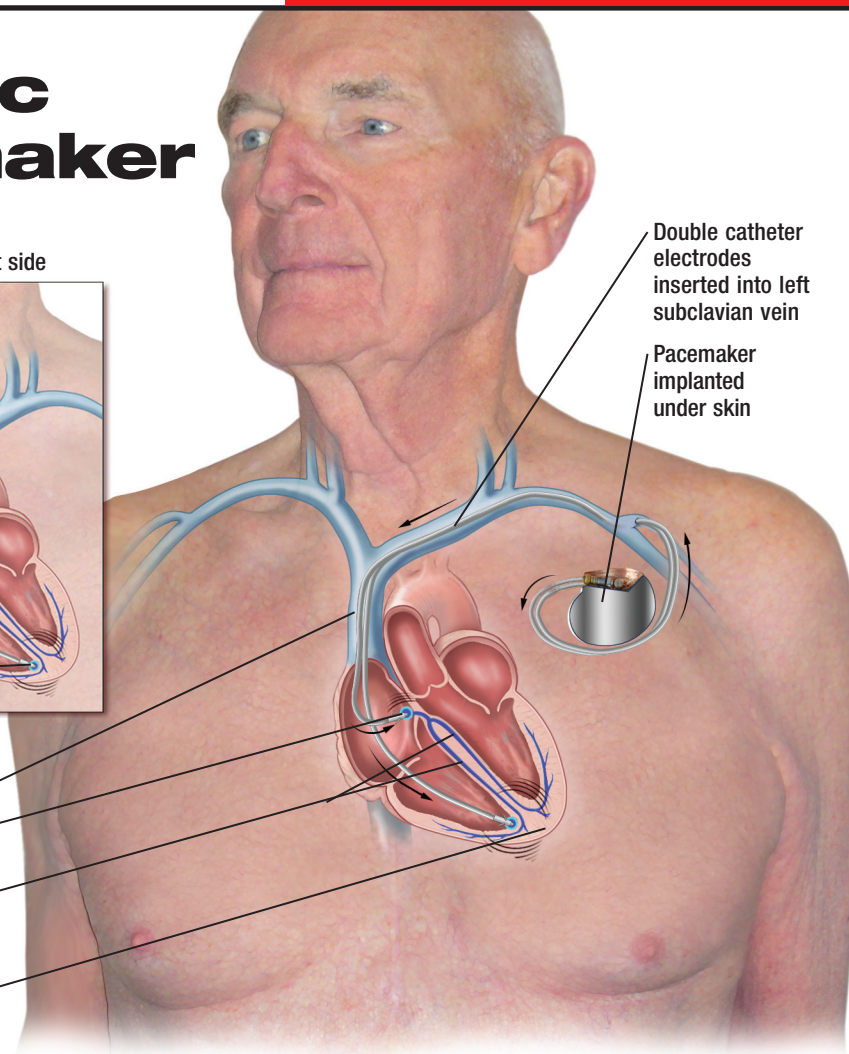
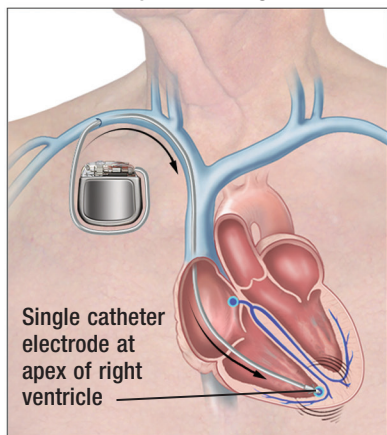


Cardiac Pacemaker

Pacemaker implanted on right side



Superior vena cava

Catheter electrode impacted at atrioventricular node in right atrium

Bundle branches conduct impulses to apex of heart

Apex of heart

Electrical Device That Regulates Heart Rhythm

An artificial cardiac pacemaker is a small, battery-operated device that is implanted under the skin near the heart to help the heart beat at a regular rate and rhythm. Patients with a slow heartbeat, heartbeats that fluctuate in speed, or an electrical blockage usually can benefit from an artificial pacemaker.

The human heart contains two upper chambers (atria) and two lower chambers (ventricles). The heart pumps blood through these chambers during contraction, creating a heartbeat. In the normal heart, the sinoatrial node (a group of cells on the wall of the right atrium) sends an electrical signal to the atria, causing them to contract. The atrial contraction sends blood to the ventricles. The electrical signal moves through the atrioventricular node (a group of cells between the atria and ventricles) to the ventricles, causing them to contract. The contractions must occur in a coordinated manner, at a certain rate and rhythm, to effectively pump blood through the body with each heartbeat. Certain conditions can cause the heart's internal electrical system to fail, resulting in an irregular heartbeat.

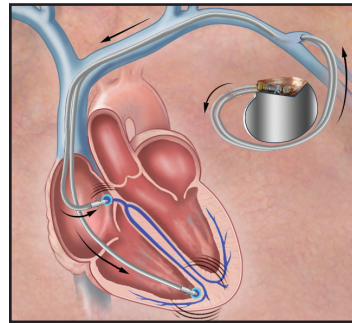
The pacemaker is a sophisticated piece of equipment that senses the rate at which the heart is beating and adjusts it to a predetermined rate by using an electrical signal similar to the heart's natural signal. Some pacemakers are programmed to turn off when a slow heart rate increases to normal, and vice versa. Some pacemakers have sensors that automatically adjust the heart rate to match the patient's activity level.

Patients with an abnormal heart rhythm may have symptoms of fatigue and lightheadedness, or they may have no symptoms at all. In patients who are candidates for a cardiac pacemaker, normal heart rhythm can be restored, making activities of daily living possible once again.

TEAR ALONG PERFORATION

Inform Health Care Professionals That You Have a Pacemaker

Individuals who have an irregular heartbeat and symptoms such as fatigue, fainting, and shortness of breath may benefit from an artificial cardiac pacemaker. Tests performed to determine whether a pacemaker would be helpful may include an electrocardiogram (ECG), a Holter monitor to record the heart's electrical activity over 1 to 2 days, an echocardiogram to assess how well the heart pumps blood, a stress test to determine how well the heart works during exercise, or an electrophysiologic study to check the heart's electrical system.



This device senses the heart's rate and rhythm and transmits an electrical impulse to normalize an abnormal heartbeat.

What Is a Pacemaker and How Does It Work?

An artificial cardiac pacemaker is a small, battery-run, programmable device with one or more lead wires that attach to the heart wall. The lead wires carry signals from the heart to the pacemaker, which determines from the signals when to send electrical impulses to pace the heart.

The device is surgically implanted under the skin, usually near the left side of the chest by the collarbone. Local anesthesia is used during surgery, and the patient is kept overnight to confirm that the equipment is working correctly. The procedure is safe and has few complications. Any mild pain or swelling of the site may be treated with nonprescription pain medications. Patients are instructed to avoid activities such as heavy lifting or strenuous exercise for a few weeks after surgery to prevent the pacemaker or lead wires from dislodging.

The pacemaker senses the heart's rate and rhythm and transmits an electrical impulse to restore the heartbeat to normal. One type of pacemaker, called a *demand pacemaker*, transmits an impulse when the heart beats too slowly or skips a beat, but turns itself off when the heart is beating normally. *Rate-responsive pacemakers* can sense a person's activity level at any given time and adjusts the heart rate accordingly.

Regular Pacemaker Checks Are Important

Once a pacemaker is implanted, it must be checked regularly to be sure it is working properly. One method is to use a programming device that is held over the location of the pacemaker. The programming device can also change the settings on the pacemaker, if necessary. Pacemaker activity also can be checked by telephone with special equipment; however, regular visits to the cardiologist are still necessary.

Pacemaker batteries last up to 15 years before replacement is required. During replacement surgery, the pacemaker is replaced, but the lead wires are usually left in place. Eventually, the lead wires also may need to be replaced.

Avoid Exposure to Certain Equipment

A person with an artificial cardiac pacemaker should avoid close exposure to equipment that can affect its performance. A patient receiving a pacemaker should be given a list of devices to avoid, such as MRI machines, radiation machines for cancer treatment, dental equipment, and generators. Many electronic devices are safe to use around a pacemaker. Currently available cellular phones and MP3 players usually can be used, but they should not be stored in a shirt pocket, and when in use they should be held on the opposite side of the chest at least 6 inches from the pacemaker. This recommendation should be checked with the cardiologist who implanted the pacemaker.

Patients should always tell their doctors, dentists, and health care technicians that they have a pacemaker; they also should carry a card identifying the type of pacemaker implanted.