

# Sudden Cardiac Arrest

OPTIONS FOR TREATMENT

# What is SCA?

Sudden Cardiac Arrest (SCA) happens when the electrical system of the heart malfunctions suddenly and without warning. It occurs when electrical impulses that tell the heart to pump blood become rapid or chaotic. This causes the heart to stop pumping blood to the brain and vital organs, which in most cases leads to death. However, there is a lot you can do to help prevent SCA. Read on to learn more about SCA and how to keep your heart healthy.

## SCA AND HEART ATTACK

SCA is not a heart attack. Seventy percent of Americans don't know the difference between SCA and a heart attack. A heart attack occurs when oxygen-rich blood is blocked from moving through the arteries to the heart. A heart attack has symptoms, such as chest pain and difficulty breathing, and some warning signs. In contrast, SCA is an electrical problem in the heart that causes the heart to beat so fast that it cannot fill and thus cannot pump blood. SCA may have no symptoms and can occur without warning. Patients who have had a heart attack or a previous cardiac arrest (when the heart's electrical system suddenly stops working normally) are at the greatest known risk of SCA.



## SURVIVING SCA

Since SCA prevents the heart from pumping effectively, blood does not get to the brain. This leads to loss of consciousness (“black out”) and can cause death within minutes if the heart doesn't receive either an internal or external shock to get it pumping again. An internal shock comes from a device surgically implanted in the chest called an Implantable Cardioverter Defibrillator (ICD). An external shock comes from a defibrillator (like that used by emergency medical personnel) or an automated external defibrillator (AED) that you may see in public spaces. The challenge with AEDs is that they have to be operated by a person and one has to be at, or near, the location of your cardiac event. Since AEDs may not be readily available, the best treatment for SCA is prevention. This might mean making changes in your lifestyle, taking medication for heart disease, or having an ICD placed in your chest. After consulting with a heart rhythm specialist, patients at risk for SCA often do a combination of all three prevention options to reduce their risk of SCA.

# Are You at Risk?

SCA can happen to a person of any age, race, or gender. In fact, it can even happen to young athletes who seem in excellent physical condition. So even if you feel healthy, you could still be at risk.

## RISK FACTORS

Talk to your health care provider about whether you should see a doctor who specializes in heart rhythm problems (electrophysiologist). Electrophysiologists (EPs) have additional education and training in the diagnosis and treatment of abnormal heart rhythms. You may need to have tests that check your circulation, heart function, and heart rhythm, as well as blood tests for genetic or inherited conditions, if you have any of the following risk factors:

- Family history of heart disease, heart attack, or sudden cardiac arrest
- Unexplained fainting, near fainting, or palpitations (“racing heart”)
- Chest pain, shortness of breath, or fainting with exertion—such as during sports
- Heart failure or heart attack
- Cardiac risk factors, such as high blood pressure, diabetes, obesity, or abnormal cholesterol
- Weak heart muscle, or a cardiac “ejection fraction” of 35% or less

## EJECTION FRACTION

Ejection fraction (EF) is the percentage of blood in the lower heart chamber (ventricle) that is pumped out to the body with each heartbeat. A normal EF is 50% or more. A lower number means a greater risk of SCA. Your EF can be determined by a number of tests. The test most commonly used is called an echocardiogram (see page 6).

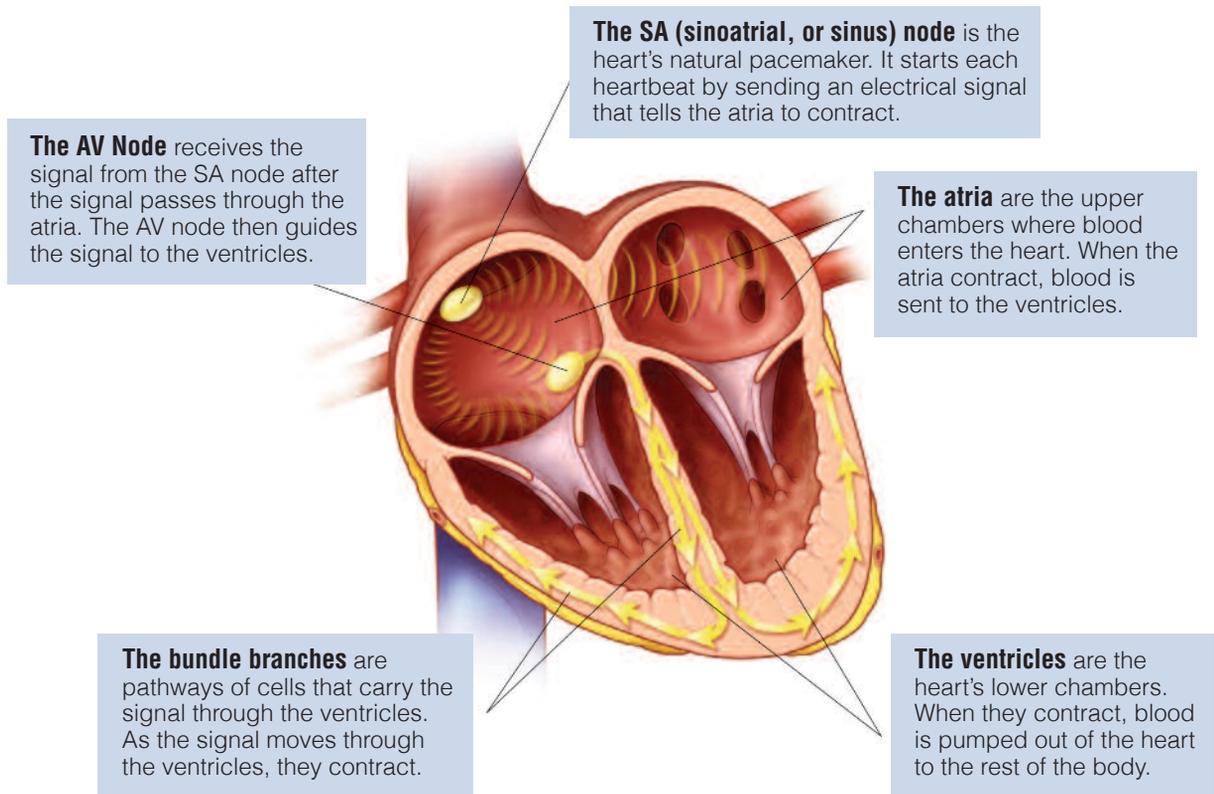


# A Normal Heart Rhythm

Your heart is a muscle that pumps blood throughout your body. The heart muscle beats (contracts and relaxes) many times a minute. The pattern of your heartbeat (regular or irregular) is known as your heart *rhythm*, while the speed of heartbeats (how fast your heartbeats) is known as your heart *rate*. Signals from the heart's electrical system control the rhythm and rate. A problem with the heart's electrical system may cause an abnormal heart rhythm.

## YOUR HEART'S ELECTRICAL SYSTEM

Groups of special electrical cells, called nodes, create or send electrical signals through the heart. As the electrical signals pass through the heart muscle, they cause the muscle to contract, pumping the blood through the heart and out to the rest of the body. The signals start in the top chamber of the heart (the right atrium) in the area of the heart's natural pacemaker, which is called the sinoatrial (SA) node. Signals travel from the SA node through the top chambers of the heart (the atria) to the checkpoint between the atria and the lower chambers of the heart (ventricles). This checkpoint is called the atrioventricular (AV) node. The AV node passes the signals to the ventricles along special pathways called bundle branches.



# Abnormal Rhythms

Your heart's rhythm and rate can be too fast, too slow, or irregular. For most people with a healthy heart, these abnormal rhythms do not last. But for others, they can lead to severe complications. These abnormal rhythms are called arrhythmias. Some types of arrhythmia can cause SCA, the most common of which is ventricular fibrillation (VF).

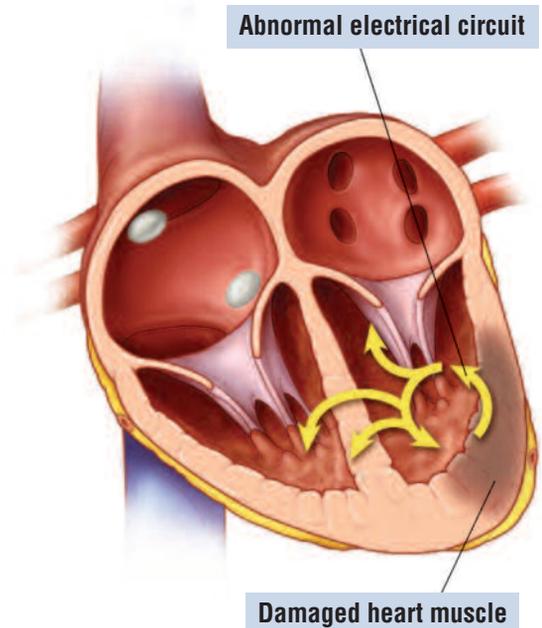
## **VENTRICULAR TACHYCARDIA (VT) AND VENTRICULAR FIBRILLATION (VF)**

The ventricles do most of the work to pump blood to the body. So, fast rhythms in the ventricles are often more serious than those in the atria. With ventricular tachycardia (VT), abnormal electrical signals develop in the ventricles. This usually occurs in areas of damaged heart muscle or cells. VT makes the heartbeat very fast, causing the heart to pump ineffectively. It can develop into the most serious arrhythmia, called ventricular fibrillation (VF). VF is a chaotic, fast, irregular rhythm. This causes the heart to pump little to no blood and results in death unless corrected within minutes.

## **OTHER CAUSES OF SCA**

Life-threatening arrhythmias tend to develop in people with other heart conditions. The most common of these conditions are:

- **Coronary artery disease**, which occurs when an artery wall is damaged by things like abnormal blood cholesterol or smoking. Plaque (a fatty material) builds up in the damaged wall. This is called atherosclerosis.



The buildup can prevent blood from flowing through the arteries and cause a heart attack.

- **Heart attack**, usually a result of coronary artery disease, can cause areas of the heart to develop scar tissue. This scar tissue can alter the electrical pathway in your heart muscle and cause abnormalities that lead to SCA.
- **Cardiomyopathy**, a disease of the heart muscle that may make it weak, thickened, or scarred.
- **Heart failure**, which occurs when the heart can't pump as much blood as it should. This means some parts of the body don't get enough blood. Heart failure occurs when the heart has been weakened, often by other heart conditions, such as those listed above.
- **Inherited arrhythmia syndromes**, which can cause abnormal conduction or recovery of the heart with each heartbeat. This can initiate (start) chaotic or life-threatening heart rhythms.

# Determining Risk for SCA

Your healthcare provider may decide that you are at risk of SCA. If so, he or she may request that you have one or more tests done on your heart. These tests can be done in a doctor's office or at a hospital. The test will help your healthcare provider find out what, if anything, is wrong with your heart, and what you can do to prevent complications.

## TESTS AND EXAMS

- An electrocardiogram (ECG or EKG) records the way electrical signals travel through your heart. Small pads (electrodes) are placed on your chest, arms, and legs. Wires connect the pads to the ECG machine, which records your heart's signals. This can show the pattern of your heartbeat and detect abnormalities.
- An echocardiogram uses ultrasound waves to show the structure and movement of your heart muscle. This shows how well the heart pumps. It also shows if the heart is enlarged, the thickness of the heart's walls, and any problems with the heart valves.
- Holter monitoring can help detect an abnormal heartbeat. A portable monitor is connected to your chest with soft pads. The monitor records your heart's rhythm over several hours or days.
- An event recorder is similar to a Holter monitor, but instead of recording your every heartbeat for long periods, it only records the most current 30 seconds of heart rhythm. When you experience a symptom, however, you will be able to choose to store the 30 seconds of rhythm at the time of the symptom by pressing a button.
- An electrophysiology (EP) study is an invasive procedure that gives information about your heart's electrical system. During the procedure, thin tubes (catheters) are inserted into a blood vessel and carefully guided into your heart with the help of x-rays. The electrical activity and the electrical pathways in your heart are then recorded.
- Cardiac catheterization helps detect clogged blood vessels. X-ray dye is injected into the heart through a catheter. Then, an angiogram (a special type of x-ray) is taken of the blood vessels. Cardiac catheterization can also show problems with pumping, heart chambers, blood flow, or valves.
- Genetic testing is performed on a sample of blood to determine if an individual has any genes that can cause electrical problems in the heart. If such a gene is identified, other family members can also be screened to determine whether they, too, have the same gene.

# Living Healthy

After being diagnosed and treated for heart problems, some people may make the mistake of thinking that everything is okay because they feel better. But the sooner you accept your condition the better you can feel about your health over time. Understand that unless you make some changes in your life, you are at high risk of more problems. At first, it may be hard for you to face making lifestyle changes. But having your family and friends work with you can help make these changes easier.

## STAYING ACTIVE

Regular exercise will make your heart and coronary arteries healthier. It helps increase strength, lower blood pressure, and relieve stress. It also helps you control your weight. Your doctor will prescribe an exercise program that's best for you. In the meantime, try these tips:

- Plan activities like a walk around the block. If the weather is bad, try walking indoors, such as at a shopping mall. Light gardening and swimming are other options that may work for you. Talk to your health care provider about safe choices.
- Involve family and friends in your activities. You can enjoy yourself and help your heart at the same time!
- Stay aware of your limits. Stop and rest if you feel tired or short of breath. If you can't hold a conversation during activity, you're pushing yourself too hard.



## EATING RIGHT

Making some changes in your eating habits can help reduce your risk of heart disease.

- Cut down on fat. Eating less fat, especially saturated fats, can improve your cholesterol levels, which is a major risk factor for coronary artery disease.
- Eat more fruits and vegetables.
- Limit salt. Salt can raise blood pressure and over time can cause the heart to work harder. This contributes to heart disease.
- Limit or avoid alcohol. Excessive alcohol consumption can lead to stroke, arrhythmia, and SCA.

## MEDICATIONS

Your health care provider may prescribe medication to help control arrhythmia or other conditions that could lead to SCA. Some medications improve the way your heart pumps over time. Others work to keep your heart rhythm regular. Additional medications may help to relieve symptoms of cardiovascular disease. Either way, it is very important to take your medications as directed. These medications might include:

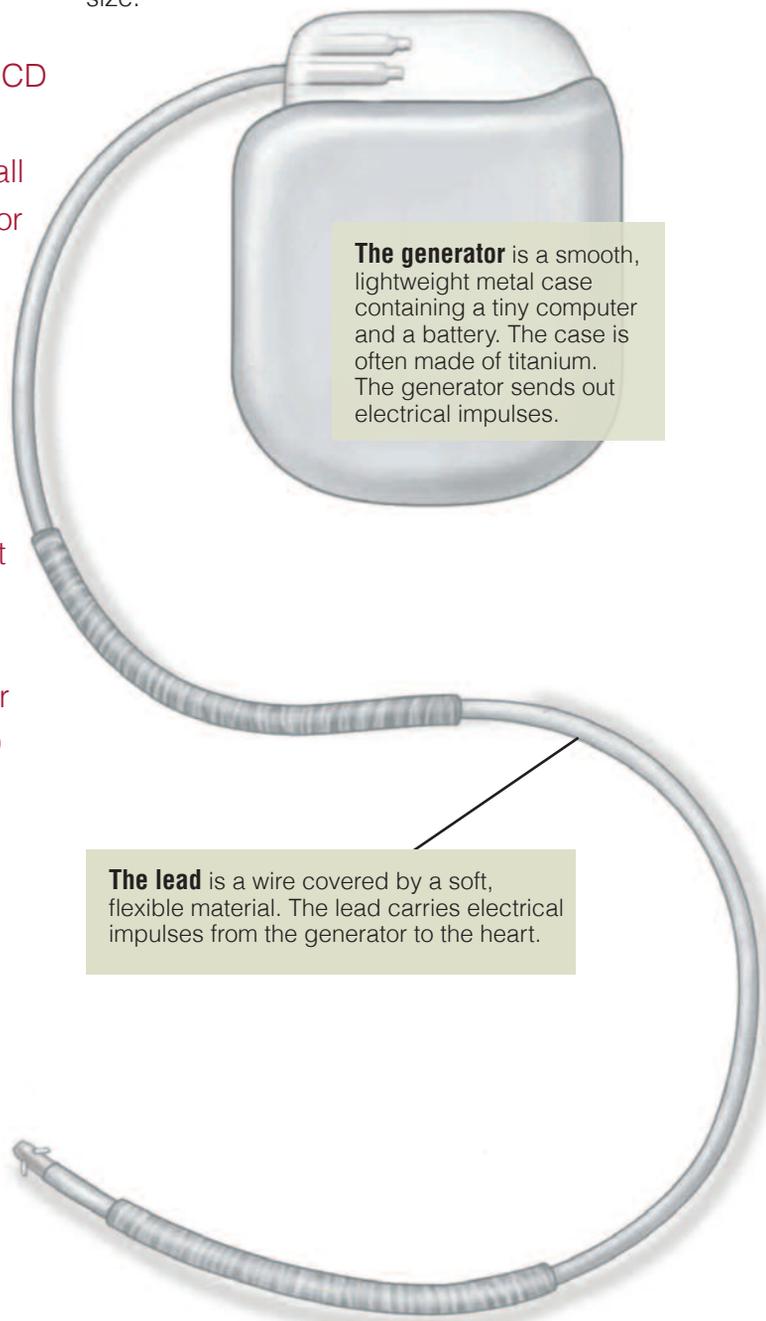
- ACE inhibitors
- Angiotensin receptor blockers (ARBs)
- Beta-blockers
- Statins
- Anti-arrhythmic medication

# Treating SCA

If you're found to be at high risk of SCA, your healthcare provider may advise you to get an Implantable Cardioverter Defibrillator (ICD). An ICD is a device that is placed under the skin in your chest. ICDs can be small and thin and relatively comfortable for patients. It treats SCA by monitoring your heart rhythm and sending out electronic signals to disrupt dangerously fast rhythms that may lead to SCA. Although your healthcare provider may prescribe other treatments, an ICD is the most effective. ICDs can last a long time, some as long as 10 years, before needing to be replaced. Talk to your healthcare provider to see if an ICD device is a good option to you.

## WHAT THE DEVICE LOOKS LIKE

This ICD is shown slightly smaller than actual size.



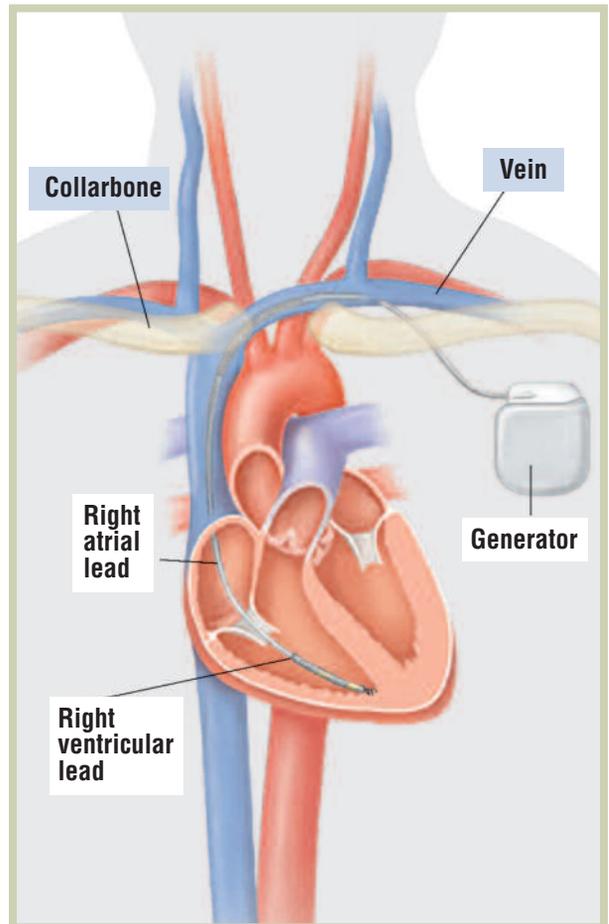
**The generator** is a smooth, lightweight metal case containing a tiny computer and a battery. The case is often made of titanium. The generator sends out electrical impulses.

**The lead** is a wire covered by a soft, flexible material. The lead carries electrical impulses from the generator to the heart.

# How An ICD is Put into the Body

The device is placed in your body during a process called implantation. Here's how it's done:

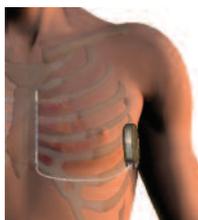
- First, you'll receive medications to prevent pain and help you relax or sleep.
- An incision is made in the skin below the collarbone. This creates a small "pocket" to hold the device.
- A lead is threaded through the incision into a vein in the upper chest. With the help of x-ray monitors, the lead is then anchored into one of the heart's chambers. Depending on how many leads your ICD has, this process may be repeated to guide leads into other chambers.
- The leads are attached to the heart muscle so they will stay in place.
- The generator is attached to the leads. Then, the generator is placed in its pocket under the skin.
- A fast heart rhythm may be induced (started) to test the ICD.
- Once the device has been implanted, the incision is closed with sutures, medical glue, or staples.



## OTHER ICD TYPES

Recently, two new types of ICDs have been introduced in the United States: the S-ICD and the Wearable Cardioverter Defibrillator (WCD).

- **S-ICD.** An S-ICD is similar in function to a conventional ICD but it is placed under the skin (subcutaneous) along the ribcage (instead of implanted in a "pocket" near the collarbone). An incision is made in the middle of the chest, and



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an electrode is implanted under the skin along the sternum. Unlike a conventional ICD, the S-ICD does not have leads placed inside the heart.

- **WCD.** A WCD is not implanted in the body. Instead, the patient wears a special vest, which has sensors that monitor the patient's heart rhythm. If the WCD senses a life-threatening arrhythmia, the WCD emits an alert before an electrical shock is delivered. The generator that delivers the shock can be attached to clothing or carried in a small shoulder bag.

## FOLLOW UP

Once you have an ICD, your doctor may be able to monitor your heart rhythm while you are at home. Some doctors like to check (“interrogate”) the ICD every three to six months.

## REMOTE MONITORING

Once you have an ICD, your doctor may be able to monitor your heart rhythm from home, depending on the type of ICD you have. Some ICDs can record your heart rhythm and this data can be transmitted from the ICD to your doctor’s office using a regular telephone line. In this way, your doctor can receive regular updates on your heart rhythm and ICD. If your doctor notices an irregularity, you may be asked to come into the office. However, even with remote monitoring, if you feel that you are having a cardiac episode, you should call 911 or go to the nearest emergency room.

## ID CARD

After you have an ICD implanted, you will be given an identification card that contains your device information. Show this card to any doctor or emergency room staff member so that they are aware of your device and can act accordingly. You can also show this to airport security, if necessary.



## OTHER TREATMENTS

Your health care provider may prescribe treatments in addition to an ICD. These might include:

- Catheter ablation to correct an abnormal electrical pathway or group of electrical cells that may be causing an arrhythmia. During the procedure, a catheter is placed in the heart. Radiofrequency waves (or another form of energy) are then sent through the catheter to eliminate the abnormal electrical pathway.
- Medications, such as ACE inhibitors, beta-blockers, calcium channel blockers, and anti-arrhythmic drugs may be prescribed to help control your heart’s rhythm.

**For additional information on treatment options, please visit [www.HRSonline.org](http://www.HRSonline.org)**

# Coping with SCA

When you have been told you're at high risk of SCA, it's normal to feel sad or down at times. People who've survived SCA can feel this way, too. That's because it can feel like you don't have control. But there are many things that you can do to reduce your risk of SCA. If you feel overwhelmed, try focusing on one day at a time. And don't be afraid to ask others for help when you need it.

## TAKING CONTROL

You may feel better by doing everything you can to control your risk factors for SCA. You can commit to:

- Eating a heart healthy diet. Reduce your fat and salt intake, eat more fruits and vegetables, and limit the amount of alcohol you drink.
- Exercising regularly. If you're worried about physical activity, ask your doctor to create an exercise program for you.
- Taking your medication. Don't skip or miss doses of medication prescribed by your doctor.

## WAYS TO FEEL BETTER

If you're still feeling down after taking control of managing your risk factors, try not to withdraw from family and friends. Even if you are finding it hard to talk with them, they can still be a good source of support. To feel better, you can also:

- Spend time doing things you enjoy. This may include participating in a favorite hobby, meditating, praying, or spending time with people you care about.



- Share what you learn about your condition with the people in your life. Invite family members to join you during appointments with health care providers.
- Think about joining an SCA or ICD support group. It may be easier to talk to people who know firsthand what you're going through. They can offer advice and share stories. You may want to ask loved ones to join you for a meeting.

## ASKING FOR HELP

Consider talking to your health care provider or a therapist if:

- You feel worthless or helpless or are thinking about suicide. These are warning signs of depression. Treatment can help you feel better. When depression is under control, your overall health may also improve.
- You feel anxious about what will happen to you or your loved ones if your health gets worse. Taking care of legal arrangements, such as a living will and durable power of attorney, can help you feel more secure about your and your loved ones' futures. Have an advanced care plan in place.

# Staying Committed

Having a healthier heart takes long-term commitment. Plan small, realistic goals. Tackle them one at a time. Search for information about heart disease and lifestyle changes. And get support from support groups.



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