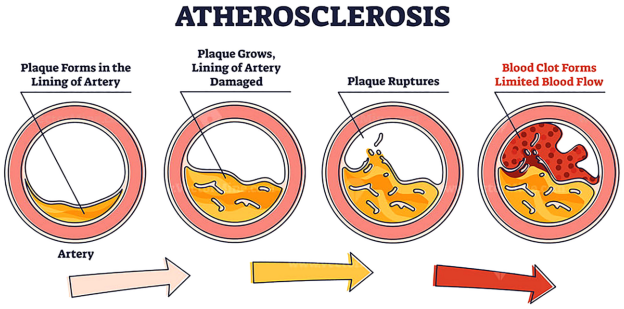
The severity of symptoms often depends on the degree of arterial blockage and the level of activity. Many people may remain asymptomatic until the disease advances. Common symptoms include:

- **Intermittent Claudication:** Cramping pain or discomfort in the calf, thigh, or hip during walking or exercise, which eases with rest.
- **Leg Numbness and Weakness:** Due to inadequate blood supply to nerves and muscles.
- **Weak or Absent Pulse in the Legs or Feet:** Indicates reduced blood circulation.
- **Skin Changes:** Skin may become pale, shiny, or develop a bluish discoloration. Hair growth on legs may reduce.
- **Poorly Healing Wounds or Ulcers:** Even small injuries may not heal due to lack of oxygen and nutrients.
- **Critical Limb Ischemia:** A severe stage where blood flow is critically low, leading to persistent pain, non- healing sores, gangrene, and risk of amputation if untreated.

D. AORTIC ATHEROSCLEROSIS

The aorta is the largest artery in the human body. It carries oxygen-rich blood from the heart to the chest, abdomen, pelvis, and lower limbs. In some individuals, the aorta or its branches (especially where it travels down into the abdomen and pelvis) may become narrowed or completely blocked due to atherosclerosis (plaque buildup) or embolic events. This condition is referred to as "Aortoiliac Occlusive Disease (AIOD)". Blockage in the aorta results in reduced or absent blood supply to multiple vital organs and tissues of the lower body. The most common site of pain is the abdomen, though symptoms may radiate to the back, buttocks, or legs. When oxygen-rich blood is insufficient, muscles, nerves, and organs do not function properly.

In severe cases, fragments of clots or cholesterol deposits may dislodge, leading to thromboembolism or atheroembolism. This can suddenly block smaller arteries, cutting off blood supply to the legs or organs. Additionally, chronic weakening of the aortic wall increases the risk of developing an aortic aneurysm—a dangerous bulge in the aorta that may rupture and cause life-threatening internal bleeding.



CAUSES

Aortic blockage usually develops over time due to a combination of lifestyle, medical, and age-related factors:

- **Hyperlipidemia (High cholesterol):** Promotes plaque buildup in arterial walls.
- **Hypertension (High blood pressure):** Constant pressure damages the aortic lining, encouraging narrowing.
- **Unhealthy Diet:** Diets rich in saturated fats, processed foods, and sugars accelerate atherosclerosis.
- **Inflammatory Conditions:** Such as vasculitis or autoimmune diseases that damage blood vessels.
- **Sedentary Lifestyle:** Lack of exercise reduces circulation and increases risk of plaque deposition.
- **Aging:** With age, arteries naturally stiffen and narrow.
- **Smoking:** One of the strongest risk factors, causing direct injury to the vascular lining and promoting clot formation.

- **Family History & Genetic Predisposition:** Increases the likelihood of vascular disease.

SYMPTOMS

In its early stages, aortic blockage may be **asymptomatic** and remain undiagnosed until significant narrowing occurs. As the disease progresses, the following symptoms may develop:

- **Chest Pain or Discomfort:** Due to strain on the upper part of the aorta or associated arteries.
- **Back and Abdominal Pain:** A common feature as blood supply is restricted in the abdominal aorta.
- **Claudication (Cramping Pain):** Pain in hips, buttocks, or legs while walking, which eases with rest, due to poor blood flow.
- **Ischemia (Reduced Blood Supply):** Leads to fatigue, numbness, or weakness in lower limbs.
- **Bruising or Skin Changes:** Poor circulation may cause discoloration or delayed healing.
- **Signs of Embolism:** Sudden pain, coldness, or bluish discoloration of legs or toes if a clot blocks circulation.
- **Aortic Aneurysm Symptoms:** Pulsating mass in the abdomen, severe abdominal or back pain, and risk of rupture.
- **Aortic Dissection Symptoms:** Sudden, sharp tearing pain in chest or back, often a medical emergency.

B. CARDIOMYOPATHY

Cardiomyopathy refers to a group of diseases of the heart muscle. In this condition, the heart becomes enlarged, thickened, or stiff, which leads to impaired pumping functions or abnormal rhythms. It can result in heart failure, arrhythmias, or sudden cardiac arrest if untreated.

TYPES OF CARDIOMYOPATHY

1. DILATED CARDIOMYOPATHY (DCM)

The heart chambers, especially the left ventricle, become enlarged (dilated) and weakened, making it harder for the heart to pump blood efficiently.

CAUSES

- Genetic factors (inherited)
- Alcohol abuse
- Viral infections (e.g., myocarditis)
- Long-term uncontrolled hypertension
- Toxins and certain chemotherapy drugs
- Idiopathic (unknown cause)

SYMPTOMS

- Fatigue and weakness
- Swelling (edema) in legs, ankles, and feet
- Shortness of breath (especially during exertion or lying down)
- Arrhythmias (irregular heartbeat)
- Dizziness or fainting
- Risk of blood clots and heart failure

2. Hypertrophic Cardiomyopathy (HCM)

The heart muscle, especially the interventricular septum, becomes abnormally thick. This makes it harder for the heart to relax and fill properly with blood.

CAUSES

Mostly inherited genetic mutations

SYMPTOMS

- Chest pain (especially during exercise)
- Fainting (syncope)
- Palpitations or irregular heartbeats
- Shortness of breath
- Fatigue

3. Restrictive Cardiomyopathy (RCM)

The heart muscle becomes stiff and less elastic, restricting the ventricles from filling properly. Pumping ability may remain normal at first but worsens with time.

CAUSES

- Amyloidosis (abnormal protein deposits)
- Hemochromatosis (iron overload in body)
- Sarcoidosis (inflammatory disease)
- Radiation therapy to the chest

SYMPTOMS

- Swelling in legs and ankles
- Fatigue and weakness
- Arrhythmias
- Difficulty breathing, especially at night or when lying down
- Poor exercise tolerance

4. Arrhythmogenic Right Ventricular Cardiomyopathy

A rare inherited type in which the muscle of the right ventricle is gradually replaced by fatty or fibrous tissue, disrupting electrical signals and causing dangerous arrhythmias.

CAUSES

- Genetic (inherited mutations)
- Strong family history is a key risk factor

SYMPTOMS

- Palpitations (fluttering heartbeat)
- Irregular heartbeats (arrhythmias)
- Fainting spells

- Sudden cardiac death (especially in young adults/athletes)

C. PERICARDITIS

Pericarditis is the inflammation of the pericardium, a thin, double-layered sac that surrounds and protects the heart. The pericardium has two layers – an outer fibrous layer and an inner serous layer with a small amount of lubricating fluid in between. In pericarditis, inflammation leads to irritation of these layers, causing chest pain and other symptoms.

CAUSES

1. Infectious Causes:

- **Viral infections:** Like Influenza virus, Coxsackie virus, Echovirus, HIV, Hepatitis C (less common)
- **Bacterial infections:** Tuberculosis (common in developing countries), Pneumonia or septicemia - related infections
- **Fungal infections:** Histoplasmosis, Aspergillosis

2. Non-Infectious Causes:

- **Autoimmune diseases:** Diseases such as Systemic lupus erythematosus (SLE), Rheumatoid arthritis, Scleroderma
- **Post-myocardial infarction:** Known as **Dressler's syndrome** (autoimmune reaction after heart attack)
- **Trauma or surgery:** Injury to the chest wall or after open-heart surgery
- **Cancer:** For instance, Lung cancer, breast cancer, leukemia, or metastasis to pericardium
- **Kidney failure (Uremia):** Uremic pericarditis due to toxin buildup
- **Radiation therapy:** Especially after treatment for chest cancers

SYMPTOMS

- **Chest pain:** Sharp, stabbing pain often felt behind the breastbone. Pain worsens with deep breathing, coughing, or lying flat. Improves when sitting up or leaning forward
- **Fever and chills** (if infection is present)
- **Palpitations** (irregular or fast heartbeat)
- **Dyspnea (shortness of breath):** Especially when lying down
- **Fatigue and weakness**
- **Pericardial friction rubs:** A scratchy, high-pitched sound heard with a stethoscope, caused by rubbing of inflamed pericardial layers.

VI. PHARMACOLOGICAL TREATMENT FOR HEART-RELATED DISEASES

A.CORONARY HEART DISEASE

Drug Class	Examples	Mode of Action	Therapeutic Effects in CHD	Limitations	Common Side Effects
Antiplatelet	Aspirin, Clopidogrel, Ticagrelor, Prasugrel	Inhibit platelet aggregation (Aspirin: COX-1 inhibition ↓ TXA2; P2Y12 inhibitors block ADP receptor)	Prevent thrombosis, reduce MI risk, prevent stent thrombosis	Risk of bleeding; contraindicated in active bleeding or aspirin allergy; caution in GI ulcers	GI irritation, bleeding, bruising, dyspnea (ticagrelor)
Beta-blockers	Metoprolol, Atenolol, Bisoprolol, Carvedilol	Block β1 (±β2) receptors → ↓ HR, ↓ contractility, ↓ myocardia O_2 demand	Reduce angina frequency, improve post-MI survival, control arrhythmias	Avoid in severe asthma, bradycardia, decompensated HF	Fatigue, bradycardia, hypotension, bronchospasm, sexual dysfunction

Nitrates	Nitroglycerin, Isosorbide mononitrate/ dinitrate	Donate NO → vasodilation (venous > arterial) → ↓ preload & afterload	Rapid relief of angina; improves exercise tolerance	Tolerance with long-term use; contraindicated with PDE-5 inhibitors	Headache, flushing, hypotension, reflex tachycardia
Calcium Channel Blockers (CCBs)	Amlodipine, Nifedipine (DHP); Verapamil, Diltiazem (non- DHP)	Block L-type Ca^{2+} channels → vasodilation (DHP) or ↓ AV node conduction (non- DHP)	Reduce angina, control BP, alternative if β-blockers contraindicated	Avoid non-DHP in HF or AV block; edema with DHPs	Edema, constipation (verapamil), bradycardia (non-DHP), headache
ACE Inhibitors	Enalapril, Ramipril, Lisinopril	Inhibit ACE → ↓ angiotensin II → ↓ BP, ↓ afterload, improves endothelial function	Reduce mortality, prevent remodeling post-MI, BP control	Contraindicated in pregnancy, bilateral renal artery stenosis	Cough, hyperkalemia, hypotension, angioedema
ARBs	Losartan, Valsartan, Telmisartan	Block angiotensin II (AT1) receptor	Alternative to ACEI; reduce mortality, improve BP and ventricular remodeling	Avoid in pregnancy; caution in renal impairment	Hyperkalemia, hypotension, dizziness (no cough)
Statins	Atorvastatin, Rosuvastatin, Simvastatin	Inhibit HMG-CoA reductase → ↓ hepatic cholesterol synthesis	Major reduction in LDL; stabilizes plaques; lowers MACE	Rare hepatotoxicity; contraindicated in pregnancy	Myalgia, elevated LFTs, rare rhabdomyolysis
Ezetimibe	Ezetimibe	Inhibits intestinal cholesterol absorption	Additional LDL lowering when added to statins	Modest LDL effect alone	GI upset, elevated LFTs
PCSK9 inhibitors	Alirocumab, Evolocumab	Increase LDL receptor recycling → profound LDL reduction	Significant LDL reduction in high-risk CHD patients	Expensive; injectable	Injection-site reactions, nasopharyngitis

Anticoagulants	Enoxaparin, Heparin, Warfarin, DOACs (apixaban, rivaroxaban)	Inhibit various steps of coagulation cascade	Prevent thrombus extension in ACS; prevent emboli	Risk of bleeding; require monitoring (warfarin)	Bleeding, bruising, thrombocytopenia (heparin)
Ranolazine	Ranolazine	Inhibits late Na^+ current → ↓ intracellular Ca^{2+} → ↓ wall tension	Used for chronic angina when symptoms persist despite standard therapy	Does not reduce BP or HR; QT prolongation	Dizziness, constipation, QT prolongation
Ivabradine	Ivabradine	Selective If channel inhibitor → ↓ HR without ↓ contractility	Used when β-blockers not tolerated; reduces angina	Only works if patient in sinus rhythm	Bradycardia, luminous visual phenomena (phosphenes)
Fibrates	Fenofibrate, Gemfibrozil	↑ lipoprotein lipase activity → ↓ triglycerides	Useful for hypertriglyceridemia	Risk of myopathy with statins; limited CHD protection	GI upset, myopathy (especially with gemfibrozil)

B. CEREBROVASCULAR DISEASE

Drug Class	Examples	Mode of Action	Therapeutic Effects	Limitations / Side Effects
Antiplatelet agents	Aspirin, Clopidogrel, Dipyridamole	Inhibit platelet aggregation (Aspirin: COX-1 inhibition ↓ thromboxane A2; Clopidogrel: ADP receptor blocker; Dipyridamole: ↑ cAMP in platelets)	Reduce risk of ischemic stroke by preventing thrombus formation	Risk of bleeding, gastrointestinal irritation (aspirin), resistance/non-response in some patients

Anticoagulants	Warfarin, Dabigatran, Rivaroxaban, Apixaban, Heparin	Inhibit clotting factors (Warfarin: vitamin K antagonist; DOACs: inhibit thrombin or factor Xa; Heparin: activates antithrombin III)	Prevent cardioembolic stroke (e.g., in atrial fibrillation)	High bleeding risk, drug/food interactions (warfarin), requires monitoring (warfarin, heparin)
Thrombolytics	Alteplase (tPA), Tenecteplase	Convert plasminogen → plasmin → dissolve fibrin clot	Restore cerebral blood flow in acute ischemic stroke (if given within therapeutic window)	Strict time window (≤4.5h), risk of intracranial hemorrhage, contraindicated in hemorrhagic stroke
Antihypertensives	ACE inhibitors (Perindopril), ARBs (Losartan), Beta-blockers (Atenolol), Calcium channel blockers (Amlodipine), Diuretics (Indapamide)	Lower blood pressure through various mechanisms (RAAS inhibition, vasodilation, ↓ cardiac output, natriuresis)	Reduce risk of recurrent stroke and hemorrhagic stroke	Hypotension, electrolyte imbalance, poor compliance with polytherapy
Statins	Atorvastatin, Rosuvastatin, Simvastatin	Inhibit HMG-CoA reductase → ↓ cholesterol, stabilize atherosclerotic plaques, anti-inflammatory effects	Reduce stroke risk in patients with atherosclerosis and dyslipidemia	Muscle pain, liver enzyme elevation, risk of diabetes
Neuroprotective agents *(Experimental/limited use)*	Citicoline, Edaravone	Reduce oxidative stress, stabilizecell membranes, limit neuronal injury	May improve recovery in ischemic stroke (under investigation)	Limited proven efficacy, availability issues, not standard therapy

C. PERIPHERAL ARTERY DISEASE (PAD)

Drug Class	Examples	Mode of Action	Therapeutic Effects	Limitations / Side Effects
Antiplatelet agents	Aspirin, Clopidogrel, Ticagrelor	Inhibit platelet aggregation (Aspirin: COX-1 inhibition ↓ thromboxane A2; Clopidogrel/Ticagrelor: block ADP receptor on platelets)	Reduce risk of thromboembolic complications (stroke, MI, distal embolization)	Risk of bleeding, GI irritation (aspirin), resistance in some patients
Anticoagulants *(Selected cases, e.g., with mural thrombus or embolic risk)*	Warfarin, Rivaroxaban, Apixaban, Heparin	Inhibit clotting factors (Warfarin: vitamin K antagonist; DOACs: inhibit thrombin or Xa; Heparin: enhances antithrombin III activity)	Prevent embolization from aortic thrombus or aneurysm	Bleeding risk, monitoring needed (warfarin, heparin), interactions
Statins	Atorvastatin, Rosuvastatin, Simvastatin	Inhibit HMG-CoA reductase → ↓ LDL cholesterol, stabilize atherosclerotic plaques, anti-inflammatory effects	Slow plaque progression, reduce CV risk, stabilize aortic wall	Muscle pain, liver enzyme elevation, risk of diabetes
Antihypertensives	ACE inhibitors (Ramipril), ARBs (Losartan), Beta-blockers (Metoprolol), Calcium channel blockers (Amlodipine), Diuretics (Indapamide)	Lower BP via vasodilation, RAAS inhibition, ↓ cardiac output, or natriuresis	Reduce hemodynamic stress on aorta, slow progression of aortic disease, reduce CV events	Hypotension, electrolyte imbalance, bradycardia/fatigue (β-blockers)
Glucose-lowering agents *(For patients with diabetes)*	Metformin, SGLT2 inhibitors (Empagliflozin), GLP-1 agonists (Liraglutide)	Improve glycemic control; some also reduce CV risk and inflammation	Reduce vascular complications and plaque progression	GI upset (metformin), risk of ketoacidosis (SGLT2i), injectable form (GLP-1)

Emerging / adjunct therapies	PCSK9 inhibitors (Evolocumab, Alirocumab), Ezetimibe	PCSK9 inhibitors ↑ LDL receptor recycling → ↓ LDL; Ezetimibe ↓ intestinal cholesterol absorption	Further LDL lowering in statin-resistant or high-risk patients	Expensive (PCSK9i), injection route, GI upset (ezetimibe)

D.CARDIOMYOPATHIES

Drug Class	Examples	Mode of Action	Therapeutic Effects	Limitations / Side Effects
ACE inhibitors / ARBs / ARNI	Enalapril, Ramipril, Losartan, Sacubitril Valsartan	Inhibit RAAS (↓ angiotensin II, ↑ vasodilation, ↓ afterload & preload); ARNI adds neprilysin inhibition	Improve symptoms, reduce mortality in dilated cardiomyopathy (DCM) and heart failure	Hypotension, hyperkalemia, renal impairment, cough/angioedema (ACEi)
Beta-blockers	Carvedilol, Metoprolol, Bisoprolol	Block β-adrenergic receptors → ↓ HR, ↓ contractility, ↓ arrhythmias, anti-remodeling	Improve survival in DCM, reduce arrhythmias, improve exercise tolerance	Bradycardia, fatigue, bronchospasm, contraindicated in acute decompensation
Diuretics	Furosemide, Spironolactone, Eplerenone	Promote sodium & water excretion; aldosterone antagonists reduce remodeling	Relieve congestion, edema, dyspnea in heart failure	Electrolyte imbalance, dehydration, renal dysfunction, gynecomastia (spironolactone)
Anticoagulants	Warfarin, Rivaroxaban, Apixaban, Dabigatran	Inhibit clotting pathways (VK antagonist or Xa/thrombin inhibitors)	Prevent thromboembolism in patients with atrial fibrillation, mural thrombus, severe LV dysfunction	Bleeding risk, monitoring needed (warfarin), drug interactions
Antiarrhythmics	Amiodarone, Sotalol	Stabilize cardiac rhythm by blocking ion	Manage atrial and ventricular arrhythmias	Pro-arrhythmic risk, thyroid/lung toxicity

		channels or adrenergic effects	common in cardiomyopathy	(amiodarone), QT prolongation
Calcium channel blockers *(selective use in hypertrophic cardiomyopathy)*	Verapamil, Diltiazem	Block L-type Ca^{2+} channels → slow HR, improve diastolic filling, reduce outflow tract gradient	Improve symptoms in hypertrophic cardiomyopathy (HCM)	Hypotension, bradycardia, contraindicated in severe systolic dysfunction
Vasodilators / Nitrates *(Symptomatic relief)*	Isosorbide dinitrate, Hydralazine	Venodilation → ↓ preload; arterial dilation → ↓ afterload	Relieve angina and dyspnea, especially in restrictive cardiomyopathy	Headache, hypotension, tolerance (nitrates)
Newer agents *(Specific settings)*	Ivabradine, SGLT2 inhibitors (Dapagliflozin), Mavacamten (for obstructive HCM)	Ivabradine: ↓ HR via SA node inhibition; SGLT2i: metabolic & diuretic effects; Mavacamten : myosin inhibitor → ↓ contractility in HCM	Reduce hospitalizations, improve survival or symptoms in select cardiomyopathy subtypes	Ivabradine: only works in sinus rhythm; SGLT2i: risk of genital infections; Mavacamten: costly, requires monitoring

E. PERICARDITIS

Drug Class	Examples	Mode of Action	Therapeutic Effects	Limitations / Side Effects
Nonsteroidal anti-inflammatory drugs (NSAIDs)	Ibuprofen, Aspirin, Indomethacin	Inhibit COX → ↓ prostaglandin synthesis → ↓ inflammation & pain	First-line for acute pericarditis; relieve chest pain & inflammation	GI irritation, peptic ulcers, renal dysfunction, contraindicated in some cardiac patients (e.g., recent MI with indomethacin)
Colchicine	Colchicine	Inhibits microtubule polymerization → ↓ neutrophil	Reduces recurrence, adjunct to NSAIDs in	GI upset (diarrhea), contraindicated in severe

		activity & inflammatory response	acute & recurrent pericarditis	renal/hepatic impairment
Corticosteroids *(Reserved for refractory/autoimmune causes)*	Prednisone, Methylprednisolone	Broad anti-inflammatory & immunosuppressive effects	Used in refractory cases, autoimmune-related pericarditis, or NSAID/colchicine intolerance	Risk of recurrence on withdrawal, immunosuppression, weight gain, osteoporosis
Immunosuppressants / Biologics *(For recurrent/autoimmune pericarditis)*	Azathioprine, Methotrexate, IVIG, Anakinra (IL-1 blocker)	Suppress autoimmune response, inhibit cytokines	For recurrent, resistant, or autoimmune pericarditis	Expensive (biologics), risk of infection, long-term toxicity
Diuretics *(adjunct in pericardial effusion with heart failure signs)*	Furosemide, Spironolactone	Promote fluid excretion → ↓ preload	Symptomatic relief in effusive pericarditis with volume overload	Electrolyte imbalance, renal dysfunction
Antibiotics / Antitubercular drugs	Tailored to infection (e.g., anti-TB regimen for tuberculous pericarditis)	Kill or inhibit pathogen	Treat infectious causes of pericarditis	Drug-specific toxicity, prolonged treatment (TB therapy)

VII. NON-PHARMACOLOGICAL TREATMENT FOR HEART-RELATED DISEASES

Disease	Non-Pharmacological Treatments
Cerebrovascular Disease (Stroke/TIA)	• Smoking cessation • Regular aerobic exercise (≥150 min/week) • Healthy diet (DASH/Mediterranean, low salt, low fat) • Weight reduction & diabetes control • Carotid endarterectomy/stenting (for significant stenosis) • Stroke rehabilitation (physiotherapy, occupational, speech therapy)
Peripheral Artery Disease (PAD)	• Smoking cessation (most important) • Supervised walking/exercise programs • Diet modification (low-fat, low-cholesterol) • Weight control • Foot care to prevent ulcers/infections • Revascularization (angioplasty, stenting, bypass surgery if severe)

Aortic Atherosclerosis	• Healthy diet (low cholesterol, high fiber, avoid trans fats) • Regular exercise • Weight control • Smoking/alcohol reduction or cessation • BP control (low-salt diet, stress management) • Monitoring with imaging (ultrasound, CT, MRI) • Surgical/endovascular repair if aneurysm develops
Cardiomyopathy	• Avoid alcohol, smoking, and recreational drugs • Low-sodium diet • Weight control & light/moderate exercise (avoid strenuous activity in HCM) • Device therapy: ICD (arrhythmia prevention), CRT (heart failure) • Surgical: Septal myectomy/ablation (HCM), Heart transplantation (end-stage)
Pericarditis	• Rest during acute phase • Avoid strenuous activity until resolved • Adequate hydration & balanced diet • Pericardiocentesis (drain effusion if large/symptomatic) • Pericardiectomy (for chronic constrictive pericarditis) • Infection control/supportivemeasures (e.g., TB pericarditis management)

VIII. RECENT ADVANCES IN THERAPEUTICS FOR HEART HEALTH

A. CORONARY HEART DISEASE

1. INNOVATIVE INTERVENTIONAL PROCEDURES

Area	Innovation	Impact
Cholesterol Control	PCSK9 inhibitors (evolocumab,alirocumab)	Enhance LDL clearance; significantly lower cholesterol
Inflammation Targeting	Colchicine	Reduces cardiovascular risk via anti-inflammatory action
	IL-1β antibodies	Modulate atherothrombotic inflammation
Metabolic Therapy	Semaglutide, Tirzepatide	Weight loss + reduced CV events
Gene Regulation	RNA-targeted therapies	Precise control of genes driving cholesterol & hypertension
Targeted Delivery	Nanotechnology drug delivery	Direct delivery to lesions; reduces restenosis; fewer side effects

Impact/Benefit

- Better cholesterol & inflammation control
- Reduced heart attack & stroke risk
- Long-lasting, targeted therapy
- Personalized treatment & improved healing

2. ADVANCED SURGICAL & REGENERATIVE TECHNIQUES

Area	Innovation	Impact
Minimally Invasive Surgery	MICS	Less trauma, faster recovery
Hybrid Strategy	Hybrid revascularization	Combines PCI + CABG for optimal outcomes
CABG Enhancement	Off-pump CABG	Lower complication risk
Tissue Regeneration	Stem cell therapy	Regenerates myocardium
Genetic Repair	CRISPR-Cas9	Corrects genetic defects (experimental)

Impact/Benefit

- Fewer surgical risks with durable bypass outcomes
- Potential heart tissue regeneration
- Promise for curing genetic disorders

3. TECHNOLOGY-BASED APPROACHES

Area	Technology	Impact
AI & ML	Risk prediction, ECG analysis, 3D modeling	Early diagnosis; personalized surgical planning
Wearables	Continuous monitoring	Early arrhythmia detection
Telemedicine	Remote follow-up	Better access, improved patient engagement

Impact/Benefit

- Early diagnosis & prevention
- Precision and personalization
- Enhanced long-term monitoring
- Expanded access to care

B. CEREBROVASCULAR DISEASE

Category / Area	Innovation / Technology / Therapy	Purpose / Key Benefit / Impact
Diagnosis & Early Management	Mobile Stroke Units (CT-equipped ambulances)	Diagnose and treat stroke rapidly
	AI (Imaging analysis)	Predict outcomes; differentiate core vs penumbra
	Advanced Imaging (CT/MRI perfusion & angiography)	Identify blockage and salvageable tissue
Ischemic Stroke Therapy	Tenecteplase (TNK-tPA)	Single bolus, high fibrin specificity → better clot dissolution, lower hemorrhage risk
	Extended-window thrombectomy	6–24 hour eligibility → saves more brain tissue
	Aspiration catheters + stent retrievers	Improved first-pass recanalization → higher effectiveness
	Combination therapies (IV thrombolysis + thrombectomy)	Better reperfusion outcomes
Hemorrhagic Stroke & Aneurysm Treatment	Flow diversion	Diverts blood from aneurysm → durable healing of wide-neck aneurysms
	WEB device	Treats bifurcation aneurysms → avoids dual antiplatelets; ideal for ruptured cases
	Transradial access	Wrist artery entry → more comfort, less bleeding
	MMA embolization	For chronic subdural hematoma → lower recurrence
AVMs & Related Diseases	Targeted drug therapy (KRAS/MAPK-ERK inhibitors)	Corrects underlying mutation-driven AVMs
	Embolization + Radiosurgery	Improved precision → better access to difficult AVMs
Carotid Artery Stenosis	Drug-eluting stents	Prevent restenosis and stroke
Advances in Diagnosis	Advanced Imaging (CT/MRI perfusion)	Penumbra identification
	ASL & DTI	Microvascular and white matter assessment
	AI-3D angiography Radiomics	Detect small aneurysms Clot typing and prognosis → personalized prediction
Advances in Treatment	Endovascular therapy (MT, stent retrievers, flow diverters)	Direct clot removal
	Extended time window (imaging-based selection)	Safe treatment beyond 6 hours
	Emerging therapies (Neuroprotection, stem/gene therapy)	Neurorepair and malformation targeting

C. PERIPHERAL ARTERY DISEASE

1.Diagnosis

Area	Innovation	Purpose
Duplex ultrasound	Improved resolution	Assess flow & wall structure
CT/MR angiography	High-contrast 3D imaging	Detect stenosis/occlusion
Contrast MRI	Tissue perfusion analysis	Microvascular assessment
AI algorithms	Automated detection	Early risk profiling

2. Treatment

Category	Innovation	Purpose
Medical therapy	Aspirin, Clopidogrel, Rivaroxaban combo	Reduce CV events
Vasodilators	Cilostazol, Naftidrofuryl	Improve walking distance
Endovascular	DCBs, DES, bioresorbable scaffolds	Reduce restenosis
	Atherectomy, IV lithotripsy	Remove plaque; fracture calcium
Surgery	Hybrid revascularization	One-session repair
Regenerative therapy	Stem cell, gene therapy, VEGF/FGF	Promote angiogenesis

D. AORTIC ATHEROSCLEROSIS

1. Diagnosis

Area	Innovation	Purpose
CTA	High-res imaging	Detect plaque
MRI	Wall inflammation detection	Characterize plaque stability
TEE	Gold standard	Detect arch atheroma
IVUS/OCT	Detailed plaque morphology	Assess vulnerability
AI	Plaque measurements	Risk prediction

2. Treatment

Category	Innovation	Purpose
Endovascular	EVAR, TEVAR	Repair aneurysm/dissection
Hybrid repair	Open + endovascular	Complex aortic disease
Lithotripsy	Break calcification	Improve stent placement
Regenerative	Gene therapy, stem cells	Vascular regeneration

E. CARDIOMYOPATHY

1. Diagnostic Advances

Tool	Purpose
GLS echocardiography	Detect early LV dysfunction
Cardiac MRI	Fibrosis, edema detection
Tc-PYP/DPD scans	Noninvasive ATTR diagnosis
AI	Early detection & risk modeling

2. Treatment Advances

Type	Therapy	Benefit
HCM	Mavacamten	Reduces LVOT obstruction
DCM	ARNI, SGLT2 inhibitors	Reduces mortality & hospitalization
Amyloid cardiomyopathy	Tafamidis, Vutrisiran, Patisiran	Slows/reverses amyloid deposition
Precision therapy	Gene/stem-cell treatments	Molecular-level correction

F. HEART VALVE DISEASE

1. Diagnostic Advances

Area	Innovation	Purpose
Echocardiography	3D + strain	Assess valve structure/function
Cardiac MRI	Fibrosis + regurgitant volume	Timing of intervention
CT angiography	Planning TAVR/TMVR	Annular sizing
AI	Predict valve disease progression	Early detection

2. Treatment Advances

Procedure	Innovation	Purpose
TAVR	Next-gen valves	Low-risk patient eligibility
Transcathetermitral/tricuspid repair	Clips, replacements	For high-risk patients
Valve repair	Chordalreplacement, annuloplasty	Longer durability
Bioprosthetic improvement	Anti-calcification strategies	Extended valve life

IX. KEY CARDIOVASCULAR TRIALS IN 2025

Trial Name (Phases of Trial)	Therapeutic Area / Focus	Key Question / Objective
REBOOT-CNIC(Phase IV, NCT03596385)	Post-myocardial infarction (MI)	Whether long-term beta-blockers are still needed after MI when left ventricular ejection fraction is preserved.
BETAMI (Phase IV, NCT03646357)	Post-MI	Assessing the effects of beta-blockers on cardiovascular events in MI patients without heart failure.
DANBLOCK (Phase IV, NCT03778554)	Post-MI	Whether long-term beta-blockers are still needed after MI when left ventricular ejection fraction is preserved.
NEO-MINDSET (Phase III, NCT04360720)	Antiplatelet or Anticoagulation therapy (ACS)	Testing earlier withdrawal of aspirin or other anti-platelets to reduce bleeding risk.
DUAL-ACS (Phase IV, NCT03462498)	Acute coronary syndromes	Whether dual antiplatelet therapy canbe safely reduced earlier.
ALONE-AF (Phase IV, NCT04432220)	Atrial fibrillation	Testing if oral anticoagulants (OACs) can be safely stopped after one year in patients free of arrhythmia post-ablation.
PARACHUTE-HF (Phase IV, NCT04023227)	Heart failure (Chagas cardiomyopathy)	Comparing Sacubitril/Valsartan vs Enalapril for chronic Chagas-related HF, aiming for guideline-level mortality data.
DAPA ACT HF-TIMI 68 (Phase IV, NCT04363697)	Acute heart failure	Evaluates starting SGLT2 inhibitors (like Dapagliflozin) during hospitalisation for acute HF.
VICTOR (Phase III, NCT05093933)	Chronic heart failure	Expanding the role of Vericiguat in chronic HF.
VICTORIA (Phase III, NCT02861534)	Chronic heart failure	Vericiguat as an option in HF management.
ODYSSEY-HCM (Phase III, NCT05582395)	Hypertrophic cardiomyopathy (HCM)	Testing Mavacamten (an oral myosin inhibitor) as a non-invasive therapy for symptomatic HCM.
MAPLE-HCM (Phase III, NCT05767346)	Hypertrophic cardiomyopathy	Testing Aficamten (another oral myosin inhibitor) vs standardtherapies or invasive approaches.
BaxHTN (Phase III, NCT06034743)	Hypertension	Testing a new aldosterone synthase inhibitor for long-term BP control.
KARDIA-3 (Phase II, NCT06272487)	Hypertension	Testing **Z**ilebesiran, a twice-yearly siRNA therapy, for blood pressure control and adherence.

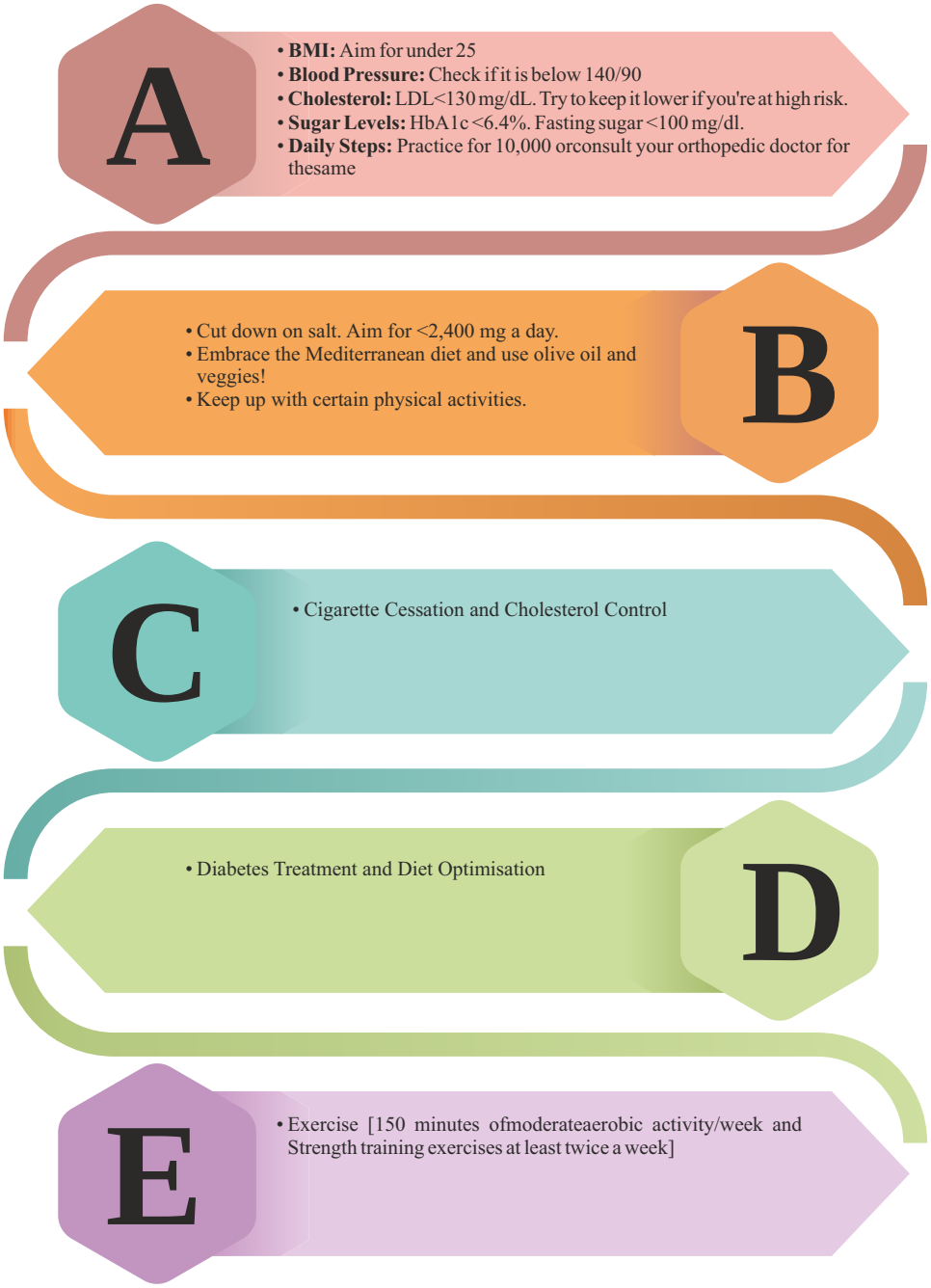
X. KEY APPROVALS IN CARDIOVASCULAR MEDICINE OR THERAPY IN 2025

Brand name (Drug)	Regulatory Body action	Indication / purpose
Semaglutide (Ozempic)	FDA approval (new indication)	Reduction of risk of worsening kidney disease and cardiovascular complications (cardiorenal indication)
Merilog (Insulin aspart-szjj)	FDA approval (biosimilar)	Rapid-acting insulin for diabetes mellitus (adult & pediatric)
TNKase (Tenecteplase)	FDA approval, new indication	Acute ischemic stroke in adults for single-bolus thrombolytic
Arbli (Losartan potassium oral suspension)	FDA approval	Hypertension; diabetic kidney disease
HemiClor (Chlorthalidone) **tablets**	FDA approval	Treatment of high blood pressure (thiazide-like diuretic)
Vanrafia (Atrasentan)	FDA approval	Immunoglobulin A (IgA) nephropathy: reduction in proteinuria (renal indication with cardiovascular relevance)
Yutrepia (Treprostinil) **inhalation powder**	FDA approval	Pulmonary arterial hypertension (PAH) and pulmonary hypertension associated with ILD
Widaplik (Amlodipine + Indapamide + Telmisartan)	FDA approval	Fixed-dose triple combination **:** 1st FDA-approved triple-combination initial therapy for hypertension
Ravenbhel (Dapagliflozin + Sacubitril/Valsartan**) (Triple FDC)**	CDSCO (India) approval to conduct bioequivalence studies & Phase III trials (regulatory milestone)	Fixed-dose combo intended for comprehensive heart-failure management (SGLT2 + Neprilysin inhibitor + ARB)
Empagliflozin + Metoprolol **(Double FDC)**	CDSCO (India) approval to proceed with Phase III trials	Fixed-dose combo targeting improved adherence; combines SGLT2 inhibitor + beta-blocker for cardiovascular indications

XI. FUTURE DIRECTIONS TO HEART HEALTH MEDICINE

- Nano-medicine: The targeted delivery of drugs, such as thrombolytics and neuroprotective agents, is an active area of research. Nano-medicines could potentially improve drug delivery across the blood-brain barrier and target specific disease sites.
- Regenerative medicine: Stem cell and cell-based therapies are under investigation for their potential to replace lost brain cells and promote neuroregeneration, offering hope for improved recovery.
- Reducing health disparities: Despite technological advancements, challenges remain in ensuring equitable access to care across different populations and regions.
- Predicting risk: Ongoing research uses machine learning and biomarker analysis to more accurately predict a patient's risk for stroke or aneurysm rupture, allowing for better preventative strategies

XII. THE ABCDE OF HEART HEALTH



XIII. YOUR HEART HEALTH CHECKLIST

Use it to keep a track of your health and consult a physician accordingly

HER HEART

YOUR HEART HEALTH CHECKLIST

Take these questions to your doctor and use the prompts to start a conversation about your heart health.

HEART CHECK INCLUDES:

- Heart Rate/Pulse
- Blood Pressure
- Auscultation of the heart (listening to the heart valves)
- Temperature

WEIGHT CHECK:

- Body mass index (Weight and Height)
- Waist Circumference

BLOOD TESTS:

- Cholesterol Levels
- Blood Glucose
- Iron Levels
- Vitamin D
- B12 Levels
- Calcium Levels
- Thyroid Levels
- Urea and Electrolytes
- Liver Function

WHILE YOU ARE THERE:

- Breast Examination
- Cervical Smear
- Ovarian Markers
- Bone Density
- Faecal Screening (over 50 years old)

ABOUT YOU

Age

Gender

Cultural Background

RISK FACTORS

Do you know what your blood pressure is?

Do you have high cholesterol?

Is there a history of Diabetes in the family, or are you diabetic?

Have you previously had Rheumatic Heart Disease?

Have you ever had high blood pressure or pregnancy induced diabetes?

Have you experienced (early)

peri-menopause or Menopause?

LIFESTYLE BEHAVIOUR

Do you smoke/vape?

Do you drink alcohol regularly?

Do you partake in any illicit drug use?

Do you get to exercise on a regular basis?

Do you consider that you eat a balanced diet?

Do you sometimes feel stressed or anxious?

Are you sleeping well at night?

FAMILY HISTORY

Is there a family history of heart attack or stroke?

Has anyone in your family had high blood pressure?

Does anyone in your family have diabetes?

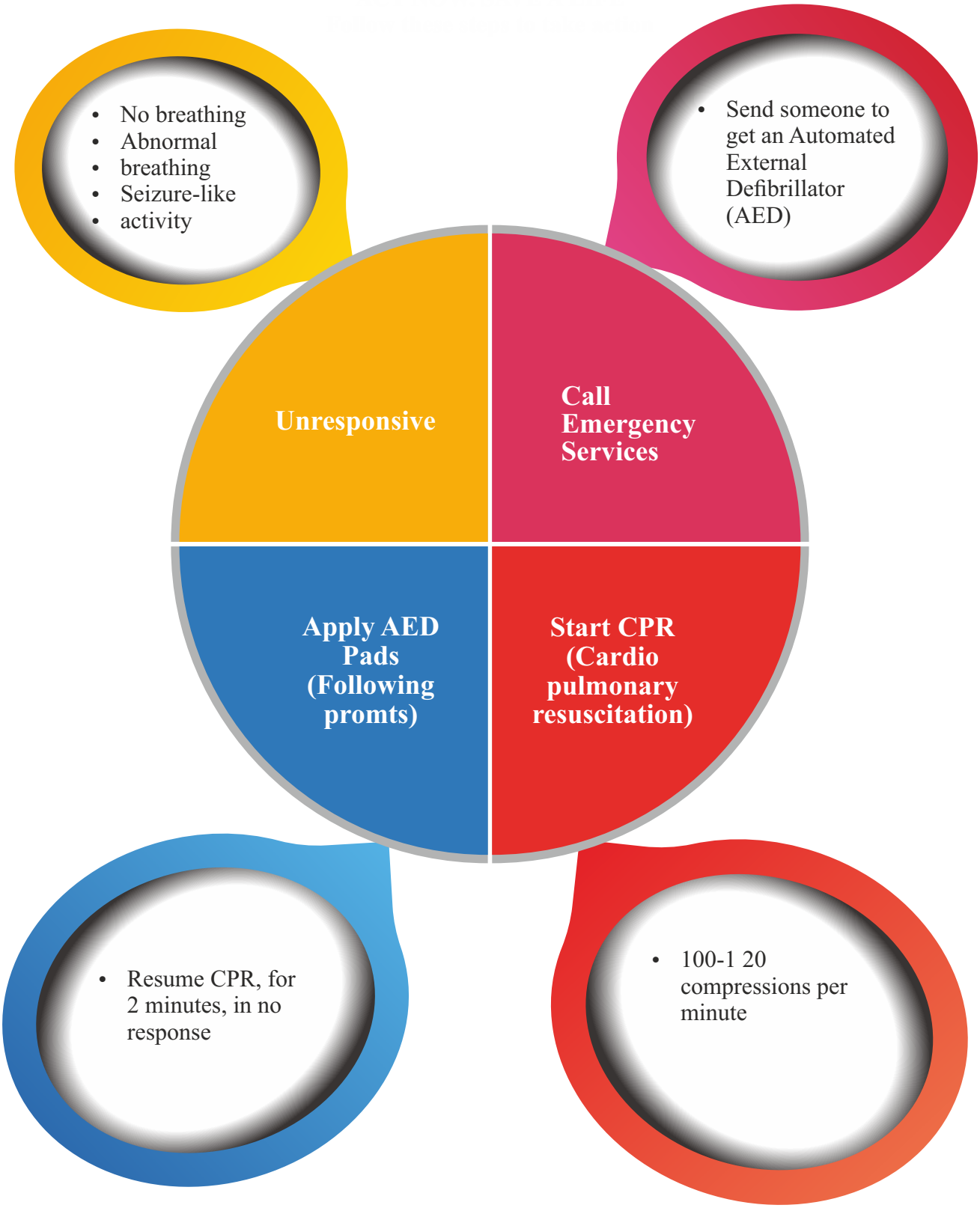
TREATMENT HISTORY

Have you or are you currently;

a) taking any prescription medication?

b) Using alternative therapies?

XIV. CARDIAC EMERGENCY RESPONSE PLAN



XV. A LETTER TO THE POLICY MAKERS

As the world prepares to convene in Belém for the 30th United Nations Climate Change Conference (COP30), we respectfully urge governments and global leaders to place cardiovascular health at the centre of climate commitments. Climate change poses both **direct** and **indirect** threats to heart health. Two of the most urgent direct risks are:

- **Air pollution**: Largely driven by fossil fuel combustion, air pollution was responsible for
- approximately 8 million premature deaths in 2023, with half resulting from heart disease and stroke. It remains the leading environmental risk factor for cardiovascular disease worldwide.
- **Extreme heat**: Heatwaves are becoming more frequent and intense, which could raise

  cardiovascular mortality up to seven-fold among people living with existing heart disease.

  Beyond these immediate dangers, climate change also heightens indirect risks to cardiovascular health. Droughts, floods, wildfires, and hurricanes threaten food and water security, sanitation, can exacerbate chronic diseases, increase vulnerability to acute cardiovascular events, and erode community resilience. These risks are especially acute in low- and middle-income countries, where 90% of air pollution related deaths occur and where health systems are often less equipped to respond to climate-related emergencies. The pace of implementing mitigation and adaptation measures in these settings remains far too slow to match the urgency of the threat.To ensure the inclusion of health equity and heart health in climate policy, the World Heart Federation and Instituto Lado a Lado pela Vida request governments at COP30 to:

- Integrate cardiovascular health into the Nationally Determined Contributions and other climate-related national strategies,
- Phase down fossil fuel use, which drives both climate change and air pollution,
- Develop national policies that reduce exposure to air pollution, promote clean household energy, and improve active and sustainable mobility,
- Adopt and implement the WHO 2021 Global Air Quality Guidelines to reduce air pollution levels and prevent over 4.5 million CVD deaths,
- Strengthen heatwave preparedness plans, with a focus on early warnings, public health
- messaging, and targeted protections for high-risk populations,
- Prioritize vulnerable populations, including people living with NCDs, children, and older Adults, in building more resilient, equitable health systems:
- Safeguard policies from commercial and vested interests
- Engage civil society and marginalized groups in the planning, implementation, and
- monitoring of climate and health strategies.
- Thus as climate action is not only an environmental imperative, but a public health necessity we urge governments to defend a future where clean air, a stable climate, and cardiovascular health are recognized as shared global goods.

XVI. TAKE HOME MESSAGE

Your heart is your lifelong engine, protect it today to power your tomorrow.

By learning how the heart works, recognizing early warning signs, and choosing healthier habits now, you can prevent many serious diseases long before they start. Staying active, eating smart, avoiding tobacco, managing stress, and understanding your family history all play a huge role in keeping your heart strong. Small daily choices, like taking the stairs, drinking more water, sleeping well, and spending less time on screens—add up to big lifelong benefits.

Remember: **the earlier you care, the longer it will carry you.**

"Start early. Stay healthy. Keep your heart happy!"

SALIENT FEATURES

ICFAI School of Pharmaceutical Sciences

- Modem and state-of-the-art infrastructure
- Modular labs with hi-tech instruments
- Highly qualified, dedicated, and experienced faculty members.
- Enriched library and information center
- Research-driven education.
- Novel pedagogy methods
- Wi-Fi enabled campus.
- Career counselling for higher studies & competitive examinations
- Assistance for bank loans to students in need

BEST PRACTICES

- Leaner's centric approach in teaching
- Peer Tutoring
- Peer-review of teaching
- Student empowerment through student council
- Quality Circles to inculcate team work & positive attitude.

WHY ICFAI?

- Center of excellence m Technical & Professional Education
- Attractive Scholarships
- Nurture an attitude of problem-solving
- Imbibe skills of creativity

Program Offered	B.Pharm
Full Form	Bachelor of Pharmacy
Duration	4 Years
Course Level	Undergraduate
Examination Type	Semester
Eligibility Criteria	Passed 10+2 from the state or central board with English and Physics, Chemistry, Mathematics, and/or Biology taken individually, as required for eligibility criteria purposes
Admission Process	Merit basis

CELEBRATING OUR RECENT SUCCESS

A research grant of 6 lakhs has been sanctioned by the Uttarakhand State Council for Science and Technology (UCOST), Dehradun, to the ICFAI School of Pharmaceutical Sciences, The ICFAI University Dehradun, for a research project. This prestigious grant is a testament to the University's expertise, dedication, and commitment to high-quality research.

INDIGENOUS PREPARATION OF HAND-RUB FORMULATION

Addressing the increasing demand for health and safety measures, the school has formulated an effective and affordable hand-rub formulation. Developed in accordance with WHO-approved guidelines and crafted with high-quality ingredients, this initiative underscores our dedication to advancing public health and hygiene.

COLLABORATION WITH PHARMACEUTICAL INDUSTRIES

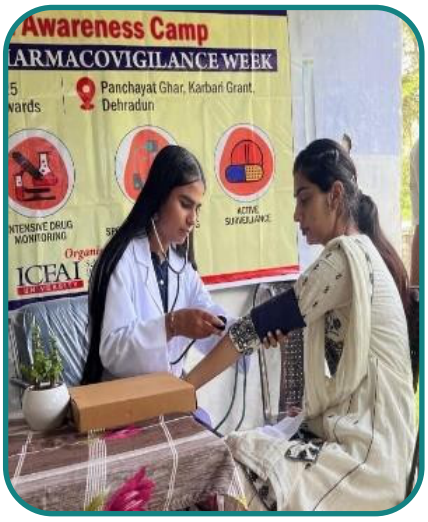
Collaborations with pharmaceutical industries, in the form of MoUs (i.e., with Ishaanav Nutraceuticals) are being strengthened to enhance the student internship program. These partnerships will offer valuable industry exposure and significantly expand job opportunities for students.

DEPARTMENTAL ACTIVITY

I. National Pharmacovigilance Week, 2025

Health Awareness Program on 24th September, 2025, Panchayat Ghar, Karbari Grant, Dehradun

People Participating in Awareness Program, ***"Your Safety, Just a Click Away: Report to PvPI"***



2. World Pharmacist's Day, 2025

"Think health, Think Pharmacists"

Felicitation of Chief Guest, Mr. M.L Joshi

Talk by Chief Guest, Mr. M.L Joshi

3. National Pharmacy Week, 2025

Think health, Think Pharmacists"

Opening of the Ceremony

Opening of the Ceremony

Felicitation of Guest Lecturer **Mr. Ritesh Kumar Singh**

Student Oral Presentation

Free Health Check-up Camp

Rangoli Competition

The ICFAI University

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