# What is Heart Failure?

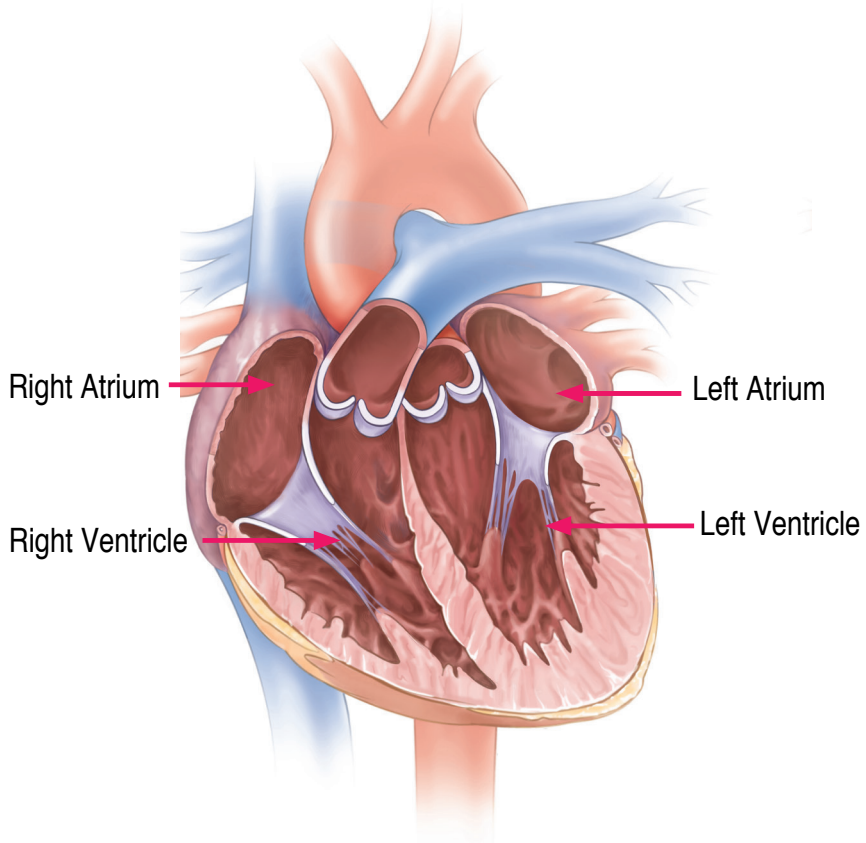
The term "heart failure" makes it sound like your heart is no longer working or stopped. Actually, heart failure means your heart isn't pumping or relaxing as well as it should be. While heart failure is a serious condition, people often live very fulfilling lives with medications and other treatments their doctor recommends.

**How does a normal healthy heart work?**
A normal healthy heart is a strong, muscular pump about the size of your fist, located slightly to the left and behind your breastbone. Its function is to pump blood throughout your body. The right side of the heart receives blood from the body and pumps blood to the lungs to pick up oxygen. The left side of the heart receives the oxygen-rich blood from the lungs and pumps it to the body.

**The heart has four chambers**, two on the right and two on the left:

- The two upper chambers are called **atria** (left atrium and right atrium)
- The two lower chambers are called **ventricles** (left ventricle and right ventricle)

**Normal Heart**



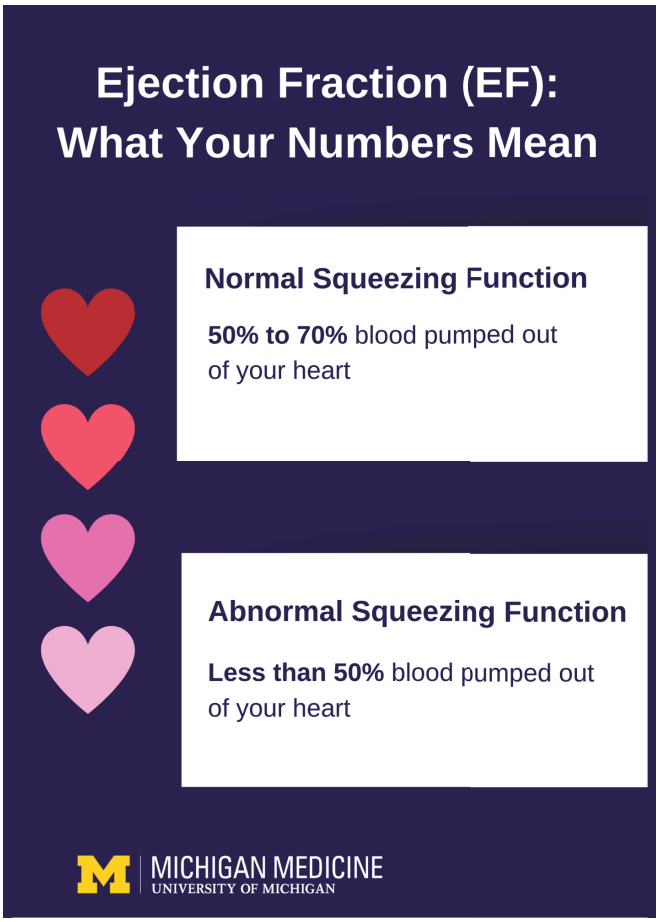
**What is Ejection Fraction (EF)?**
With each heartbeat, the two pumping chambers (left and right ventricles) of your heart fill with blood then squeeze the blood out. The ejection fraction (EF) refers to the amount of blood your heart squeezes (ejects) with each beat. In other words, the chamber fills with blood and pumps a portion (the EF) of that blood out of the heart. The ejection fraction is expressed as a percentage.

A normal heart squeezes out a half to three quarters (50 to 70%) of the blood that enters it. Thus an EF of 50-70% is considered normal.

This percentage (EF) of the left ventricle helps your doctor determine what type of heart failure you have.

- Heart failure with preserved EF (HFpEF) is a filling problem →Normal EF
- Heart failure with reduced EF (HFrEF) is a squeezing problem →Low EF

A normal heart squeezes out between 50 to 70% of the blood that enters it.



## What is Heart Failure?

Heart failure is a chronic, progressive condition in which the heart muscle is unable to meet the body's needs for blood and oxygen.

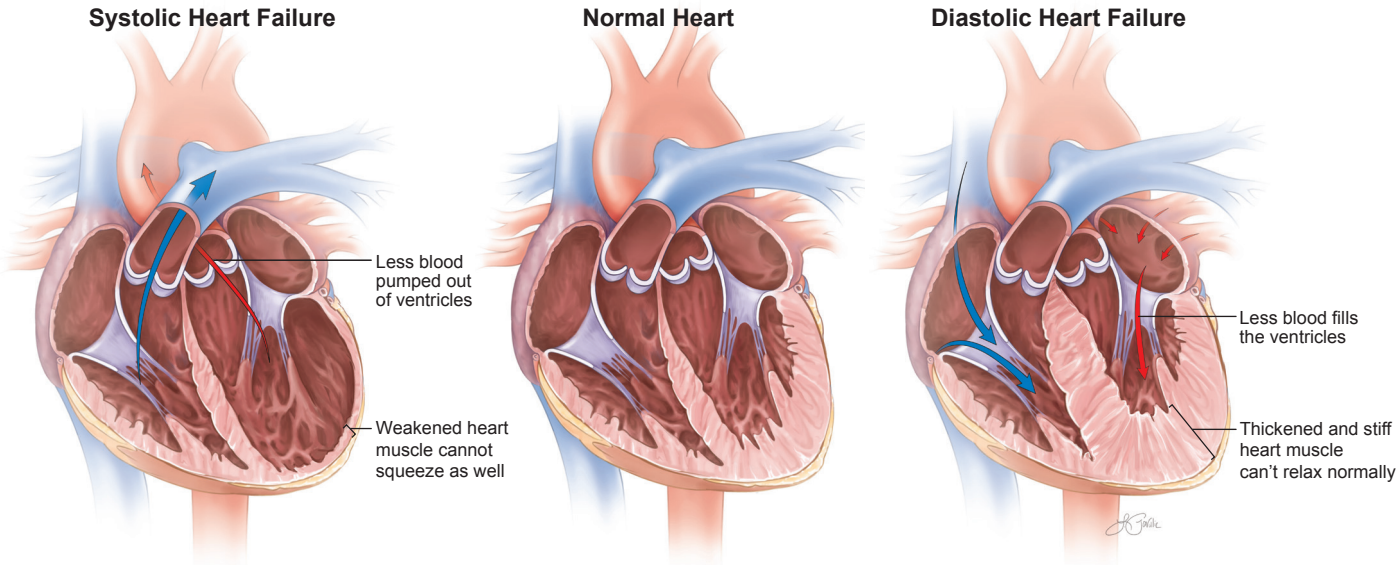
**The volume of blood pumped by the heart is determined by:**

- The contraction of the heart muscle — how well the heart squeezes
- The filling of the heart chambers — how well the heart relaxes and fills with blood

We classify heart failure based on which of these two functions is abnormal.

People with heart failure often live very fulfilling lives with medications and other treatments recommended by their doctor.

## Left-Sided Heart Failure Definitions




**Heart failure with preserved ejection fraction (HFpEF; previously called diastolic heart failure):**
The heart muscle squeezes normally but loses its ability to fill normally because the muscle has become stiff. This limits the amount of blood that can be pumped to the body at rest or with exercise.

**Heart failure with reduced ejection fraction (HFrEF; also called systolic heart failure):**
The heart muscle does not squeeze effectively and less blood is pumped to the body.


**Congestive heart failure** is a term that is often used interchangeably with heart failure. The term "congestive" refers to fluid that congests your heart, lungs and veins causing swelling and shortness of breath.

# Left-sided Heart Failure

## The heart can't pump blood to the rest of the body

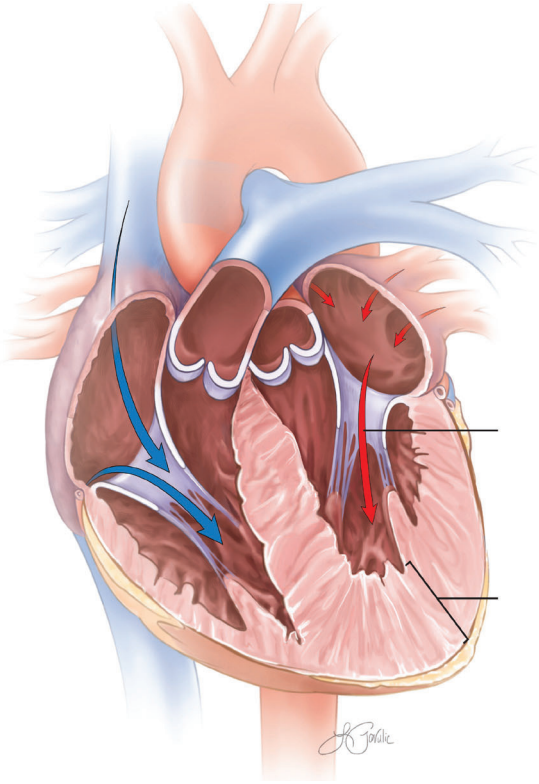
Ejection Fraction (EF)

### Preserved Ejection Fraction

*(HFpEF)*

**A "filling problem"**

The heart does not fill back up with blood properly.



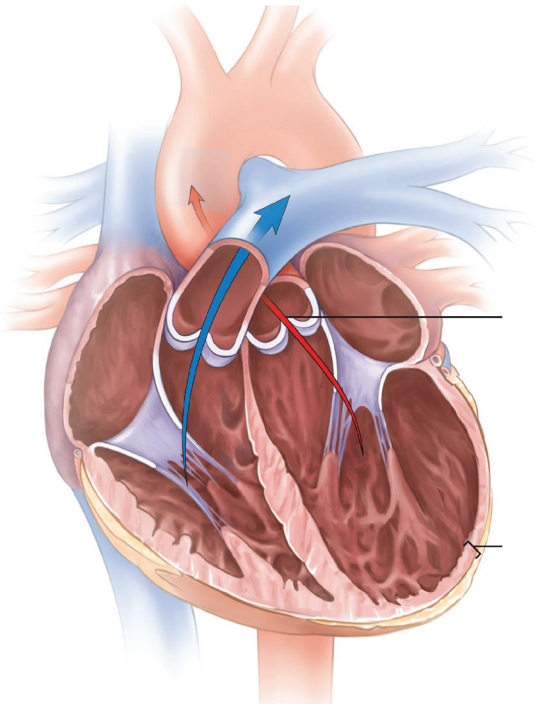
**Normal**
The EF is normal

### Reduced Ejection Fraction

*(HFrEF)*

**A "squeezing problem"**

The heart does not pump blood the way it should.



**Low**
The EF is low

**What causes heart failure?**

A number of health conditions can weaken or stiffen your heart causing heart failure. The following medical conditions may lead to heart failure:

- Blockages in the heart's arteries (coronary artery disease)
- High blood pressure
- Heart attack (myocardial infarction)
- Abnormal heart rhythm (atrial fibrillation)
- Abnormal heart valves
- Heart muscle disease (cardiomyopathy) or inflammation (myocarditis)
- Heart defects present at birth (congenital heart disease)
- Severe lung disease
- Diabetes
- Obesity
- Sleep Apnea

**What are the symptoms of heart failure?**

The effects of heart failure can be felt throughout your body.

Typical signs of heart failure include:

- Swelling in the ankles, feet, legs or belly
- Extreme tiredness (fatigue that limits your activity)
- Shortness of breath with activity or at rest
- Shortness of breath when you lie flat
- Persistent coughing or wheezing
- Feeling lightheaded
- High or irregular heartbeat
- Lack of appetite or nausea
- Unexplained weight gain

**How is heart failure diagnosed?**
To diagnose heart failure, your doctor will ask you questions about your symptoms and medical history. Your doctor will also complete a full physical examination.

**To help determine the cause and severity of your heart failure, your doctor may order one or more of the following tests:**

## Chest x-ray

**Chest x-ray**- takes a picture to check the size of your heart and see if there is extra fluid in and around your lungs.

### What will happen?

When you have a chest x-ray, you will be asked to sit or stand in different positions while holding your breath so that a picture can be taken.

## Blood tests

**Blood tests**- will be ordered to check your kidney and liver function, sodium and potassium levels, blood count and other measurements. Blood tests used to specifically diagnose and monitor heart failure include **BNP** (B-type natriuretic peptides) and **NT-proBNP** (N-terminal pro-B-type natriuretic peptides). These are hormones released into the blood in people with heart failure.

### What will happen?

A technician will take samples of your blood. Your doctor will use the results of your blood work to select and adjust treatments for your heart failure. Blood tests often are repeated to check for changes over time.

## Echocardiogram (Echo)

**Echocardiogram (Echo)** – is a test that uses sound waves (ultrasound) to create images of your heart. It is a test used to measure ejection fraction (EF) and check valve function.

### What will happen?

A technician puts gel on your chest to help the sound waves pass through your skin. The ultrasound probe is moved across your chest. The probe produces sound waves that bounce off your heart and "echo" back to the probe. These waves are changed into images of your heart.

**This test helps your doctor find out:**

- The size and shape of your heart
- How your heart squeezes and fills
- If your heart valves are working correctly

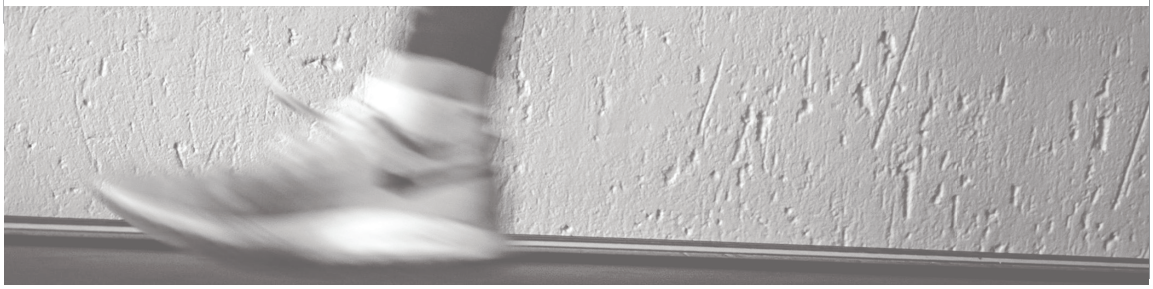
This test is non-invasive and may require you to position your body in certain ways to maximize image quality.

## Treadmill Exercise Stress Test

**Treadmill Exercise Stress Test**- this test is used to measure the effect of exercise on your heart and how well your heart pumps blood during exercise.

### What will happen?

This test involves walking on a treadmill while electrodes monitor your heart rate and rhythm. The walk starts off slowly, then the speed and incline increase at set times. You walk as long as you can or until you reach a target heart rate.



## Radionuclide ventriculography or nuclear scan (MUGA)

**Radionuclide ventriculography or nuclear scan (MUGA)**- this test measures the heart's pumping ability.

### What will happen?

- A nurse puts an intravenous line (IV) in a vein in your arm. A small amount of radioactive substance called a tracer is injected into the vein.
- You will be brought in to the scanner room. You lie on a table while a special camera is positioned over your chest to take images of your heart.
- The special camera, called a gamma camera, detects the small amounts of radiation release by the tracer to produce computer- generated movie images of your beating heart.

## Right heart catheterization

**Cardiac catheterization-** is done to check how well your heart is working.

**This test helps your Doctor:**

- Assess the severity of your heart failure.
- Check the pumping function of your heart.
- Evaluate the pressure in each chamber of your heart.

### What will happen?

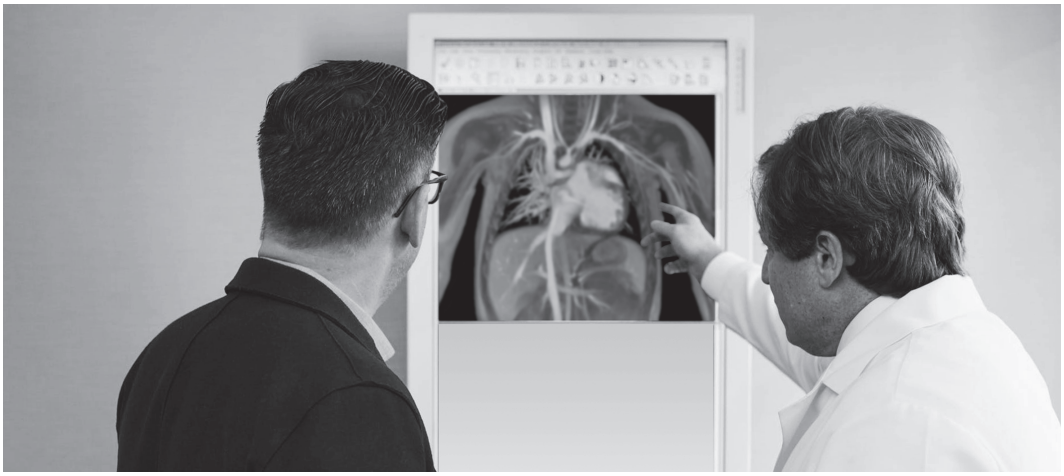
- A thin hollow tube, called a catheter, is placed into a blood vessel and, using an X-ray machine, passed into your heart.
- Once the catheter is in place, several tests may be done to evaluate your heart function.

# Cardiac Magnetic Resonance Imaging (MRI)

**Cardiac Magnetic Resonance Imaging (MRI)**
MRI provides detailed pictures of the heart and vessels. It also reveals how well your heart is functioning.

## What will happen?

- The machine looks like a long metal tube. You lie down on a movable table that slides into the opening of the tube.
- There will be technologist who monitors you from another room. You can talk with this person by microphone. During the MRI scan, the magnet produces repetitive tapping, thumping and other noises. Earplugs or music may be provided to help block the noise.
- In some cases, a contrast material may be injected through an intravenous (IV) line into a vein in your hand or arm to allow your doctor to see parts of your body more clearly.
- You must hold very still because movement can blur the test results.



**What happens after I have been diagnosed with heart failure?**
After your diagnosis is confirmed, your doctor will classify, or rank, your heart failure based on the severity of your symptoms. At Michigan Medicine we use the New York Heart Association (NYHA) Functional Classification system. It places patients in one of four categories based on how much they are limited during physical activity. These classes may change as you undergo treatment.

To learn more about the NYHA Functional classification categories visit the American Heart Association website at:
https://www.heart.org/en/health-topics/heart-failure/what-is-heart-failure/classes-of-heart-failure

## Notes

My heart failure is caused by:

What is my ejection fraction?