

# Heart Failure

## Abstract:

Heart failure, also known as congestive heart failure, is a condition affecting blood movement within the circulatory system of the body. At times, as with heart failure, the heart is unable to fill with enough blood so it can be pumped throughout the body to transport needed oxygen and nutrients. Additionally, if the heart can adequately fill with blood but the heart muscle is too weak to pump it out to the body, the body will not receive the needed oxygen and nutrients. Either way, there is a decreased transport of oxygen and nutrients to the body for health sustainability.

According to the Centers for Disease Control and Prevention (CDC), there are more than 6 million adults in the United States that have heart failure. 50% of those individuals diagnosed with heart failure only have a 5-year life expectancy and 90% of those diagnosed with advanced-stage heart failure will die within a year. Those in the moderate stage of heart failure could live an average of 10 years with appropriate medical attention and lifestyle choices.

## Learning Objectives:

1. Identify the stages of heart failure.
2. List symptoms associated with heart failure.
3. Explain treatments for those with heart failure.
4. Describe how to care for those with heart failure.

## **Introduction**

The heart is an organ about the size of a closed fist. The heart is made up of layers of muscle tissue that continually contract automatically. This usually happens between 60-100 times a minute when the heart muscle is performing optimally. This rate changes rapidly depending on what the body's needs are. If a person is sitting the heart rate will increase if that person stands up and walks. If the person must move quickly there will probably be a rapid increase in the heart rate because the body will demand more oxygen and nutrients for the muscles to move.

The circulatory system is made up of the heart and a network of blood vessels, such as arteries, veins, and capillaries. These vessels are all connected to the pump, the heart. When the heart beats, it pushes blood out to the body while at the same time, veins return blood to the heart. The blood that has been returned to the heart now contains carbon dioxide, one of the body's waste products. Once the blood passes through the lungs carbon dioxide will be removed from the blood as the person breathes it out.

The heart's contractions are controlled by an electrical system within the heart muscle. This system controls the rate, how fast or slow the heart will beat, and the rhythm of the heart. If the heart is healthy and contracting as it should, it supplies the body with an adequate amount of blood for that given moment. But, if the heart is affected by disease or injury that weakens the heart muscle, it will be unable to supply the body with its needed oxygen and nutrients to work properly. In return, if the heart muscle itself does not receive oxygen and nutrients it could sustain further injury. If there is a problem with the electrical system within the heart which controls the heart rate and rhythm, or an issue within the endocrine system, which controls heart rate and blood pressure, there will be further issues with the heart.

## **Anatomy of the Heart**

The heart has 4 chambers. The upper two chambers are known as the left and right atriums. The lower two chambers are known as the left and right ventricles.

### **The right side of the heart:**

The right atrium receives non-oxygenated blood from the body through large veins, the superior and inferior vena cava. This blood is pumped through the tricuspid valve into the right ventricle. The right ventricle then pumps the blood through the pulmonary valve, into the lungs where it is oxygenated.

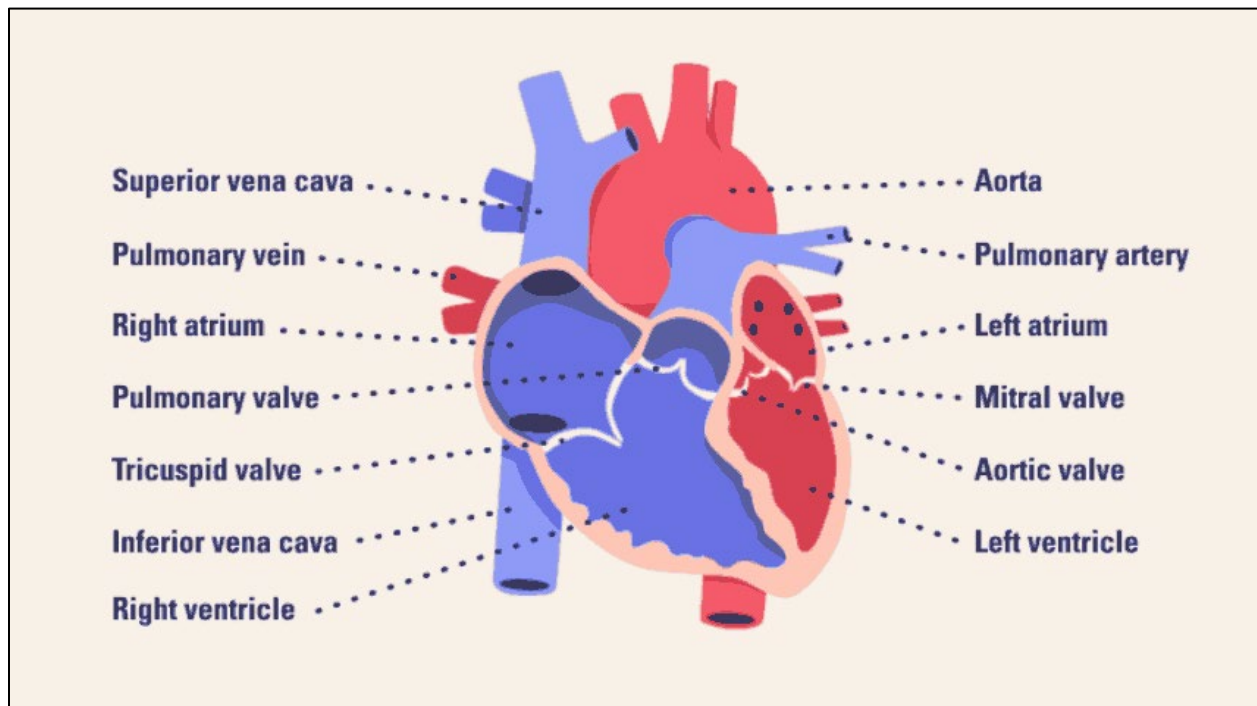
### **The left side of the heart:**

The left atrium receives oxygenated blood from the lungs and when the pressure inside the left ventricle drops below that of the left atrium, blood from the left atrium forces open the mitral valve and allows passive movement of blood through the mitral valve and into the left ventricle. The left ventricle then pumps oxygen-rich blood through the aortic valve to the aorta which is then moved out the rest of the body.

This system includes the 4 valves of the heart, the coronary arteries that run along the surface of the heart and provide oxygen-rich blood to the heart muscle, and a nerve network that goes through the heart muscle and conducts a complex signaling pattern process for the contraction and relaxation of the heart muscle.

The table below gives a visual of how the blood moves through the heart.

Table #1



### **Types of Heart Failure**

There are two types of heart failure, right-sided heart failure and left-sided heart failure. These will be discussed below.

Left-sided heart failure is more common than right-sided heart failure. Heart failure is based on ejection fraction. The ejection fraction is measured as a percentage of the total amount of blood in the heart that is pumped out with each heartbeat. 50% or above is considered a normal ejection fraction.

Heart failure with reduced ejection fraction, the left side of the heart is weak and can't pump enough blood to the rest of the body. The most common chronic conditions that leave the heart muscle weak and damaged are:

1. Coronary heart disease
2. Myocardial infarction (heart attack)
3. Hypertension
4. Arrhythmias
5. Infections
6. Alcoholism
7. Smoking
8. Anemia
9. Diabetes
10. Heart valve disease
11. Cardiomyopathy
12. Obesity

Heart failure with preserved ejection fraction, the left side of the heart muscle is too stiff or thick to fully relax between heart contractions (beats). This does not enable the heart to completely fill with blood before the contraction and this produces a decreased amount of blood being sent to the body. Some conditions that can lead to preserved ejection fraction heart failure are:

1. Hypertension
2. Obesity
3. Diabetes
4. Cardiomyopathy
5. Cardiac amyloidosis

Right-sided heart failure occurs when the heart can't pump enough blood to the lungs to pick up oxygen for the rest of the body. Left-sided heart failure is the main cause of right-sided heart failure. Left-sided heart failure causes blood to build up on the left side of the heart. This build-up leads to an increase in pressure in the vessels that carry blood from the heart to the lungs. This increase in pressure leads to pulmonary hypertension, making the right side of the heart work harder. Conditions that may lead to right-sided heart failure are:

1. Congenital heart defects
2. Abnormal heart valves

3. Chronic obstructive pulmonary disease (COPD)
4. Cor Pulmonale
5. The use of Cocaine
6. Alcoholism
7. Coronary disease
8. Diabetes
9. Hypertension
10. Obesity
11. Pulmonary edema
12. Pulmonary embolism

### **Risk Factors of Heart Failure**

Many risk factors for heart failure have just been listed above. These are conditions that damage the heart muscle in many different ways. Sometimes the damage is caused by toxins, overuse, decreased blood flow to a certain area of the heart, or chronic conditions not controlled in other areas of the body.

There are some modifiable risk factors and some non-modifiable risk factors. An increased chance of heart failure occurs if the person has more than one of the following.

1. People over the **age** of 65 have a higher risk of heart failure by contributing to stiffness of the heart muscle. Older adults are also more likely to have other health conditions that cause heart failure.
2. If a person has a **family history** of heart failure the likelihood of them having heart failure increases. Genetics may also play a role.
3. **Unhealthy lifestyle habits**, such as smoking, using cocaine or other illegal drugs, heavy alcohol consumption, unhealthy diet, and the lack of physical activity.
4. If the person has **heart or blood vessel conditions**, serious **lung disease**, or exposure to certain **infections**, their risk may increase. **Long-term conditions** also may affect the likelihood of heart failure, these again would include hypertension, diabetes, obesity, anemia, sleep apnea, cardiac arrhythmias, and chronic kidney disease, just to name a few. Radiation and chemotherapy can also injure the heart muscle and raise the risk of heart failure.
5. **Black and African American** people are more likely to have heart failure than people of other races. They are known to have more serious cases of heart failure and experience heart failure at a younger age.

Heart failure is common in both men and women, but women tend to have worse symptoms. Men often develop heart failure at a younger age than women do. Women more commonly have heart failure with preserved ejection fraction whereas men have heart failure with reduced ejection fraction.

## **Diagnosing Heart Failure**

Many tests are used to diagnose heart failure. These will all be discussed below.

### **Blood Tests**

Brain Natriuretic Peptide (BNP) levels are checked because these molecules rise during heart failure. This test is also associated with how well the liver and kidneys are working.

Complete Blood Count (CBC) is a common test and measures all the different cells in the blood. This would include red blood cells, white blood cells, and platelets. Below are all the levels included in a CBC.

1. Red blood cell levels that are higher or lower than normal could be a sign of dehydration, anemia, or bleeding. Red blood cells carry oxygen throughout the body.
2. White blood cell levels that are higher or lower than normal could be a sign of infection, blood cancer, or an immune system disorder. White blood cells are part of the body's immune system, which fights infections and diseases.
3. Platelet levels that are higher or lower than normal may be a sign of a clotting disorder or a bleeding disorder. Platelets are blood cell fragments that help the blood clot. They stick together to seal cuts or breaks on blood vessel walls and stop bleeding.
4. Hemoglobin levels that are lower than normal may be a sign of anemia, sickle cell disease, or thalassemia. Thalassemia is an inherited blood disorder that has less oxygen-carrying protein (hemoglobin) and fewer red blood cells in the body than normal. Hemoglobin is an iron-rich protein in red blood cells that carries oxygen.
5. Hematocrit levels that are too high might mean you're dehydrated. Low hematocrit levels may be a sign of anemia. Hematocrit is a measure of how much space red blood cells take up in the blood.
6. Mean corpuscular volume (MCV) levels that are lower than normal may be a sign of anemia or thalassemia. MCV is a measure of the average size of the red blood cells.

Ranges for CBC tests differ between men and women as well as the age, and race of the patient, and if the patient has been in a geographical area where they have been exposed to high altitude.

Below are the common reference ranges for tests contained in a CBC.

1. Red blood cells
  - a. Men: 5-6 million cells/mcL
  - b. Women 4-5 million cells/mcL
2. White blood cells
  - a. 4500-10,000 cells/mcL
3. Platelets
  - a. 140,000-450,000/mcL
4. Hemoglobin (varies with altitude)
  - a. Men: 14-17gm/dL
  - b. Women: 12-15gm/dL
5. Hematocrit (varies with altitude)
  - a. Men: 41%-50%
  - b. Women: 36%-44%
6. Mean corpuscular volume (MCV)
  - a. 80-100 fl

The Basic Metabolic Panel (BNP) is a group of tests looking at levels of naturally occurring chemicals in the blood. This is the fluid portion (plasma) of the blood and not the red or white blood cells, or the platelets. These tests gather information regarding the heart, liver, and kidneys. The test includes:

1. Glucose
2. Calcium
3. Electrolytes
4. Kidney Function

Blood Enzymes Tests measure the chemicals that help control chemical reactions in the body.

1. Troponin
  - a. A complex of three regulatory proteins that are integral to muscle contraction.
2. Creatine Kinase (CK)
  - a. A test that measures the amount of creatine kinase in the blood. Elevated CK levels may indicate skeletal muscle, heart, or brain damage or degeneration.
3. CK-MB

- a. The enzyme, creatine kinase-myocardial band, is most common in the heart muscle but the test can also detect damage to other muscles in the body.

A Lipoprotein Panel measures the cholesterol and fats in the body within the blood.

1. LDL is the main source of cholesterol that builds up in the arteries.
2. HDL is the type of cholesterol that helps decrease the buildup of unhealthy cholesterol LDL, in the arteries.
3. Total Cholesterol is a measure of LDL cholesterol, HDL cholesterol, and other lipid components.
4. Triglycerides are a type of fat in the blood. The body converts any calories it doesn't need to use right away into triglycerides. Triglycerides are stored in the body's fat cells.

Most people will need to fast for 9 to 12 hours before a lipoprotein panel is drawn.

Coagulation Panel checks proteins in the blood that affect the blood clotting process.

Natriuretic Peptide Tests (BNP, NT-proBNP) measure proteins that the heart and blood vessels make. This test is mainly used to help confirm or rule out heart failure. The provider will probably order other heart health tests to help make a final diagnosis if there are high levels of natriuretic peptides. In most cases, the higher the level of natriuretic peptides, the more serious the heart failure may be.

A Cardiac CT uses X-rays to take many detailed pictures of the heart and its blood vessels. Computers can combine these pictures to create a three-dimensional (3D) model of the whole heart. A cardiac CT is used to diagnose:

1. Aortic Aneurysm
2. Atrial Fibrillation
3. Congenital Heart Defects
4. Coronary Artery Disease
5. Heart Attack
6. Heart Failure
7. Heart Inflammation

A Coronary Calcium Scan is a CT scan of the heart that measures the amount of calcium in the walls of the coronary arteries. A coronary calcium scan is used to diagnose:



1. Aortic Aneurysm
2. Angina
3. Atherosclerosis
4. Heart Attack
5. Heart Failure
6. Coronary Artery Disease

Cardiac Magnetic Resonance Imaging (MRI) is a noninvasive imaging test that uses radio waves, magnets, and a computer to create detailed pictures of the heart. A cardiac MRI can provide an accurate look at the heart muscle, heart chamber sizes and function, and connecting blood vessels. A cardiac MRI is used to diagnose:

1. Arrhythmia
2. Congenital Heart Defects
3. Coronary Artery Disease
4. Heart Attack
5. Heart Failure
6. Heart Valve Disease

A Nuclear Heart Scan is an imaging test that uses special cameras, and a radioactive substance called a tracer to create pictures of the heart. It also can check for damaged or dead heart muscle tissue and assess how well the heart pumps blood to the body. This test is used to diagnose:

1. Angina
2. Coronary Artery Disease
3. COPD
4. Heart Attack
5. Heart Failure

An Echocardiography (echo) may be ordered to measure the patient's ejection fraction. Ejection fraction is the percentage of blood in the lower chamber of the heart (left ventricle) that is pumped out of the heart with each contraction or heartbeat. Ejection fraction measures how well the heart can pump.

- a. When 40% or less of the blood in the left ventricle is pumped out with one contraction, heart failure is diagnosed with reduced ejection fraction.
- b. When 50% or more of the blood in the left ventricle is pumped out with one contraction, heart failure is diagnosed with preserved ejection fraction.

- c. When the ejection fraction is between 41% and 49%, heart failure is likely diagnosed with borderline ejection fraction.

An Echocardiography may also be used with Doppler to show how well blood flows through the heart's chambers and valves.

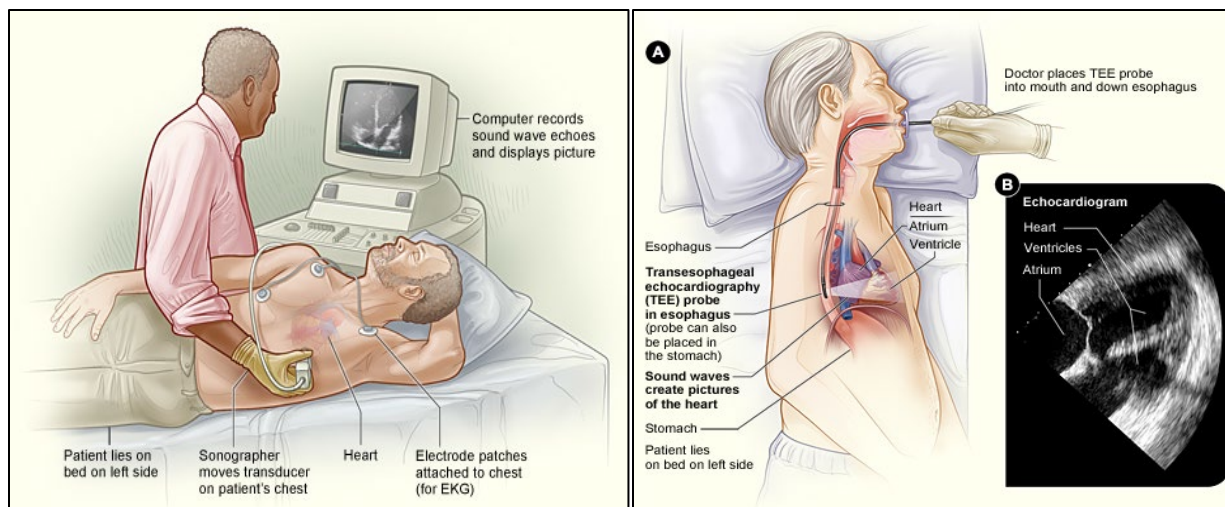
1. Congenital Heart Defects
2. Coronary Artery Disease
3. Heart Attack
4. Heart Failure
5. Heart Valve Diseases

There are several types of echocardiography:

1. *Transthoracic Echocardiography* is the most common type of echo. It involves placing a device called a transducer on the chest after a gel is applied to the skin. The device sends special sound waves, called ultrasound, through the chest wall to the heart. As the ultrasound waves bounce off the structures of the heart, a computer in the echo machine converts them into pictures on a screen.
2. *Stress Echocardiography* is done as part of a stress test. During a stress test, the patient exercises or takes medicine to make their heart work hard and beat fast. A technician will create pictures of the heart before they exercise and as soon as they are done.
3. *Transesophageal Echocardiography* gives the provider a more detailed view of the heart. During this test, the transducer is attached to the end of a flexible tube. The tube is guided down the throat and into the esophagus (the passage leading from the mouth to the stomach). The provider will inject medicine into a vein to help the patient relax during the test.
4. *Three-dimensional (3D) Echocardiography* creates 3D images of the heart. This may be done as part of a transthoracic or transesophageal echo.

Table #2

Table #3



An Electrocardiogram, also called an ECG or EKG, detects and records the heart's electrical activity.

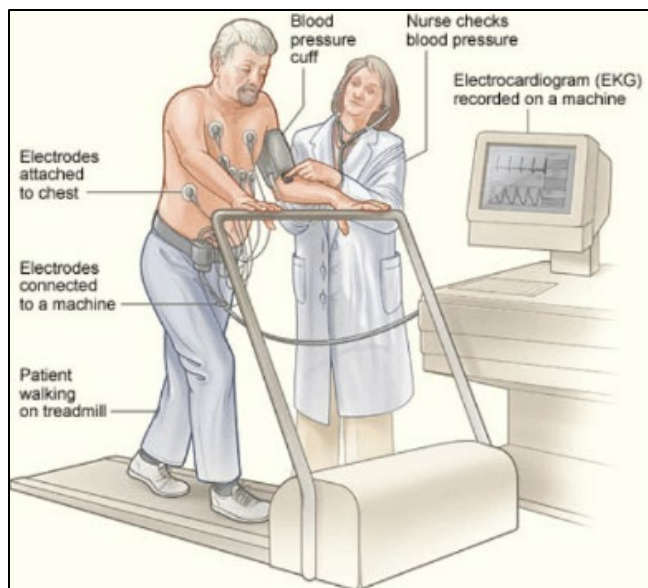
Holter and Event Monitors are small, portable electrocardiogram devices that record the heart's electrical activity for long periods while doing normal activities. These monitors help in the diagnosis of:

1. Angina (Chest Pain)
2. Arrhythmias
3. Atrial Fibrillation
4. Cardiac Arrest
5. Heart Failure
6. Stroke

A Stress Test measures how much exercise the body can handle and how well it works during physical activity. During physical activity, an electrocardiogram is recorded, and vital signs are taken. A stress test is used to help diagnose:

1. Angina (Chest Pain)
2. Arrhythmias
3. Coronary Heart Disease
4. Heart Failure
5. Heart Valve Diseases

Table #4



## Stages of Heart Failure

Heart failure is classified into 4 stages. These stages are categorized by using A, B, C, and D. They range from having a high risk of developing heart failure to having advanced heart failure. Heart failure only gets worse over time. Patients are usually classified with heart failure according to the severity of their symptoms. The stages are explained below.

### Stage A Heart Failure

If a patient is given a Stage A classification, they are at risk of heart failure. These patients have no symptoms, structural heart disease, or evidence of elevated biomarkers, but they do have risk markers present. Risk factors could include:

1. Hypertension
2. Diabetes
3. Obesity
4. Metabolic syndrome
5. Coronary artery disease
6. Cardiotoxic medications or history of taking them (cancer treatment)
7. History of alcohol use disorder
8. History of Rheumatic Fever
9. Have a genetic variant for cardiomyopathy

Patients with Stage A heart failure will have no limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitations, or shortness of breath.

### **Stage B Heart Failure**

Patients with Stage B heart failure are classified as pre-heart failure. They will have no signs or symptoms of heart failure but have structural heart disease and evidence of elevated filling pressures within the heart chambers. The left ventricle isn't working well. They can also have persistently elevated cardiac markers in the absence of the reason for these to be elevated. Patients with Stage B heart failure will have slight limitations in physical activity but are comfortable at rest. Ordinary physical activity results in fatigue, palpitation, shortness of breath, or chest pain.

### **Stage C Heart Failure**

When a patient is classified with Stage C heart failure, they have structural heart disease and a current or history of heart failure symptoms. Class C heart failure is also called symptomatic heart failure. These patients will have marked limitations in physical activity but do remain comfortable at rest. Less than ordinary activity causes fatigue, palpitation, shortness of breath, or chest pain.

### **Stage D Heart Failure**

Stage D heart failure occurs in patients who have reduced ejection fraction and are classified as having advanced heart failure. These patients will have refractory symptoms, meaning, the symptoms cannot be adequately controlled in a tolerable time frame despite the aggressiveness of therapies. These patients do not get better with treatments and their symptoms interfere with daily life activities. They are frequently hospitalized and are in the final stage of heart failure. Symptoms are now present at rest.

## **Symptoms of Heart Failure**

Left-sided heart failure may have the following symptoms:

1. Trouble breathing
2. Cough
3. Fatigue (extreme tiredness even after rest)
4. General weakness
5. Bluish color of fingers and lips

6. Sleepiness and trouble concentrating
7. Inability to sleep lying flat

Right-sided heart failure will likely have the above symptoms as well as the following symptoms:

1. Nausea (feeling sick in the stomach) and loss of appetite
2. Pain in the abdomen (area around the stomach)
3. Swelling in the ankles, feet, legs, abdomen, and the veins in the neck
4. Needing to void urine often
5. Weight gain

### **Treatment of Heart Failure**

Treatment for heart failure is making heart-healthy lifestyle changes along with managing risk factors and decreasing stress. These steps can also be used for the prevention of heart failure. They are listed below:

1. Lower the sodium (salt) intake. Salt can cause the body to hold more fluids and cause more swelling.
2. Having extra weight on the body makes the heart work harder. Keeping weight in a healthy range will keep the heart from overworking.
3. The level of activity will depend on how serious heart failure is. Getting regular physical activity but getting direction from a healthcare provider should always be done regarding daily activities, work, exercise, and sex. Outpatient cardiac rehabilitation services may even be recommended to improve a patient's exercise level and reduce other risk factors.
4. Stop smoking. For support, reach out to a provider or call 1-800-QUIT-NOW (1-800-784-8669). Quit Lines offer evidence-based support like counseling, referrals to local programs, and free medication to people who want to quit tobacco.
5. Avoid or limit alcohol. It may be recommended by a provider to limit or stop drinking alcohol. Moderate and heavy alcohol consumption has been associated with lower ejection fraction.
6. Manage contributing risk factors. Controlling things such as blood pressure, the rhythm of the heart, and anemia will often improve overall heart health.
7. Manage daily stress. Learning how to manage stress and cope with problems can improve overall mental and physical health. Relaxation techniques, talking to a counselor, and finding a support group can all help lower stress and anxiety.

8. Get adequate sleep. Sleep disorders such as sleep apnea are common in people who have heart failure. Treating sleep disorders helps improve sleep and may help improve heart failure symptoms.

## **Medications for Heart Failure**

The following medicines are commonly used to treat left-sided heart failure with reduced ejection fraction.

Medicines such as diuretics and aldosterone antagonists remove extra sodium and fluid from the body. When you lower the amount of sodium in the circulatory system the amount of blood in the system is decreased. This decreases the amount of stress on the heart. It is important to understand that some sodium is needed for the body to carry out many of its daily functions and high doses of diuretics may cause low blood pressure, kidney disease, and worsening heart failure symptoms. Side effects of aldosterone antagonists can include kidney disease and high potassium levels.

Diuretics are drugs that increase the flow of urine. They are commonly used to treat edema, hypertension, and heart failure. There are 5 classes of diuretics: thiazide diuretics, loop diuretics, potassium-sparing diuretics, osmotic diuretics, and carbonic anhydrase inhibitors.

1. Examples of thiazide diuretics include:
  - a. Chlorothiazide
  - b. Chlorthalidone
  - c. Hydrochlorothiazide
  - d. Indapamide
  - e. Metolazone
2. Examples of loop diuretics include:
  - a. Bumetanide (Bumex)
  - b. Ethacrynic acid (Edecrin)
  - c. Furosemide (Lasix)
  - d. Torsemide (Soaanz)
3. Examples of potassium-sparing diuretics include:
  - a. Amiloride (Midamor)
  - b. Eplerenone (Inspra)
  - c. Spironolactone (Aldactone, Carospir)
  - d. Triamterene (Dyrenium)

4. Examples of osmotic diuretics include:
  - a. Mannitol
  - b. Glycerin
  - c. Isosorbide
  
5. Examples of carbonic anhydrase inhibitors include:
  - a. Acetazolamide (Diamox)
  - b. Acetazolamide (Diamox Sequels Pro)
  - c. Dichlorphenamide (Keveyis Pro)
  - d. Methazolamide (Neptazane)
  
6. Examples of aldosterone antagonists include:
  - a. Eplerenone (Inspra)
  - b. Spironolactone (Aldactone)

Medicines like Angiotensin-Converting Enzyme Inhibitors (ACE inhibitors) and Angiotensin Receptor Blockers (ARBs) relax the blood vessels in the body. When the blood vessels are relaxed it makes it easier for the heart to pump blood. Possible side effects are cough, low blood pressure, and short-term reduced kidney function.

1. Examples of ACE inhibitors include:
  - a. Benazepril (Lotensin)
  - b. Captopril
  - c. Enalapril (Vasotec)
  - d. Fosinopril
  - e. Lisinopril (Zestril)
  - f. Moexipril
  - g. Perindopril
  - h. Quinapril
  - i. Ramipril (Altace)
  - j. Trandolapril
  
2. Examples of ARBs include:
  - a. Azilsartan (Edarbi)
  - b. Candesartan (Atacand)



- c. Irbesartan (Avapro)
- d. Losartan (Cozaar)
- e. Olmesartan (Benicar)
- f. Telmisartan (Micardis)
- g. Valsartan (Diovan)

Medications to slow the heart rate are also used for the treatment of heart failure. These medications are beta blockers.

1. Examples of beta blockers include:
  - a. Bisoprolol (Zebeta)
  - b. Carvedilol (Coreg)
  - c. Metoprolol (Toprol)

Possible side effects of beta blockers include a slow or irregular heart rate, high blood pressure, fuzzy vision, or seeing bright halos.

Cardiac glycosides work by affecting certain minerals (sodium and potassium) inside heart cells. This medication makes the heartbeat stronger and pumps more blood. This medicine is mostly used to treat serious heart failure when other medicines do not help improve symptoms. Side effects may include digestive problems, confusion, and vision problems.

1. An example of a cardiac glycoside is:
  - a. Digoxin (Lanoxin)

The following medicines are commonly used to treat right-sided heart failure.

Medicines such as diuretics and aldosterone antagonists remove extra sodium and fluid from the body. As stated earlier, when you lower the amount of sodium in the circulatory system the amount of blood in the system is decreased, decreasing stress on the heart. Angiotensin-Converting Enzyme Inhibitors (ACE inhibitors) and Angiotensin Receptor Blockers (ARBs) are used to treat right-sided heart failure as well. They work by relaxing the blood vessels in the body. When the blood vessels are relaxed it makes it easier for the heart to pump blood. Possible side effects are cough, low blood pressure, and short-term reduced kidney function.

## **Procedures and Surgeries**

Heart failure with a reduced ejection fraction that is progressively getting worse, may be treated with one of the following medical devices:

1. A biventricular pacemaker can help both sides of the heart contract at the same time to relieve the symptoms.
2. A mechanical heart pump, such as a ventricular assist device or a total artificial heart may be used until you have surgery or as a long-term treatment.
3. An implantable cardioverter defibrillator (ICD) checks the heart rate and uses electrical pulses to correct irregular heart rhythms that can cause sudden cardiac arrest.

If heart failure is life-threatening and other treatments have not worked, a heart transplant may be needed. For those with preserved ejection fraction heart failure, there are no currently approved devices or procedures to improve symptoms.

### **Caring for Someone with Heart Failure**

Health care professionals will likely be caring for someone at some point who has a diagnosis of heart failure. Here are some daily routines that should be followed.

#### **Weigh Daily**

A weight change can be a sign that their heart failure is not controlled as well as it needs to be. Know the patient's dry weight. Dry weight is the weight of the body without extra fluid that builds up in the body because of heart failure. Weighing every day and keeping a record will help in the monitoring of heart failure. Notify the provider if the patient has gained 4 or more pounds than their recorded dry weight.

On each provider visit, record the in-office dry weight so it can be compared to the most recent dry weight recorded.

#### **Take Medications as Prescribed**

Patients should always take medications as prescribed by the provider. They should not discontinue, change, or take more than prescribed. Always call the provider if the patient is experiencing side effects.

#### **Daily Exercise**

The provider will write orders when it is the right time for the patient to begin an exercise program. Certain activities may need to be avoided or the patient may have other restrictions based on their health. It may take many months to develop the optimal exercise program. This could be a cardiac rehabilitation program. Below are some basic guidelines to follow:

1. Start slowly and gradually increase in accordance with the patient's treatment plan.
2. Rest when needed.
3. Choose an exercise the patient enjoys and talk with the provider about it.
4. Try to set a routine and exercise at the same time each day.
5. Remember that some shortness of breath and increased heart rate are normal when engaging in exercise. If these are excessive, rest and contact the provider.

### **Eat a Heart Healthy Low Salt (Sodium) Diet**

Sodium, or salt, is a natural mineral found in foods and within the body. Most foods contain a small amount of sodium. This includes fresh fruits, vegetables, meats, and seafood. We need sodium to live, but most people take in more than they need. Processed foods tend to contain a high level of salt.

Salt attracts fluid. Eating too much salt will likely increase the blood pressure. An excess amount of salt will cause the body to hold on to extra fluid, making the heart work harder. Normal limits of daily salt intake are 1500 to 2000 mg. This can be personalized to the patient and these numbers could be different depending on their condition.

Below are the approximate amounts of sodium in table salt. This can be used as a guide to stay within the prescribed amount of sodium the patient has been assigned.

- 1/4 teaspoon salt = 575 milligrams (mg) sodium
- 1/2 teaspoon salt = 1,150 milligrams (mg) sodium
- 3/4 teaspoon salt = 1,725 milligrams (mg) sodium
- 1 teaspoon salt = 2,300 milligrams (mg) sodium

### **Reducing Salt When Eating Out**

Things anyone can do when dining out but especially those who have heart failure are:

1. Be familiar with low-sodium foods and look for them on the menu.
2. Request the meal be prepared without salt.
3. Don't use the saltshaker on the table. Get used to using the peppershaker.
4. Use fresh lemon juice in place of salt to season food.
5. Order vegetables without salt added and fruit as side items.
6. Limit fast food and takeout foods because they are laden with salt and there is less control over how the food is prepared.

There is a difference between sodium and salt. Sodium is a mineral that is naturally occurring and can be found inherently in some foods but is regularly added to food during preparation or manufacturing. Salt on the other hand is about 40% sodium and 60% chloride. Chloride is also a naturally occurring mineral that is usually bound to sodium, and therefore the amount in the blood tends to coincide with sodium levels.

### **Common Sodium Sources**

About 15% of sodium is naturally occurring in some foods, including celery, beets, and milk. Sodium is also a common ingredient added when the meal is being prepared. Sodium is used for flavoring and as a preservative and is often added in packaged and prepared foods. When reading labels, you would see an increase in sodium in canned soups, lunch meats, and frozen dinners. You might see on the label of some foods that baking soda (sodium bicarbonate) is included. Hence the name, sodium bicarbonate, is very high in sodium, with 630 mg per ½ teaspoon.

70% of the sodium eaten comes from processed and restaurant-prepared foods. If a patient has a diagnosis of heart failure, choosing less processed foods and cooking at home is the most ideal way to control sodium intake.

Sodium can be hidden in many things we eat. Over-the-counter and prescription medications can also contain sodium. Over-the-counter medications will have them listed on the box, but prescription medications can be a little trickier. Ask the pharmacist about the medication you are being prescribed to determine if it contains sodium.

Patients with high blood pressure should be aware that the use of decongestants may raise their blood pressure. These products likely contain pseudoephedrine or phenylephrine. Decongestants relieve nasal congestion by constricting blood vessels in the nose. They also have an effect on blood vessels throughout the body, which is why they can cause an increase in blood pressure. Be aware of over-the-counter cold and flu preparations that contain

decongestants as well. Always discuss any medications prior to use with the provider.

Here are some medications and other substances that could likely raise blood pressure.

1. Alcohol
2. Amphetamines
3. Antidepressants
4. Atypical antipsychotics
  - a. Clozaril (clozapine)
  - b. Zyprexa (olanzapine)
5. Caffeine
6. Cocaine
7. Oral contraceptives
8. Non-steroidal anti-inflammatory drugs (NSAIDs)
  - a. ibuprofen
  - b. naproxen
9. Systemic corticosteroids
  - a. prednisone
  - b. methylprednisolone

### **Other Names for Sodium**

Sodium can come in many different forms. The most commonly identified sources of sodium are salt and soda. Sometimes sodium can be hidden in other forms that may be difficult to identify. Below are names that not everyone could identify as sodium-containing products or another name for sodium. When looking at labels, look for keywords to help you identify sodium in a product.

1. Disodium guanylate (GMP)
2. Disodium inosinate (IMP)
3. Fleur de sel ("flower of salt" in French)
4. Himalayan pink salt
5. Kosher salt
6. Monosodium glutamate (MSG)
7. Rock salt
8. Salt
9. Sea salt
10. Sodium bicarbonate
11. Sodium nitrate
12. Sodium citrate
13. Sodium chloride

14. Sodium diacetate
15. Sodium erythorbate
16. Sodium glutamate
17. Sodium lactate
18. Sodium lauryl Sulfate
19. Sodium metabisulfite
20. Sodium phosphate
21. Trisodium phosphate

There are many alternatives to sodium. Listed below are spices, herbs, and flavorings that can be used instead of sodium. These can change the way you view food.

1. **Allspice:** Lean meats, stews, tomatoes, peaches, applesauce, cranberry sauce, gravies, lean meat
2. **Almond extract:** Puddings, fruits
3. **Basil:** Fish, lamb, lean ground meats, stews, salads, soups, sauces, fish cocktails
4. **Bay leaves:** Lean meats, stews, poultry, soups, tomatoes
5. **Caraway seeds:** Lean meats, stews, soups, salads, breads, cabbage, asparagus, noodles
6. **Chives:** Salads, sauces, soups, lean meat dishes, vegetables
7. **Cider vinegar:** Salads, vegetables, sauces
8. **Cinnamon:** Fruits (especially apples), breads
9. **Curry powder:** Lean meats (especially lamb), veal, chicken, fish, tomatoes, tomato soup
10. **Dill:** Fish sauces, soups, tomatoes, cabbages, carrots, cauliflower, green beans, cucumbers, potatoes, salads, macaroni, lean beef, lamb, chicken, fish
11. **Garlic (not garlic salt):** Lean meats, fish, soups, salads, vegetables, tomatoes, potatoes
12. **Ginger:** Chicken, fruits
13. **Lemon juice:** Lean meats, fish, poultry, salads, vegetables
14. **Mace:** Hot breads, apples, fruit salads, carrots, cauliflower, squash, potatoes, veal, lamb
15. **Mustard (dry):** Lean meats, chicken, fish, salads, asparagus, broccoli, Brussels sprouts, cabbage, sauces
16. **Nutmeg:** Fruits, potatoes, chicken, fish, lean meatloaf, toast, veal, pudding
17. **Onion powder (not onion salt):** Lean meats, stews, vegetables, salads, soups
18. **Paprika:** Lean meats, fish, soups, salads, sauces, vegetables
19. **Parsley:** Lean meats, fish, soups, salads, sauces, vegetables
20. **Peppermint extract:** Puddings, fruits

21. **Pimiento:** Salads, vegetables, casserole dishes
22. **Rosemary:** Chicken, veal, lean meatloaf, lean beef, lean pork, sauces, stuffings, potatoes, peas, lima beans
23. **Sage:** Lean meats, stews, biscuits, tomatoes, green beans, fish, lima beans, onions, lean pork
24. **Savory:** Salads, lean pork, lean ground meats, soups, green beans, squash, tomatoes, lima beans, peas
25. **Thyme:** Lean meats (especially veal and lean pork), sauces, soups, onions, peas, tomatoes, salads
26. **Turmeric:** Lean meats, fish, sauces, rice

### **Provider Follow-up Visits**

Patients should keep all scheduled appointments with their provider and call if they have questions or concerns. This will ensure the best outcome for patients.

### **Heart failure resources:**

<https://hfsa.org/>

<https://recipes.heart.org/en/collections/programs/aha-cookbooks>

<https://www.nhlbi.nih.gov/education/dash-eating-plan>

### **Summary**

Heart failure can begin on the right or the left side of the heart, but left-sided heart failure is the main cause of right-sided heart failure. Many tests can be done to help in the diagnosis of heart failure but determining what stage a patient is at is determined by symptomology. Heart failure is not curable but there are modifiable risk factors that a patient can change in order to slow the progression of heart failure. Taking care of someone with heart failure is multifaceted and understanding the disease will ensure you are providing the best possible care.

**Resources:**

National Heart, Lung, and Blood Institute. Heart failure - what is heart failure? | NHLBI, NIH. [www.nhlbi.nih.gov](http://www.nhlbi.nih.gov). Published March 24, 2022. <https://www.nhlbi.nih.gov/health/heart-failure>

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MedlinePlus. Natriuretic Peptide Tests (BNP, NT-proBNP). [Medlineplus.gov](http://medlineplus.gov). Published 2019. <https://medlineplus.gov/lab-tests/natriuretic-peptide-tests-bnp-nt-probnp/>

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