



# Patient Information

## Artificial Pacemaker Basics

**T**he normal adult heart beats between 50 and 100 times every minute. This rhythm is maintained by the heart's "natural pacemaker"—a cluster of cells, located in the upper right chamber of the heart, called the sinus node. By sending electrical signals to all four of the heart's chambers, the sinus node causes contractions that create the heartbeat and pump blood and oxygen to the rest of the body.

A variety of factors—such as normal aging, medications, damage from a heart attack, and conditions present at birth—can interfere with this process and cause a heartbeat that is too fast, too slow, or irregular. A slow heartbeat, called *bradycardia* (brade-eh-**card**-ee-uh), can prevent the brain and other organs from getting enough blood. This can lead to shortness of breath, fatigue, dizziness, weakness, fainting, and even death.

Fortunately, bradycardia and irregular heartbeat problems often can be corrected with an artificial pacemaker. More than half a million people receive artificial pacemakers every year.

### What is it?

An artificial pacemaker is a small electrical device that is implanted in a person's body to take over the sinus node's job when necessary. It has two parts: a device called a generator and one or two wires called *leads* (**leeds**). The generator, which is usually about 1.5 inches wide and 0.5 inches thick, contains a battery and computer circuits. Like the sinus node, the generator creates electrical

pulses. The leads carry these pulses to the heart in order to adjust the heartbeat rate. Pacemakers with two leads can ensure that the chambers of the heart work together in the best way possible.

Most of today's artificial pacemakers are "rate responsive"—that is, they sense such factors as how quickly a person is moving and breathing, use this information to determine the ideal heartbeat pace, and adjust the heartbeat accordingly.

### How is it implanted?

If you and your doctor decide that you need an artificial pacemaker, the procedure probably will take an hour or two and require you to stay in the hospital for one to three days afterward.

Before the procedure, a doctor will use a needle to inject a local *anesthetic* (an-uhs-**thet**-ik) into the area in your chest where the surgeon will implant the pacemaker. The anesthetic will block pain and minimize discomfort but allow you to remain awake throughout the procedure.

During the implantation, your surgeon will make an incision beneath your collar bone and insert a lead from the pacemaker into one of your veins. He or she will guide this lead through the vein and to your heart with the help of x-ray images. If your pacemaker has two leads, the surgeon will guide each one through the same vein but to different chambers of your heart. One end of each lead will be attached to your heart, and the other end will be attached to the pacemaker's generator. The surgeon will insert the generator under your skin in a position beneath

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your collarbone, and then he or she will stitch up the incision. Before you leave the hospital, a doctor will program your pacemaker with a device that is placed on your skin over the spot where the generator has been implanted.

The entire process carries little risk. In rare cases, however, it can result in complications such as bleeding and infection. Most incisions heal completely within a couple of weeks.

### How is it maintained?

Health care professionals will need to perform routine tests to check how your pacemaker is working and how much energy is left in its battery. (The energy in most pacemaker batteries runs out after five to 10 years, but a low battery can be detected months before it actually fails.) You will need to visit the doctor's office for some pacemaker tests, but more frequent (often monthly) pacemaker tests may be performed over the telephone. During these tests, you use special devices to send information about your pacemaker over the telephone line to technicians in your doctor's office.

When the pacemaker's battery begins to run low, a surgeon will need to replace the generator. Most likely, he or she will detach the leads from the old generator and attach them to a new one through a surgical procedure that is similar to the original implantation.

### How will it change my life?

You should be able to resume your normal lifestyle within a week or so after your pacemaker implantation. In fact, the pacemaker may allow you to engage in more strenuous activity than before by improving your heartbeat and reducing symp-

toms of bradycardia. Full-contact sports might damage your pacemaker, however, and should be avoided.

After you have a pacemaker implanted, you will need to be careful around certain kinds of equipment. As medical treatments and tests—such as magnetic resonance imaging, or MRI—can affect pacemakers, always inform doctors and dentists that you have one. Pacemakers also can be affected by prolonged exposure to hand-held metal detectors, which are sometimes used at airports. By carrying an identification card that provides information about your pacemaker, you can help health care and security professionals avoid harming it.

Welding equipment, high voltage transformers, and motor-generator systems also can cause pacemaker problems, and you should always stand at least two feet away from such equipment. Although a cellular telephone can affect a pacemaker that is less than six inches away, you can avoid this problem by keeping your cell phone out of your breast pocket. Most home appliances, including microwaves, are perfectly safe around pacemakers.

Don't forget that your pacemaker will not protect you from the blood vessel blockages that cause heart disease. Exercise; a heart-healthy diet that is low in saturated fats; and, in many cases, heart medications are as important as ever after you get a pacemaker. ●

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