

# Heart Problems and Treatments

## A healthy heart

Your heart's main functions are to receive used blood from your body and pump fresh oxygen rich blood to nourish your body. To do this well:

- The heart muscle itself needs a good blood supply.
- The heart must be able to fill with blood and have a strong pumping action.
- The heart valves must be working right.
- The heart beat should be regular.

## Problems with the heart's blood supply

### Atherosclerosis

Atherosclerosis is a build up of fatty deposits inside the wall of arteries. The arteries in the body supply oxygen and nutrient rich blood to the muscles.

When you have too much **LDL, or “bad cholesterol”**, the LDL gets stuck in the inner wall of the artery. This forms fatty streaks. A **plaque**, or firm cap, grows over the fatty streak. This buildup of plaque narrows the artery opening and decreases blood flow to the muscle.

### Atherosclerosis (hardening of the arteries)

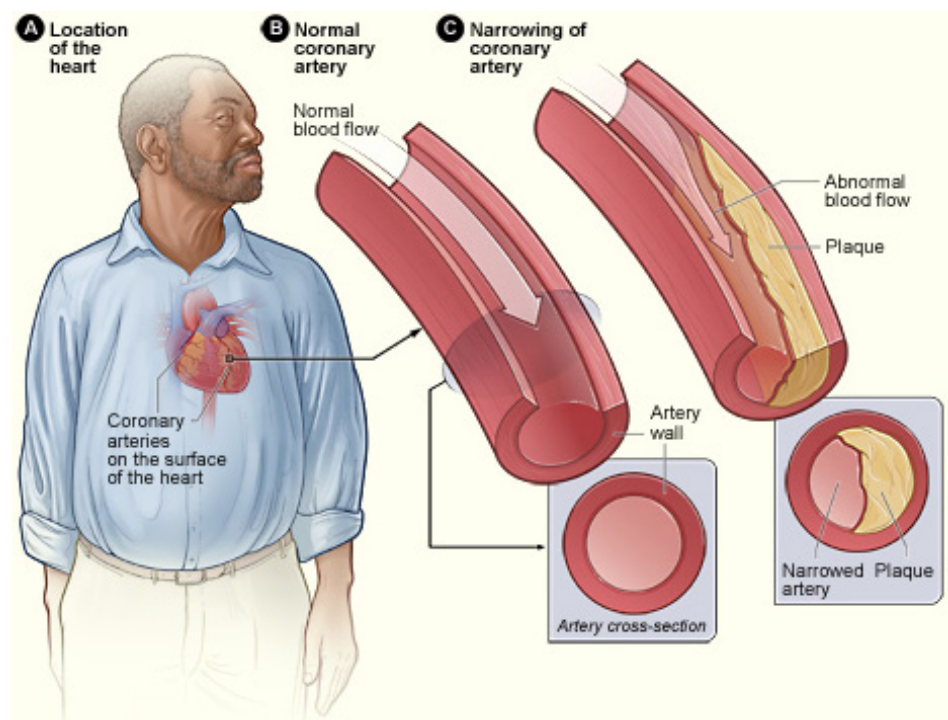


Figure A shows the location of the heart in the body.

Figure B shows a normal coronary artery with normal blood flow. The inset image shows a cross-section of a normal coronary artery.

Figure C shows a coronary artery narrowed by plaque. The buildup of plaque limits the flow of oxygen-rich blood through the artery.

The inset image shows a cross-section of the plaque-narrowed artery.

Source: National Heart, Lung and Blood Institute; National Institutes of Health; U.S. Department of Health and Human Services.



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When blood flow is decreased in the arteries to the heart, it is called **coronary artery disease (CAD)**. This can cause angina, shortness of breath, or even a heart attack to occur.

## Angina

Angina is a pain or discomfort in the chest, arms, or jaw. It often occurs during exercise, stress, or other activities when your heart rate and blood pressure increase. With these activities, the heart muscle needs more blood with oxygen. The pain is a signal that not enough blood is getting through the arteries.

Angina is often brief, lasting a few minutes and is relieved by rest and/or nitroglycerin.

**Angina is not a heart attack.** During angina, the **flow of blood** to the heart muscle is only **reduced temporarily**.

## Myocardial infarction (MI or heart attack)

A heart attack results from a lack of blood to a part of the heart muscle. This occurs when a blood clot forms in the narrowed artery, and the artery becomes blocked. A blood clot forms when there is a crack in the plaque. A heart attack causes part of the heart muscle to be **permanently damaged**.

Soon after a heart attack the healing process begins.

- In the first week after a heart attack, dead muscle cells are removed by the body's white blood cells. There may be a slight fever during this time. The heart muscle becomes thin in that area and may be at risk for more damage.
- After the dead muscle cells are removed, a scar forms in the damaged area of the heart muscle. This scar is formed in the first few weeks, but it takes about 4 to 6 weeks for the scar to become firm and tough.

### *Heart With Muscle Damage and a Blocked Artery*

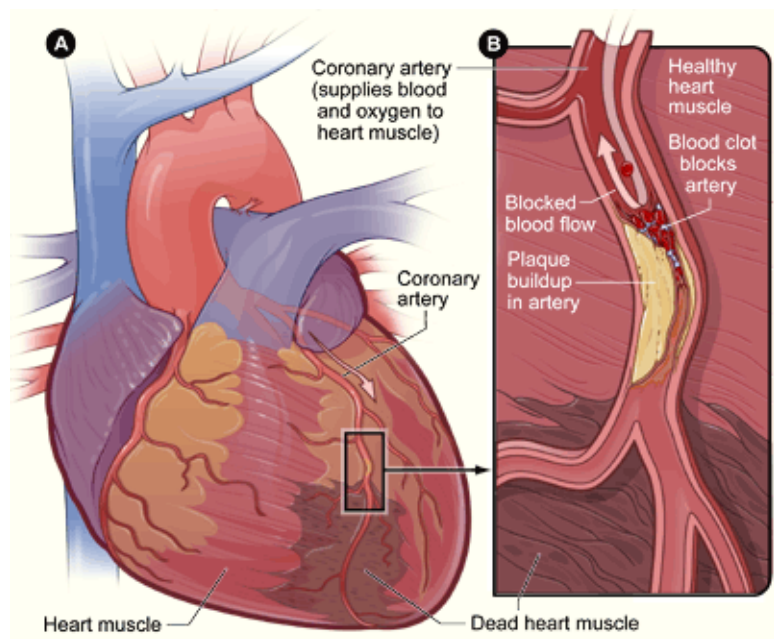


Figure A is an overview of a heart and coronary artery showing damage (dead heart muscle) caused by a heart attack. Figure B is a cross-section of the coronary artery with plaque buildup and a blood clot.

Source: National Heart, Lung and Blood Institute; National Institutes of Health; U.S. Department of Health and Human Services.

Recovery from a heart attack begins in the hospital and continues after you go home. Most people are able to return to normal activities, including work, within 6 to 12 weeks after a heart attack.

**Daily periods of rest during the first 4 to 6 weeks after a heart attack help prevent complications** and allow healing to take place.

Healing times vary and complete healing from your heart attack often takes 2 to 3 months. Scarred tissue does not help the pumping action of the heart. Therefore, the undamaged part of your heart muscle must work as well as possible. The rest of the muscles in your body need to become efficient as well.

## Coronary artery disease (CAD)

One way to prevent problems is to **know the warning signs of coronary artery disease** and to take action. Knowing the difference between angina and heart attack pain is important, so you do not delay getting help.

	Angina	Heart Attack
<b>Cause</b>	Temporary lack of blood supply to the heart muscle.	Prolonged lack of blood supply to the heart muscle. Permanent damage results.
<b>Location</b>	Pain behind breastbone, which spreads across chest. May go to shoulder, arms, neck, or stomach.	Pain is located in the same areas as angina.
<b>Type of Pain</b>	Pressure, crushing, aching, choking, squeezing, burning, or feeling of heartburn.	Same type of pain as angina, but more intense.
<b>How long does it last?</b>	Brief, gone within 15 minutes.	Lasts longer than 15 minutes.
<b>What triggers the pain?</b>	Angina is related to conditions that require your heart to do more work, such as exposure to extreme temperatures, exercise, etc.	Not related to conditions that require the heart to do more work. May occur at rest.
<b>Relief of Pain</b>	Rest and nitroglycerin.	Only temporary relief with rest and nitroglycerin.
<b>Other Signs</b>	Mild sweating and shortness of breath.	Severe sweating, shortness of breath, profound weakness, nausea, anxiety, vomiting and dizziness.
<b>Actions to Take</b>	<ol style="list-style-type: none"> <li>1. Stop. Rest.</li> <li>2. Put 1 nitroglycerin under your tongue every 3 to 5 minutes to a total of 3 tablets over 15 minutes. <b>At any time if your chest discomfort or pain does not improve or is getting worse even with nitroglycerin, call 911. Do not drive yourself to the hospital.</b></li> <li>3. If pain is relieved, call your doctor.</li> <li>4. If pain is not relieved after 3 tablets, <b>call 911 right away.</b></li> </ol>	<ol style="list-style-type: none"> <li>1. Sit or lie down, propped up if breathing is difficult.</li> <li>2. <b>Call 911.</b> Do not drive to the hospital or delay by calling your doctor.</li> <li>3. You may take 1 nitroglycerin under your tongue every 3 to 5 minutes up to a total of 3 tablets over 15 minutes.</li> </ol>

No two people have the same signs. People with diabetes may not experience pain due to nerve damage, called neuropathy. Women may have “atypical” signs, such as back pain, unusual fatigue, or shortness of breath. **Recognize and know your signs of angina!**

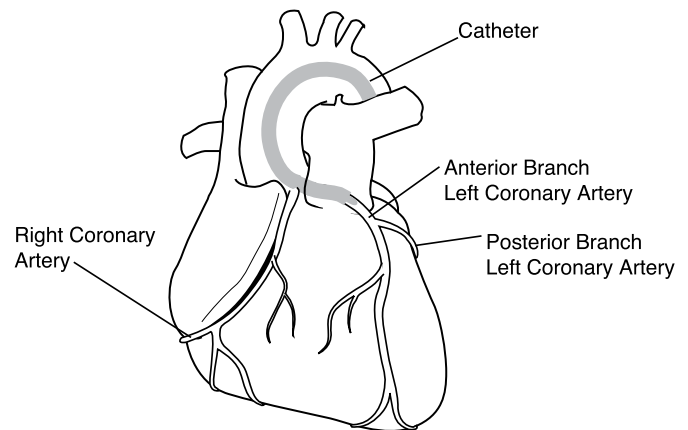
- **Diagnosing CAD:**

Your doctor may find you have CAD by:

- Changes on an electrocardiogram (EKG or ECG)
- Changes during a stress test
- Doing a cardiac catheterization

A cardiac catheterization is the most accurate way to see if you have coronary artery disease, and if so, how much. A doctor uses a catheter to inject dye to check the chambers, valves and arteries of the heart.

A cardiac MRI may also be done to get images of your heart.



- **Treatment of CAD:**

There are three types of treatment for CAD:

- Medical therapy
- Catheter treatments or repair of artery using a catheter
- Coronary artery bypass surgery

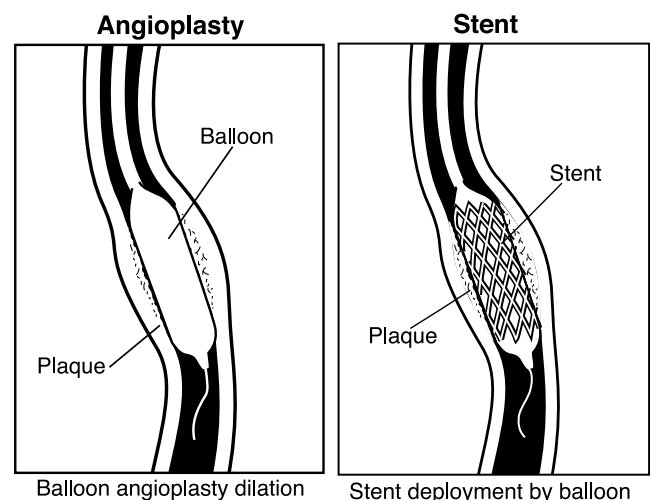
The type of treatment depends on the coronary artery disease a person has. All of these treatments improve blood flow to the heart muscle and decrease the risk of a heart attack. No matter what type of treatment is done, it does not cure coronary artery disease. Treatments must be combined with lifestyle changes to reduce your coronary risk factors for long term success.

### **Medical therapy:**

Treatment with medicines is done to decrease the heart's demand for oxygen and nutrients. Medicines can increase blood flow to the heart muscle by relaxing the coronary arteries, decreasing the heart rate and decreasing the blood pressure. Medical therapy is often used first or sometimes as a temporary treatment until angioplasty or bypass surgery is done. Common types of medicines used are nitroglycerin, beta blockers and calcium antagonists. If medical therapy fails, angioplasty or surgery is often the next step.

### **Heart catheter treatments (angioplasty):**

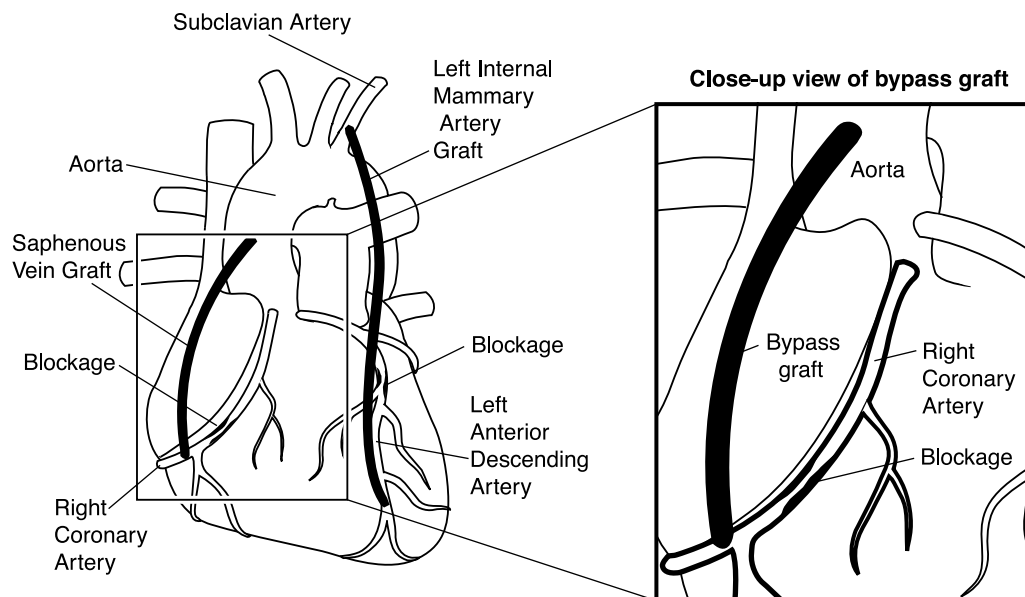
These treatments are done to decrease the amount of blockage in the coronary arteries. All of the treatments are done by passing a small tube, called a catheter, into one of the arteries in the leg, up to the heart and into the coronary artery. **Balloon angioplasty** "cracks" the blockage and pushes it to the side of the wall. Often a **stent**, a small metal tube, is placed at the site to help prevent the blockage from returning. Most of the stents contain medicine that helps to prevent blockage from returning. Sometimes a laser and roto blader is used to decrease the amount of blockage.



**Coronary artery bypass surgery:**

Coronary artery bypass surgery is done to improve the blood flow to the heart muscle by bypassing the blockages. Surgery should decrease or stop your angina. Bypass surgery is not a cure for heart disease, but it should improve the quality of your life.

During bypass surgery, a blood vessel from your leg or chest wall is used to bypass the blockage in your coronary artery. Most often, one end of the blood vessel is sewn into the coronary artery below the blockage. The blockage remains, but blood is directed around it. This surgery gives the heart muscle a new supply of oxygen and nutrient rich blood.



After your heart surgery, you may have some chest pain. This pain is from the incision in your chest, and it does not often radiate to your arms or jaw. The pain does not go away with rest and gets worse if you push the chest on or near the incision. This pain can be relieved with pain medicines. With time, pain from the surgery goes away.

## Problems with the heart's pumping action

### Heart failure

Heart failure means that your heart does not pump as strongly as it should. The blood that should pump forward backs up into your lungs and other parts of your body. It does not mean your heart has stopped.

There are two types of heart failure: left-sided heart failure and right-sided heart failure. They can often occur together.

- **Left-sided heart failure:**

Signs include:

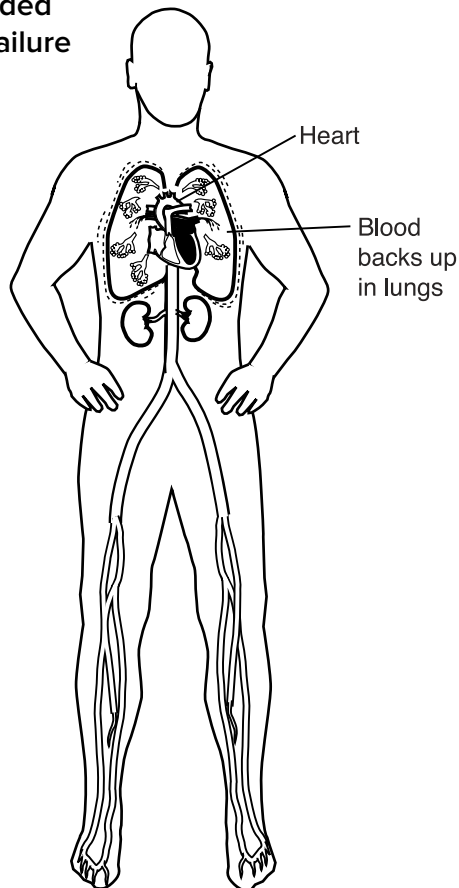
- Shortness of breath, called dyspnea, especially when you exert yourself
- Problems breathing when lying down flat
- Waking up coughing

- **Right-sided heart failure:**

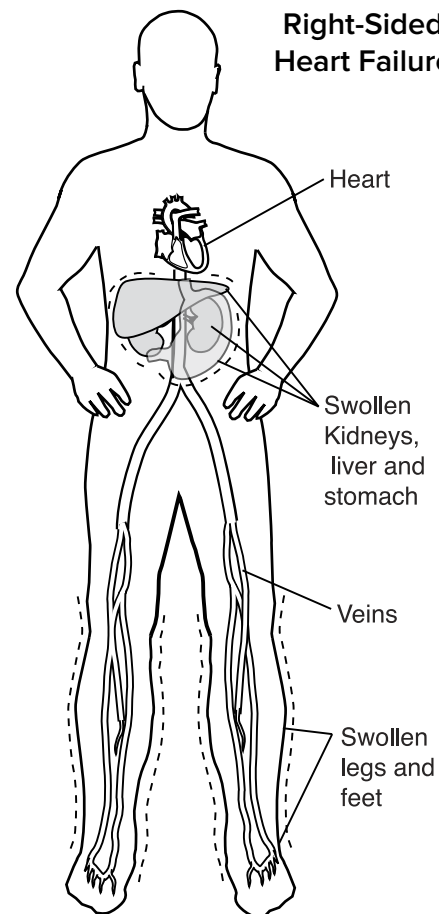
Signs include:

- Swelling, called edema, in your ankles and feet
- Liver problems
- Swelling of the abdomen, called ascites
- Loss of appetite

**Left-Sided  
Heart Failure**



**Right-Sided  
Heart Failure**





- **What causes heart failure?**

Heart failure often happens when a medical condition makes the heart weak. Coronary artery disease that causes heart blockage is a common cause. Other conditions that can lead to congestive heart failure include:

- Heart attack
- High blood pressure
- Lung disease
- Infection of the heart muscle
- Problems with the heart's valves
- Alcohol, smoking and substance abuse

- **What can be done to control heart failure?**

- Take the medicines ordered by your doctor.
- Reduce the amount of salt in your diet.
- Get enough rest. When you can, put your feet up to reduce ankle swelling.
- Plan your activities. Know your limits. Ask your doctor about exercise.
- Stop smoking.
- Get your weight within normal range. Weigh yourself every day.
- Avoid alcohol.

- **When to call your doctor**

Call your doctor if you have one or more of these symptoms:

- Problems with breathing
- Tightness or pain in your chest
- Feel more tired
- Coughing at night
- Need to prop yourself up straight to sleep comfortably
- Weight gain of 2 pounds or more in a day or 5 pounds in a week
- Feel dizzy or faint
- Urinate less often
- Feet or ankles swell more than usual (shoes may feel tight)

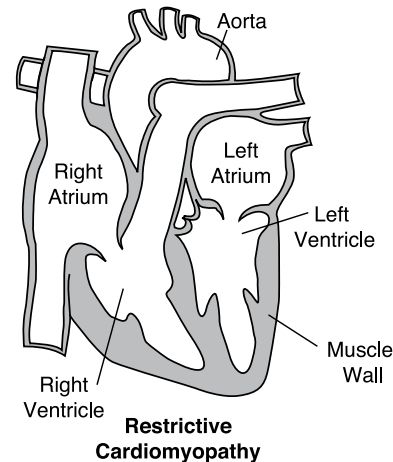
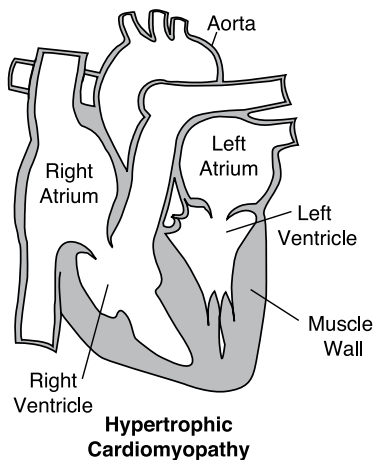
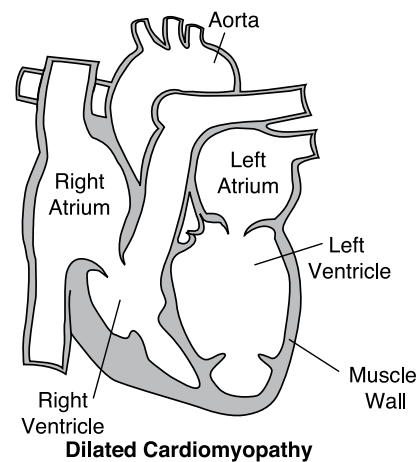
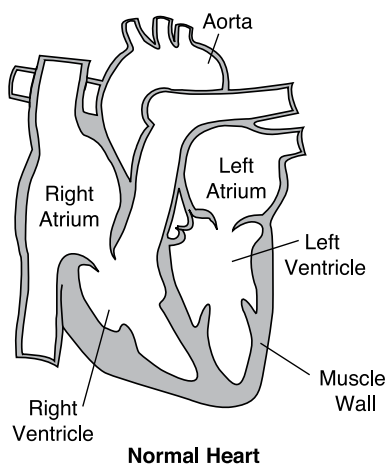
## Cardiomyopathy

Cardiomyopathy means **heart** (cardio) **muscle** (myo) **disease** (pathy). This disease changes the heart muscle and weakens it. The weakened heart muscle may become thin and get larger. The entire heart muscle is weak and pumps less effectively. Over time, the heart goes into a state of pump failure. It cannot supply the body with enough blood flow. Often, it is a long term (chronic) disease, and you will have to adjust your lifestyle.

Treatment rarely cures cardiomyopathy, but may reduce your signs.

- **There are three major types of cardiomyopathy:**

- › Dilated cardiomyopathy - heart muscle is “too thin”.
- › Hypertrophic cardiomyopathy - heart muscle is “too thick”.
- › Restrictive cardiomyopathy - heart muscle cannot relax and fill well with blood.



- **Signs of cardiomyopathy include:**

- › Trouble breathing
- › Tiredness (fatigue)
- › Chest pain
- › Weight gain
- › Dizziness and light-headedness
- › Irregular heart beat (arrhythmias and palpitations)
- › Swelling (edema)

You can help manage cardiomyopathy by talking to your doctor about your signs. Changes in usual signs may mean that your pump failure is getting worse or is improving. Report any changes to your doctor as your treatment may need to be changed.



- **Treatment of cardiomyopathy:**

Treatment is directed at the cause of the cardiomyopathy, if known. Treatment, however, is very specific for each person and does not restore your heart to complete normal function. A major goal in treatment is to make your heart work more efficiently.

Treatment may include:

- **Lifestyle changes** to manage the cause of your cardiomyopathy. This may include eating a heart healthy diet, maintaining a healthy weight, managing stress, being active and quitting smoking.
- **Taking medicines.**
- Wearing a **LifeVest**, which is a wearable defibrillator that is worn by people at risk for sudden cardiac arrest. Wearing the LifeVest gives you and your doctor time to make plans for treatment. The LifeVest is lightweight, easy to wear and worn 24 hours a day. The LifeVest garment, which is worn under clothing, detects arrhythmias and gives a shock to restore a normal heart beat, if needed. Your doctor will re-evaluate the pumping part of your heart (Ejection Fraction) with a heart echocardiogram to see if you can stop wearing the LifeVest or if an ICD (implantable cardiac defibrillator) is needed.
- A nonsurgical procedure, called **alcohol septal ablation**. The doctor injects ethanol (a type of alcohol) through a tube into the small artery that supplies blood to the thickened area of heart muscle. The alcohol kills cells, and the thickened tissue shrinks to a more normal size. This procedure allows blood to flow freely through the ventricle to improve your signs.
- **Surgery and implanted devices:**

***Septal Myectomy:***

This is open-heart surgery, which is used to treat people with hypertrophic cardiomyopathy and people with severe signs. Part of the thickened septum that is bulging into the left ventricle is removed to improve blood flow.

***Surgically Implanted Devices:***

There are several types of devices that can be placed into the heart to improve function and signs.

- » **CRT (Cardiac resynchronization therapy) device** to coordinate contractions between the heart's left and right ventricles.
- » **ICD (implantable cardiac defibrillator)** to help control arrhythmias that may lead to sudden cardiac arrest. This small, permanent device is implanted in the chest or abdomen and connected to the heart with wires. If an ICD senses a change in heart rhythm, it will send an electric shock to the heart to restore a normal heart beat.
- » **LVAD (left ventricular assist device)** to help the heart pump blood to the body. It can be used as a treatment for people who are waiting for a heart transplant or to extend life expectancy.
- » **Pacemaker** to help control arrhythmias. A small, permanent device is placed under the skin of your chest or abdomen. It sends electrical pulses to prompt the heart to beat at a normal rate.

***Heart Transplant:***

For this surgery, a surgeon replaces a person's diseased heart with a healthy heart from a deceased donor. A heart transplant is a last resort treatment for people who have end-stage heart failure. "End-stage" means the condition has become so severe that all treatments, other than heart transplant, have failed.

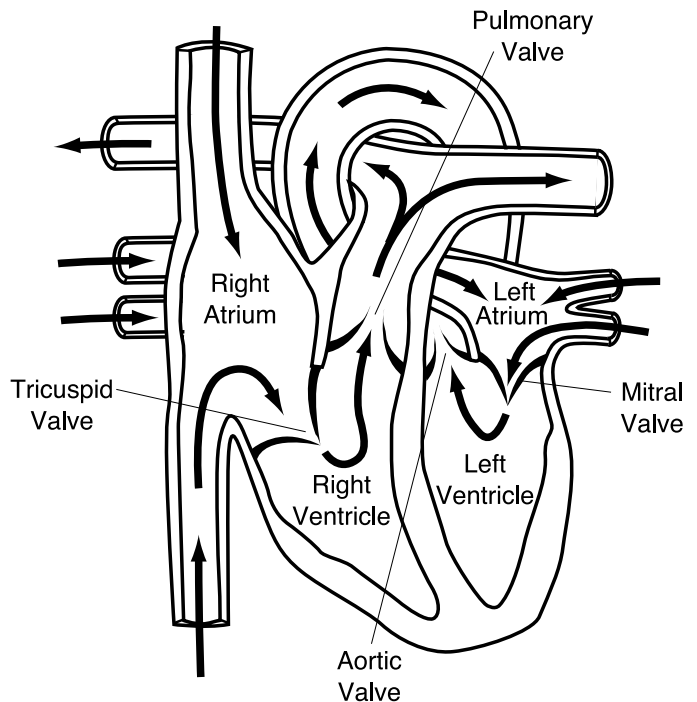
## Problems with the heart's valves

### Heart valve disease

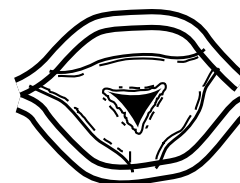
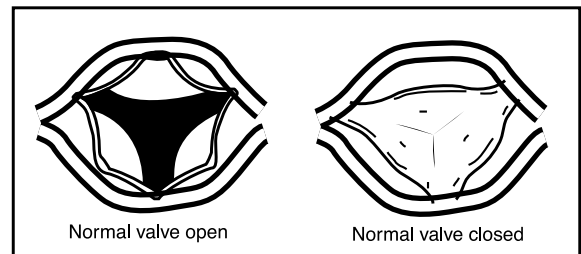
There are four valves in the normal heart. These valves control the flow of blood through the chambers of the heart. Valves open wide enough for blood to flow through then close tightly, so the blood does not leak backward. When one or more of these valves is damaged, the flow of blood changes. Damaged valves may be due to a birth defect, infections, or rheumatic heart disease that scars the valves. Valve damage can occur with aging.

Valve disease often results from a narrowing of the valve opening and/or leaking of a valve. A narrow valve restricts blood flow through the heart. A leaking valve results in less blood being pumped through the heart as blood leaks backward. The valve problems cause strain on the heart as it must work harder. The heart muscle becomes stretched. Irregular beats, shortness of breath, swelling and the formation of blood clots can result.

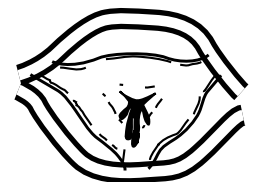
In the early stages of valve disease, medicines, diet and exercise can control signs. When signs worsen, surgery is often needed to repair or replace the diseased valve.



Normal Valves



Valve that does not open wide enough



Valve that does not close tightly (Leaking)

## Problems with the heart's conduction system

### Irregular heart beat (arrhythmia)

Sometimes the heart may become sensitive or irritable after a heart event.

- **Signs of irregular heart beat**

Irregular heart beats may cause you to feel:

- Palpitations (rapid thumping inside the chest)
- Short of breath
- Tired more easy, especially with activity
- Light-headed
- Dizzy
- Faint
- “Skipped or missed” beats

- **Types of irregular heart beat**

- **Atrial fibrillation, also called A-fib**

The SA node, also called the sinus node, is the normal “pacemaker” of the heart. With A-fib, it does not start the electrical signal in the heart. Instead, the signal comes from the atrial or top heart chambers. This causes rapid, irregular heart beats that may or may not be felt by the person.

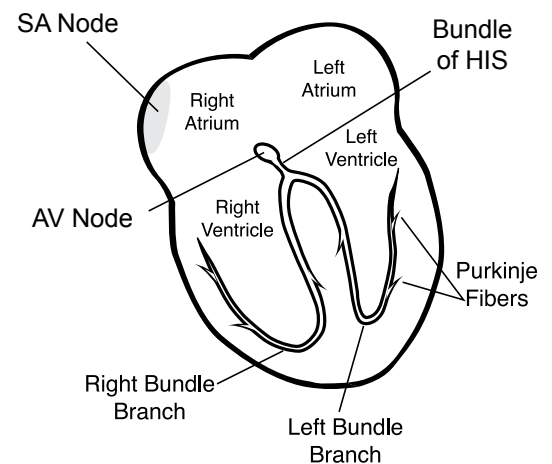
This condition may resolve on its own, but if it persists treatment, such as daily medicines and a procedure, called catheter ablation, may be prescribed. Be sure to follow up with the doctor, take medicines as ordered and have any blood work done as needed for treatment.

Having A-fib can increase your risk of having a stroke due to the potential of blood clots forming in the heart.

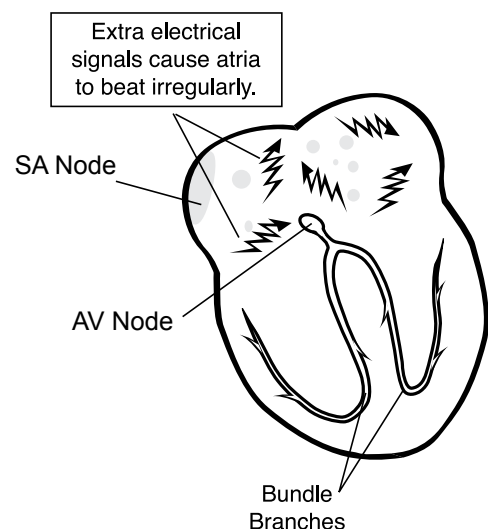
**Call 911 if you have any stroke signs:**

- » Sudden numbness or weakness of face, arm or leg, often on just one side of the body
- » Sudden confusion, trouble speaking or understanding
- » Sudden trouble seeing in one or both eyes
- » Sudden trouble walking
- » Sudden dizziness or loss of balance or coordination
- » Sudden severe headache with no known cause

#### Normal Conduction



#### Atrial Fibrillation



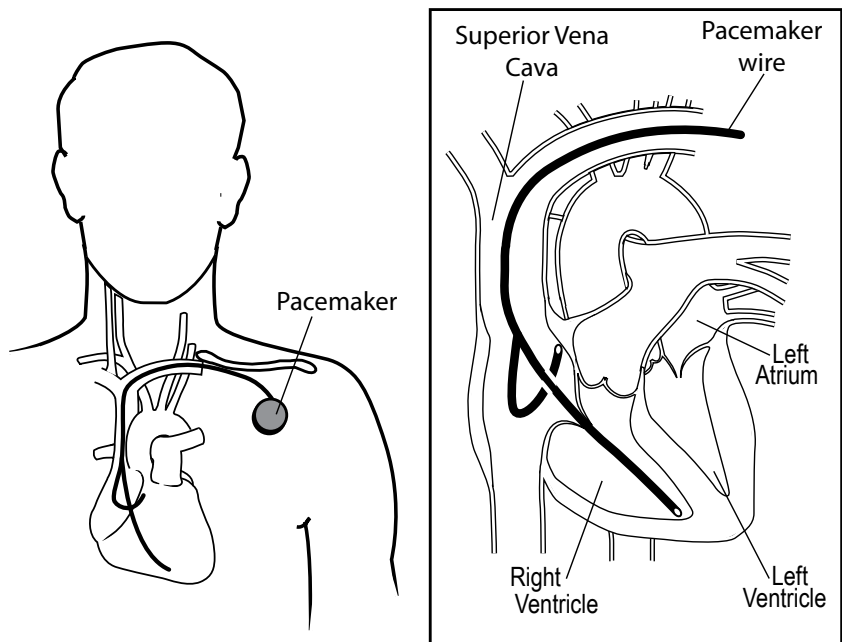
► **Premature beats - PVCs and ventricular tachycardia**

These types of irregular heart beats may override the SA node and start from the ventricles, the bottom chambers of the heart. This may be noticed as a “skipped” or “missed” beat. These types of premature heart beats are often not a concern, but be sure to tell your doctor if they happen more often or last for longer periods of time. If the rhythm is uncontrolled or persists, an implantable defibrillator may need to be considered.

► **Slow heart rhythm - bradycardia**

Sometimes the heart rate may drop below 50 beats per minute causing light-headedness, dizziness or even fainting episodes. Call 911 if this happens. Medicines may help to control this, but a pacemaker may be another option.

Pacemakers are most often a small device placed into the right or left side of the chest just under the collarbone into a pocket of tissue. Wires (leads) are guided into a large vein that goes to the heart and rests in the right atrium and right ventricle. Through these wires, the pacemaker can control the beating or rhythm of the heart. Some patients may be able to have a leadless pacemaker that does not need wires (leads). A leadless pacemaker is a small device that is inserted into the right ventricle of the heart.



## In summary

- Fatty deposits and plaque can buildup inside arteries causing angina and shortness of breath.
- Plaque can rupture and cause a blood clot to form, cutting off blood to the heart muscle to cause a heart attack.
- Do not ignore angina pain or signs of a heart attack. Take action to get help.
- Procedures, like angioplasty and stents, are not a cure for coronary artery disease (CAD). Treatments must be combined with changing your coronary risk factors for long term success.
- Heart failure happens when your heart does not pump as strongly as it should. Know when to call your doctor and how to control it.
- Signs of irregular heart beats may include: palpitations, shortness of breath, light-headedness, dizziness or skipped beats. Let your doctor know if you have these.
- Different rhythm problems are treated differently. Possible treatments include: medicines, pacemakers and internal defibrillators.