HEART FAILURE

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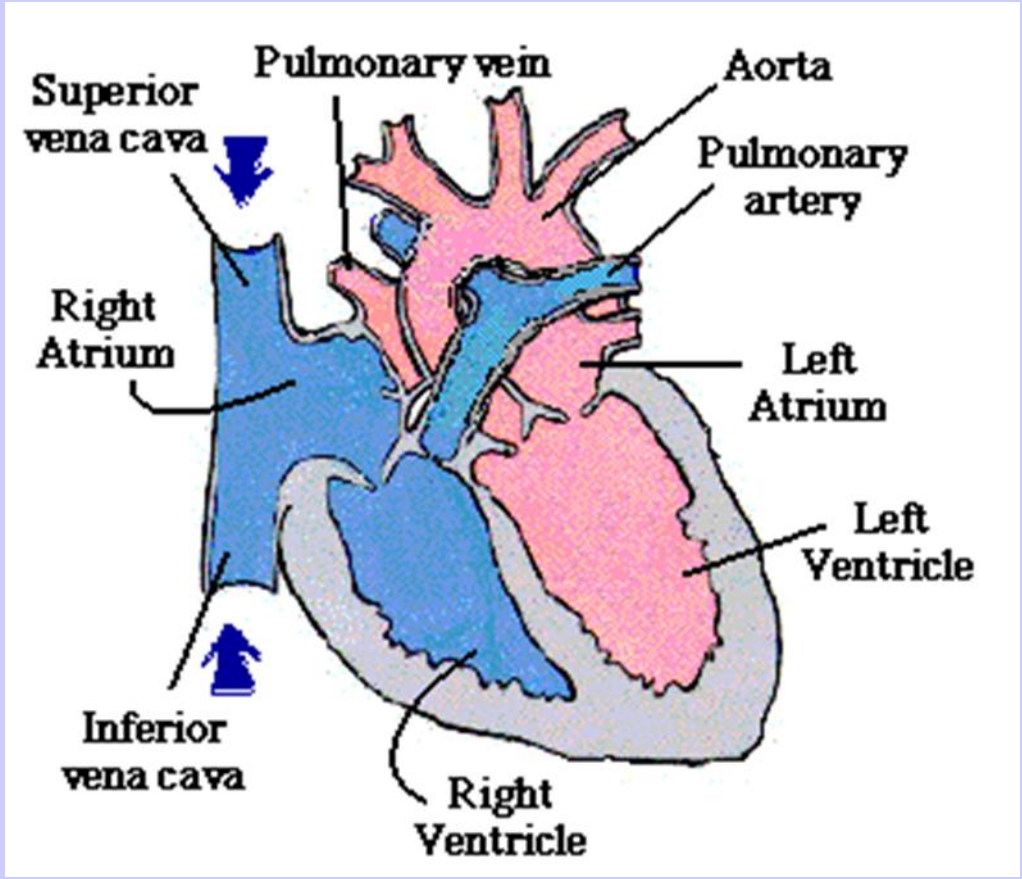
Definition

- Heart failure (HF), also known as *congestive heart failure (CHF),* is a syndrome caused by an impairment in the heart's ability to fill with and pump blood.



HF - Classification

- **Types of HF include:**

-systolic

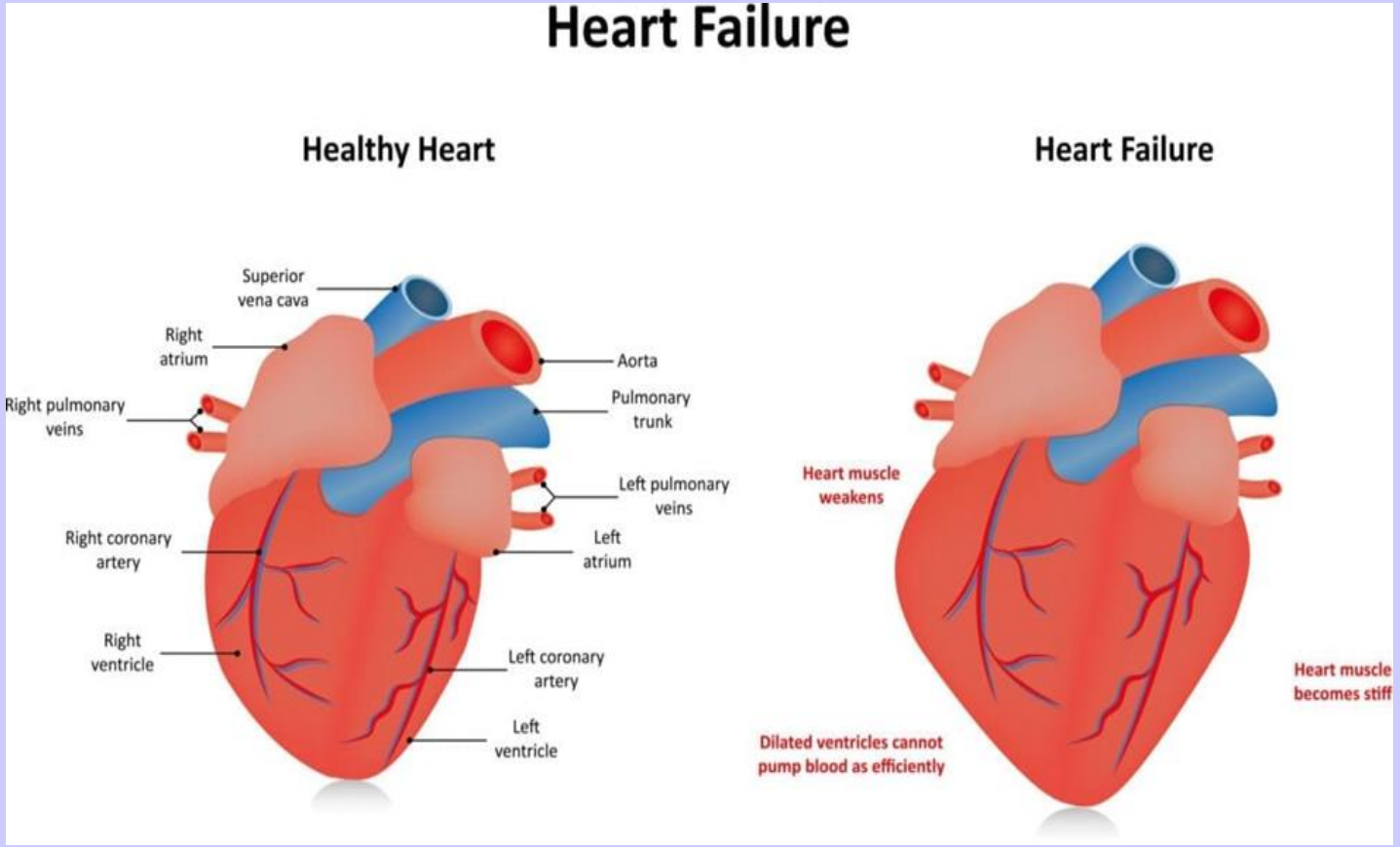
- diastolic

- acute

- chronic

- right side

- left side



HF - Classification

In collaboration with the American College of Cardiology, the AHA has identified four stages of heart failure.

Stage A: At risk for heart failure	People who are at risk for heart failure but do not yet have symptoms or structural or functional heart disease. Risk factors for people in this stage include hypertension, coronary vascular disease, diabetes, obesity, exposure to cardiotoxic agents, genetic variants for cardiomyopathy and family history of cardiomyopathy
Stage B: Pre-heart failure	People without current or previous symptoms of heart failure but with either structural heart disease, increased filling pressures in the heart or other risk factors
Stage C: Symptomatic heart failure	People with current or previous symptoms of heart failure
Stage D: Advanced heart failure	People with heart failure symptoms that interfere with daily life functions or lead to repeated hospitalizations

HF - Classification

NYHA Functional Classification.

Class	Patient Symptoms
I	No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation or shortness of breath.
II	Slight limitation of physical activity. Comfortable at rest. Ordinary physical activity results in fatigue, palpitation, shortness of breath or chest pain.
III	Marked limitation of physical activity. Comfortable at rest. Less than ordinary activity causes fatigue, palpitation, shortness of breath or chest pain.
IV	Symptoms of heart failure at rest. Any physical activity causes further discomfort.

HF -etiology

What raises the risk for heart failure?

- ***risk of HF goes up if there is more than one of the following:***

- **Aging** can weaken and stiffen the heart**.** People 65 years or older have a higher risk of HF. Older adults are also more likely to have other health conditions that cause HF.

- **Family history of heart failure** makes the risk of HF higher. Genetics may also play a role. Certain changes, or ***mutations*** , to genes can make your heart tissue weaker or less flexible.

HF -etiology

What raises the risk for heart failure?

- **Unhealthy lifestyle habits,** such as:

- an unhealthy diet,
- smoking, using cocaine or other illegal drugs,
- heavy alcohol use
- lack of physical activity,

HF –etiology

What raises the risk for heart failure?

- **Heart or blood vessel conditions, serious lung disease, or infections such as HIV or SARS-CoV-2** raise the risk.
- Long-term health conditions such as:

-obesity,

-high blood pressure

-diabetes,

-sleep apnea,

-chronic kidney disease,

- anemia,

- thyroid disease,

-iron overload,

-Cancer treatments such as radiation and chemotherapy

-Atrial fibrillation

HF –etiology

What raises the risk for heart failure?

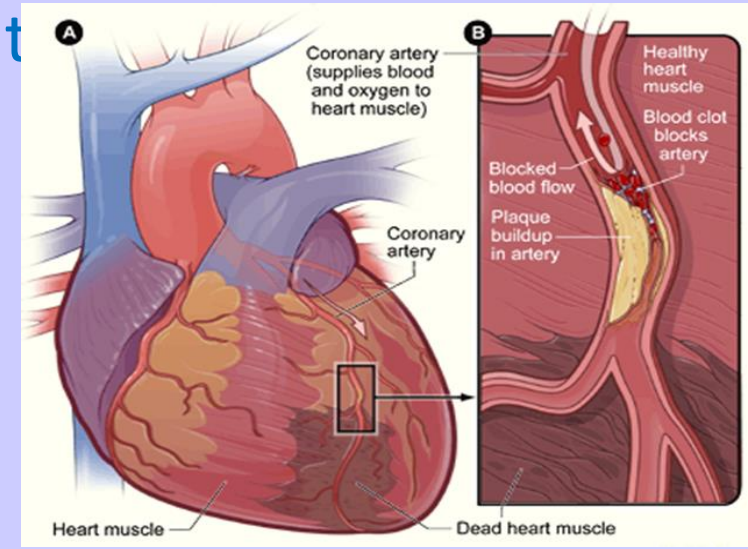
- **Black and African American** people are more likely to have HF than people of other races, often have more serious cases of HF and experience HF at a younger age

- HF is common in both men and women, although **men** often develop HF at a younger age than women. Women more commonly have HF with preserved ejection fraction (HFpEF), which is when the heart does not fill with enough blood. Men are more likely to have HF with reduced ejection fraction (HFrEF). ***Women often have worse symptoms than men.***

What causes left-sided HF?

- Chronic conditions that damage or weaken the heart muscles are the main cause of heart failure with reduced ejection fraction:

- coronary heart disease or a heart attack
- faulty heart valves,
- irregular heartbeat,
- heart diseases that the patient is are born with or inherit
- high blood pressure
- obesity
- diabetes



What causes right-sided HF?

- **Results from diseased right ventricle**

Causes:

-LVF
-Cor pulmonale
-RV infarction

-Congenital heart defects or conditions that damage the right side of the heart such as abnormal heart valves

HF – Pathophysiology

*Pump fails → decreased stroke volume /CO.

Compensatory mechanisms kick in to increase CO:

-**SNS stimulation** → release of epinephrine/nor-epinephrine

-**Increase HR**

-**Increase contractility**

-**Peripheral vasoconstriction** (increases afterload)

-**Myocardial hypertrophy**: walls of heart thicken to provide more muscle mass → stronger contractions

-**Myocardial enlarging:** over time, more strongly contraction causes the heart to enlarge.

HF - Pathophysiology

- **The body also tries to compensate in other ways:**

-*The blood vessels narrow* to keep blood pressure up, trying to make up for the heart's loss of power.

-*The kidneys retain more salt and water* rather than excrete it through urine. This creates increased volume of blood, which helps to maintain blood pressure and allows the heart to pump stronger. But over time this extra volume can overtask the heart, making heart failure worse.

*These temporary measures mask the problem of heart failure, but they don't solve it. Heart failure continues and worsens until these compensating processes no longer work.

*Eventually the heart and body simply can't keep up, and the person experiences fatigue, breathing problems or other symptoms that usually prompt a trip to the doctor.

*The body's compensation mechanisms help to explain why some people might not become aware of their condition until years after their heart begins its decline. (That is a good reason to have a regular checkup with the doctor.)

Left-sided HF

- The heart's pumping action moves oxygen-rich blood from the lungs to the left atrium, then on to the left ventricle, which pumps the blood to the rest of the body. The left ventricle supplies most of the heart's pumping power, so it's larger than the other chambers and essential for normal function.
- In left-sided or left ventricular HF, the left side must work harder to pump the same amount of blood. The percentage of blood the heart can pump with each beat is measured by a unit called ejection fraction (EF).
- A normal left ventricle ejects about 55% to 60% of the blood in it.
- Left ventricular failure can be further subdivided into heart failure with ***preserved ejection fraction (HFpEF)*** and with with ***reduced ejection fraction (HFrEF)*** - less than 40 %

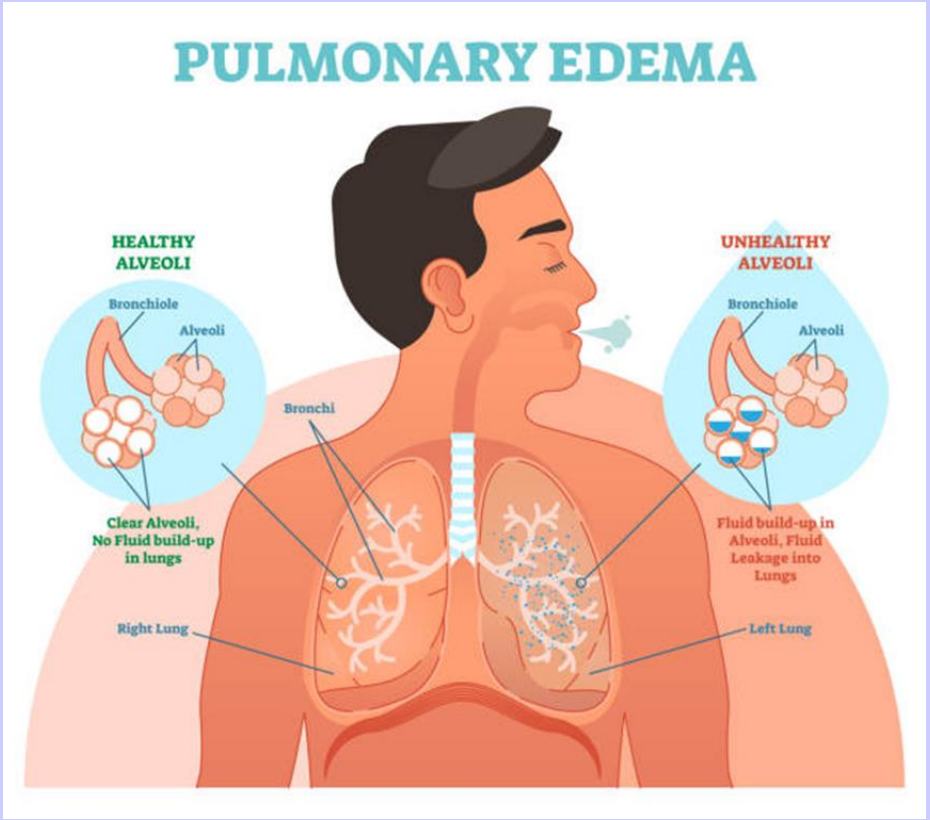
Left-sided HF

- *There are two types of left-sided heart failure:*
- **Systolic failure:** The left ventricle loses its ability to contract normally. The heart can't pump with enough force to push enough blood into circulation. This is also known as heart failure with reduced ejection, or HFrEF. When this occurs, the heart is pumping less than or equal to 40% EF.

- **Diastolic failure:** The left ventricle loses its ability to relax normally because the muscle has become stiff. The heart can't properly fill with blood during the resting period between each beat. This is also known as heart failure with preserved ejection, or HFpEF. When this occurs, the heart is pumping greater than or equal to 50%. EF heart failure with mid-range ejection fraction (HFmrEF) is a newer concept. In this type of heart failure, the left ventricle pumps between 41% and 49% EF. This places people with HFmrEF between the HFrEF and HFpEF groups.

Left - sided HF

Simptoms



Right-sided HF

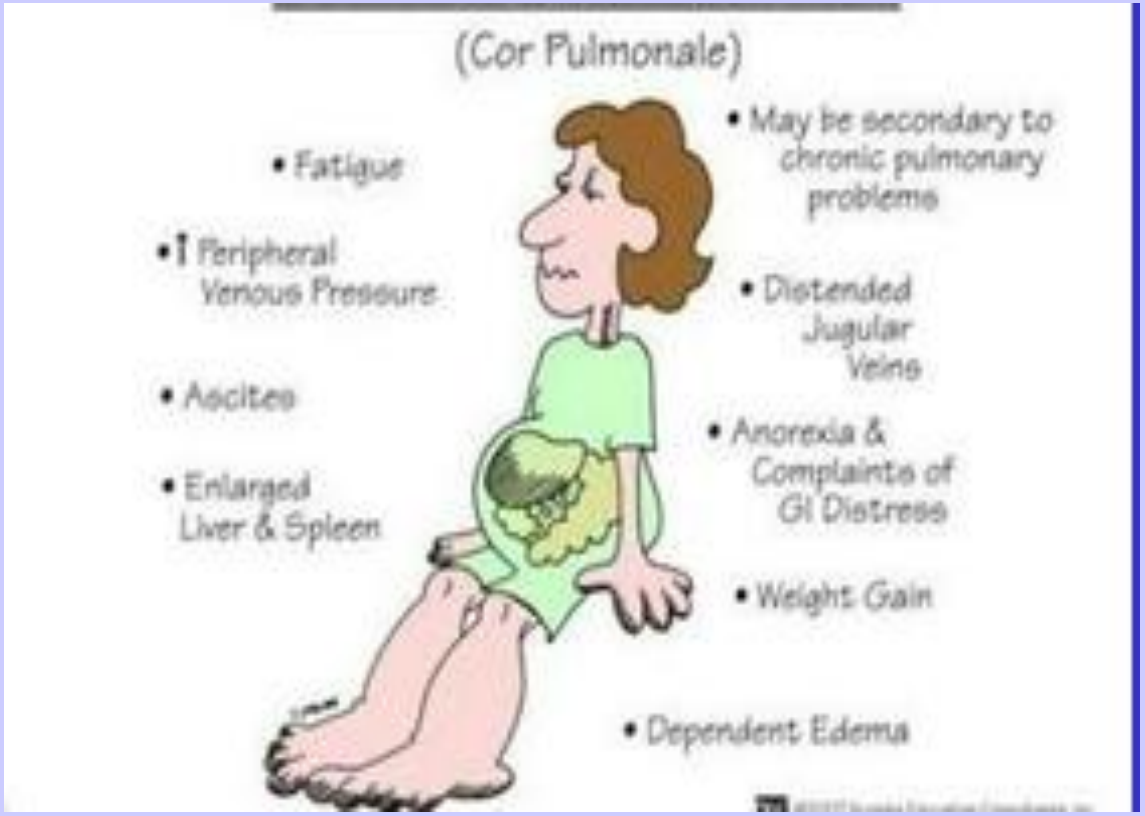
- The heart's pumping action moves "used" blood that no longer has oxygen in it back to the right atrium and on to the right ventricle. The right ventricle then pumps the blood back out of the heart and into the lungs to be replenished with oxygen.

  -Right-sided or right ventricular HF usually occurs as a result of left-sided failure. When the left ventricle fails and can’t pump enough blood out, increased fluid pressure is transferred back through the lungs. This damages the heart’s right side. When the right side loses pumping power, blood backs up in the body’s veins.

Right-sided HF

Simptoms

- Venous congestion
- Peripheral edema
- Hepatomegaly
- Splenomegaly
- Jugular venous distension



HF -simptoms

Sign or Symptom	People with Heart Failure Might Experience...	Why It Happens
Shortness of breath (also called dyspnea)	... breathlessness during activity (most commonly) or while at rest. Sometimes it comes on suddenly at night, making it very hard to breathe unless you get up and move around. You may need several pillows to raise your upper body so you can breathe more easily.	Blood "backs up" in the pulmonary veins (the vessels that return blood from the lungs to the heart) because the heart can't keep up with the supply. This causes fluid to leak into the lungs.
Persistent coughing or wheezing	... coughing that produces white or pink blood-tinged mucus.	Fluid builds up in the lungs (see above).
Buildup of excess fluid in body tissues (edema)	... swelling in the feet, ankles, legs, fingers, abdomen and in other tissues and organs. As a result, weight gain is common.	If you have heart failure, your heart doesn’t pump with enough force. This means that not enough blood is pumped out of the heart with each heartbeat. Then, because the heart isn’t emptying as it should, blood returning from the body can’t enter the heart and backs up in the veins. This forces fluid from the blood vessels into other tissues, causing swelling (edema).

HF -simptoms

Sign or Symptom	People with Heart Failure Might Experience...	Why It Happens
Tiredness, fatigue	... a tired feeling all the time and difficulty with everyday activities, such as shopping, climbing stairs, carrying groceries or walking. You may also feel sleepy after eating, feel weak in the legs when walking and get short of breath while being active.	The heart can't pump enough blood to meet the needs of body tissues. The body diverts blood away from less vital organs, particularly muscles in the limbs, and sends it to the heart and brain.
Lack of appetite, nausea	... a feeling of being full or sick to your stomach.	The digestive system receives less blood, causing problems with digestion.

HF -simptoms

Sign or Symptom	People with Heart Failure Might Experience...	Why It Happens
Confusion, impaired thinking	... memory loss and feelings of disorientation. A caregiver or relative may notice this first.	Changing levels of certain substances in the blood, such as sodium, can result in reduced blood flow to the brain, which can cause confusion.
Increased heart rate	... heart palpitations, which feel as if your heart is racing or throbbing.	To "make up for" the loss in pumping capacity, the heart beats faster.
Weight changes	... sudden weight gain or loss can be a sign that you're developing heart failure, or that your heart failure is progressing. Ask your health care professional how much fluid to drink every day.	Reduced blood flow to your stomach can make it harder to absorb nutrients from your food and may cause weight loss. Extra fluid retention may cause your weight increase.

Acute HF

Clinical Manifestations

- Pulmonary edema
- Agitation
- Pale or cyanotic, cold, clammy skin
- Severe dyspnea
- Tachypnea
- Pink, frothy sputum

Chronic HF

Clinical Manifestations

- Fatigue
- Dyspnea
- Paroxysmal nocturnal dyspnea (PND)
- Tachycardia
- Edema – (lung, liver, abdomen, legs)
- Nocturia

Chronic HF

Clinical Manifestations

-Behavioral changes

-Restlessness, confusion, attention span

-Chest pain (d/t CO and ↑ myocardial work)

-Weight changes (r/t fluid retention)

-Skin changes

-Dusky appearance

HF- Diagnosis

- Physical exam
- Blood tests. Blood tests can help diagnose diseases that can affect the heart. Blood tests also can look for a specific protein made by the heart and blood vessels. In heart failure, the level of this protein goes up.
- Chest X-ray. X-ray images can show the condition of the lungs and heart.
- Electrocardiogram (ECG). This quick and painless test records the electrical signals in the heart. It can show how fast or how slowly the heart is beating.
- Echocardiogram. Sound waves create images of the beating heart. This test shows the size and structure of the heart and heart valves and blood flow through the heart.
- Ejection fraction. Ejection fraction is a measurement of the percentage of blood leaving your heart each time it squeezes. This measurement is taken during an echocardiogram. The result helps classify heart failure and guides treatment. An ejection fraction of 50% or higher is considered ideal. But you can still have heart failure even if the number is considered ideal.

HF- Diagnosis

- Exercise tests or stress tests. These tests often involve walking on a treadmill or riding a stationary bike while the heart is monitored. Exercise tests can show how the heart responds to physical activity. If you can't exercise, you might be given medicines.
- CT scan of the heart. Also called a cardiac CT scan, this test uses X-rays to create cross-sectional images of the heart.
- Heart MRI scan, also called a cardiac MRI. This test uses magnetic fields and radio waves to create detailed images of the heart.
- Coronary angiogram. This test helps spot blockages in the heart arteries. The healthcare professional inserts a long, thin flexible tube called a catheter into a blood vessel, usually in the groin or wrist. It's then guided to the heart. Dye flows through the catheter to arteries in the heart. The dye helps the arteries show up more clearly on X-ray images and video.
- Myocardial biopsy. In this test, a healthcare professional removes very small pieces of the heart muscle for examination. This test may be done to diagnose certain types of heart muscle diseases that cause heart failure.

HF - treatment

- Lifestyle changes
- Medicines
- Surgery or other procedures

HF - treatment

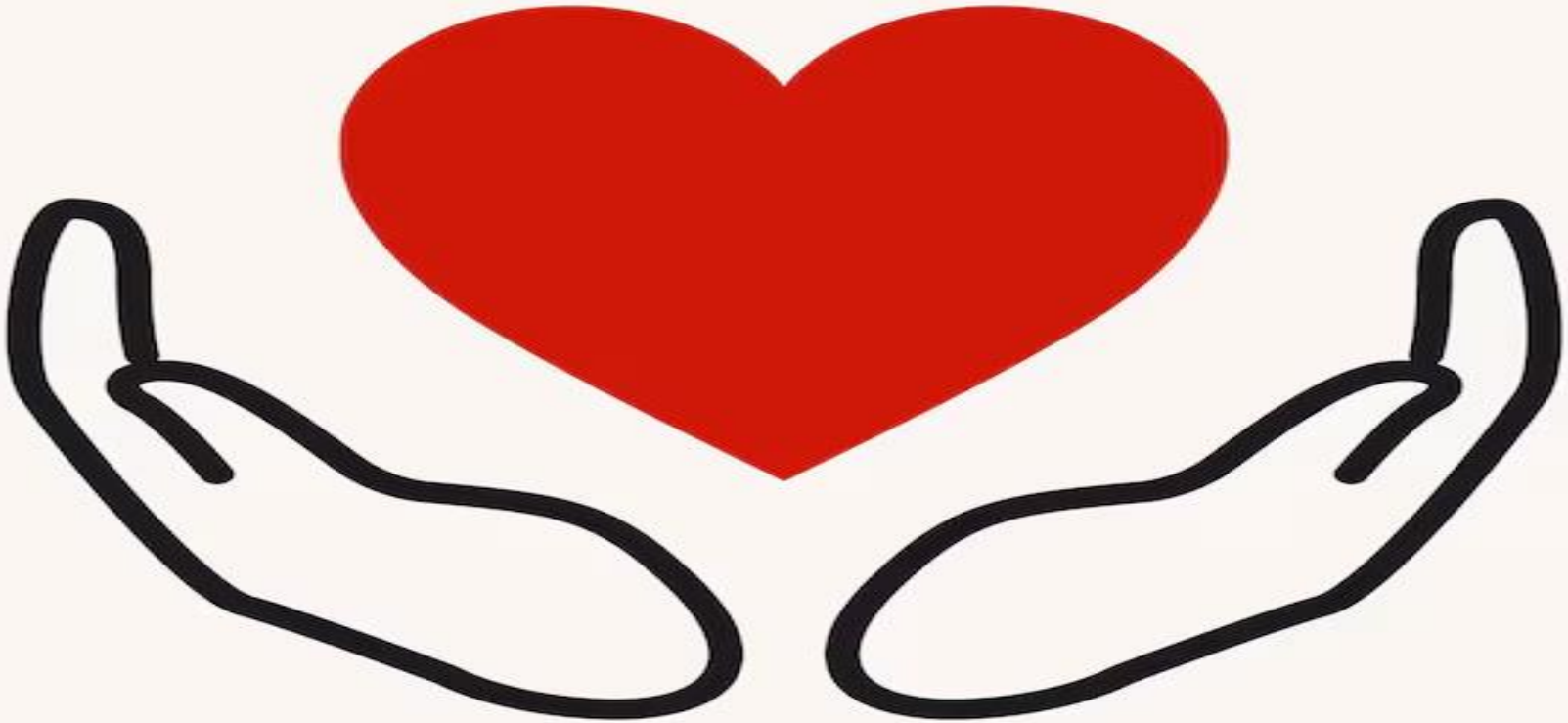
Medications

- Angiotensin-converting enzyme (ACE) inhibitors.
- Angiotensin II receptor blockers (ARBs).
- Angiotensin receptor plus neprilysin inhibitors (ARNIs).
- Beta blockers.
- Diuretics.
- Sodium-glucose cotransporter-2 (SGLT2) inhibitors.
- Digoxin (Lanoxin).
- Oxygen through a mask or small tubes placed in the nose.

HF - treatment

Surgery or other procedures

- Coronary artery bypass graft surgery.
- Heart valve repair or replacement.
- Implantable cardioverter-defibrillator (ICD)
- Cardiac resynchronization therapy (CRT)
- Ventricular assist device (VAD).
- Heart transplant.



Thank you