

Pacemaker implantation

What is a pacemaker?

A small battery-operated device that helps the heart beat in a regular rhythm. There are two parts: a generator and wires (leads).

- The generator is a small battery-powered unit.
- It produces the electrical impulses that stimulate your heart to beat.
- The generator may be implanted under your skin through a small incision.
- The generator is connected to your heart through tiny wires that are implanted at the same time.
- The impulses flow through these leads to your heart and are timed to flow at regular intervals just as impulses from your heart's natural pacemaker would.
- Some pacemakers are external and temporary, not surgically implanted.

[View an animation of a pacemaker.](#)

Why do I need one?

Your doctor may recommend a pacemaker to make your heart beat more regularly if:

- Your heartbeat is too slow and often irregular.
- Your heartbeat is sometimes normal and sometimes too fast or too slow.

How does it work?

It replaces the heart's defective natural pacemaker functions.

- The sinoatrial (SA) node or sinus node is the heart's natural pacemaker. It's a small mass of specialized cells in the top of the right atrium (upper chamber of the heart). It produces the electrical impulses that cause your heart to beat.
- A chamber of the heart contracts when an electrical impulse or signal moves across it. For the heart to beat properly, the signal must travel down a specific path to reach the ventricles (the heart's lower chambers).
- When the heart's natural pacemaker is defective, the heartbeat may be too fast, too slow or irregular.
- Rhythm problems also can occur because of a blockage of your heart's electrical pathways.
- The pacemaker's pulse generator sends electrical impulses to the heart to help it pump properly. An electrode is placed next to the heart wall and small electrical charges travel through the wire to the heart.
- Most pacemakers have a sensing mode that inhibits the pacemaker from sending impulses when the heartbeat is above a certain level. It allows the pacemaker to fire when the heartbeat is too slow. These are called demand pacemakers.

Living With Your Pacemaker

If you're living with an arrhythmia (erratic heartbeat), your doctor may have recommended a [pacemaker](#) to regulate your heart rate.

You should also do your part to help your pacemaker control your heart rate. For example, if medications are a part of your treatment plan, be sure to take them as prescribed. Medications for arrhythmia work with your pacemaker and help to regulate your heartbeat.

It's also good to keep records of what medications you take and when you take them. [Download a printable medication tracker.](#)

Early on with your pacemaker

After you have your pacemaker implanted, your doctor will go over detailed restrictions and precautions. Make sure that you and your caregiver fully understand these instructions. Don't be afraid to ask questions.

Before you leave the hospital, be sure to understand your pacemaker's programmed lower and upper heart rate. Talk to your doctor about the maximum acceptable heart rate above your pacemaker rate. Other considerations include:

- Allow about eight weeks for your pacemaker to settle firmly in place. During this time, try to avoid sudden movements that would cause your arm to pull away from your body.
- Avoid causing pressure where your pacemaker was implanted. Women may want to wear a small pad over the incision to protect from their bra strap.
- Relatively soon after your surgery, you may be able to perform all normal activities for a person of your age. Ask your doctor about how and when to increase activity.

Getting on with your life

Soon after your surgery, you may hardly think about your pacemaker as you go about your day. Just be sure to remember your doctor's recommendations about daily activities. Bear in mind:

- Be physically active. Try to do what you enjoy – or what you feel up to – each day. Take a short walk, or simply move your arms and legs to aid blood circulation.
- Don't overdo it. Quit before you get tired. The right amount of activity should make you feel better, not worse.
- Feel free to take baths and showers. Your pacemaker is completely protected against contact with water.
- Car, train or airplane trips should pose no danger.
- Stay away from magnets and strong electrical fields. Learn more about how [devices can interfere with ICDs and pacemakers](#).
- Tell your other doctors, dentists, nurses, medical technicians and hospital staff members that you have a pacemaker.
- People with pacemakers can continue their usual sexual activity.
- Remember your pacemaker when you arrive at the airport or other public places with security screening. Metal detectors won't damage your pacemaker, but they may detect the metal in your device. **At the airport, let the TSA agent know that you have a pacemaker.** You may need to undergo a separate security procedure, such as screening with a hand wand.

Download a free [pacemaker wallet ID card](#). Showing it to personnel at places with metal detectors or other security screening devices may save you some inconvenience.

Checking in on your device

Modern pacemakers are built to last. Still, your pacemaker should be checked periodically to assess the battery and find out how the wires are working. Be sure to keep your pacemaker checkup appointments. At such appointments:

- Your doctor will make sure your medications are working and that you're taking them properly.
- You can ask questions and voice any concerns you may have about living with your pacemaker. Make sure you and your caregiver understand what your doctor says. It's a good idea to take notes.
- Your doctor will use a special analyzer to reveal the battery's strength. This diagnostic tool can reveal a weak battery before you notice any changes.

Eventually, the battery may need to be replaced in a surgical procedure. This replacement procedure is less involved than the original surgery to implant the pacemaker. Your doctor can tell you about the procedure when the time comes.

Maintain awareness

Your doctor may recommend that you take and record your pulse often to gauge your heart rate. This allows both of you to compare your heart rate to your acceptable range to determine if your pacemaker is working effectively.

When taking your pulse at home, follow your doctor's instructions about when to get in touch. In general, there's no reason to contact your doctor unless:

- Your heart is beating faster than 100 beats per minute.
- Your heart rate suddenly drops below the accepted rate.
- Your heart rate increases dramatically.
- Your pulse is rapid and irregular (above 120 beats per minute) and your pacemaker is programmed for a fast-slow type of heartbeat.
- You notice a sudden slowing of your heart rate.

Don't worry if your heart is beating close to or within the intended heart rate, but has an occasional irregularity. It likely just means that your heart's natural pacemaker is competing with the signals emitted by the artificial pacemaker. This occurs infrequently, but it's normal.

Other causes for concern

Contact your doctor immediately if:

- You have difficulty breathing.
- You begin to gain weight and your legs and ankles swell.
- You faint or have dizzy spells.

Carry a pacemaker ID card

Carry a card that alerts healthcare workers in case you're unable to tell them about your pacemaker. Keep it in your wallet, purse or phone case so that it's always with you. Download a printable [pacemaker wallet ID card](#).

In case of an accident, emergency personnel need to know that you have a pacemaker implanted. For example, medical personnel should know about your pacemaker before ordering diagnostics involving an MRI, which is among the devices that may interfere with your pacemaker.

You can also consider an ID bracelet or necklace for added security and convenience.

Devices that May Interfere with ICDs and Pacemakers

Several types of devices and machinery may interfere with [implantable cardioverter defibrillators](#) (ICDs) and [pacemakers](#).

The electromagnetic waves generated by such devices can keep your ICD or pacemaker from functioning properly. Try to avoid them, or at least minimize your exposure to them.

Your doctor can advise you about specific devices and machinery to avoid. But, in general, the following can cause interference:

Anti-theft systems (also called electronic article surveillance or EAS)

Interactions with EAS systems, such as those found at department stores, are unlikely to cause clinically significant symptoms in most patients.

- Don't linger near an EAS system longer than is necessary.
- Be aware that EAS systems are often hidden or camouflaged near the exits for businesses such as retailers.

- Don't lean against the system's sensors.

Metal detectors for security

Interactions with metal detectors are unlikely to cause clinically significant symptoms in most patients.

- Don't stand near the metal detector any longer than is necessary.
- Don't lean against the structure of the system.
- If scanning with a handheld metal detector is necessary, tell the security personnel that you have an ICD or pacemaker, and request an alternative form of inspection, such as a pat down. If they insist on using a handheld metal detector, ask them not to hold the wand near your device any longer than is absolutely necessary.

See the [Transportation Security Administration \(TSA\) advisory page](#)(link opens in new window) for those traveling with implanted devices.

Cell phones

Wireless transmissions from the antennae of phones available in the United States are a very small risk to ICDs and even less of a risk for pacemakers.

- Technology is rapidly changing as the Federal Communications Commission (FCC) makes new wireless frequencies available.
- Newer cellphones using these new frequencies might make ICDs and pacemakers less reliable. The wireless industry is investigating that possibility.
- Keep your cell phone at least six inches away from your ICD or pacemaker by using it on the ear opposite where your device was implanted. Avoid keeping your cell phone in your front chest pocket.
- Keep walkie-talkies (operating on three watts or less) at least six inches away from your ICD or pacemaker implantation site.
- Bluetooth® headsets don't appear to interfere with ICDs or pacemakers.

MP3 players/headphones

MP3 players, such as an iPod®, don't pose a risk to ICDs or pacemakers. However, the headphones used with MP3 players can interfere with both devices. Most MP3 headphones contain a magnetic material that can interfere with ICDs and pacemakers. Both earbud and clip-on headphones can cause interference. So, bear in mind:

- Keep headphones at least six inches away from your ICD or pacemaker.
- Don't allow someone wearing headphones to rest his or her head on your chest.
- Don't place headphones in your breast pocket.
- Don't drape headphones around your neck so that they hang on your chest.

Radios

Citizen's band (or CB) radios and amateur "ham" radios pose little or no risk to pacemakers. But they can affect how an ICD performs.

- CB radios or ham radios under three watts should be kept at least six inches away from your ICD.
- CB and ham radios operating on three-15 watts should be kept at least 12 inches from your ICD.
- CB and ham radios operating on 15-30 watts should be kept at least two feet from your device.

Power-generating equipment, arc welding equipment and jumper cables

Follow your doctor's instructions about being around such equipment. In general, stay at least two feet away.

Magnets

Magnetic fields in magnets in devices and machinery can inhibit pulse generators for ICDs and pacemakers. In ICDs in particular, magnets can activate a switch prohibiting the ICD from delivering vital signals such as lifesaving shocks.

If you have an ICD or pacemaker, avoid close or prolonged contact with magnets or their magnetic fields. Keep magnets at least six inches from where your device is implanted.

Of course, you may not always know if you have come into proximity with machinery that employs a magnet. It's best to err on the safe side: If you feel any interference, move away from the source, or turn it off if possible.

Avoid magnet therapy that may call for you to wear magnetic bracelets or necklaces near your implantation site. Also avoid magnetic mattress pads or magnetic pillows; both may interfere with your ICD or pacemaker.

Ab stimulators and electronic body fat scales

Both devices likely interfere with an ICD or pacemaker. So avoid them if you have an implanted device.

Gas-powered equipment and gasoline ignition systems

Components within the ignition systems of gas-powered engines can cause interference in some cases. If you have an ICD, stay at least 12 inches away from the ignition system of a vehicle or other gas-powered equipment.

This does not prohibit you from using a key to start a car – the ignition components are far enough away from the car's front seats. Discuss with your doctor when it's appropriate for you to drive again after ICD or pacemaker surgery.

Portable car battery chargers

If you use such a charger, keep the components at least 12 inches away from where your device is implanted.

Electric fences and electrical pet containment systems

The electromagnetic fields used by such systems can disrupt ICDs and pacemakers. The risk increases with proximity to the signals and the length of time spent near them. Avoid or limit your exposure to such systems.

Also avoid or limit your exposure to transformer boxes. The electromagnetic field emanating from them can interfere with ICDs and pacemakers.

Medical Alert Systems and Fall Detection Pendants

It's a good idea to contact customer support of your medical alert system provider to see if their product might pose a risk to your pacemaker or ICD.

Medical procedures that may pose a risk

Some medical, diagnostic and cosmetic procedures may interfere with the operation of your ICD or pacemaker. The following are of particular concern:

Extracorporeal shock-wave lithotripsy (ESWL)

The noninvasive treatment uses hydraulic shocks to dissolve kidney stones. **If you have an ICD,**

avoid ESWL.

Many pacemaker patients may be eligible for ESWL, provided the pacemaker is evaluated and reprogrammed after treatment. After ESWL, those with pacemakers will need to follow up with their doctor over several months to ensure that the pacemaker continues to work properly.

Patients with certain kinds of pacemakers implanted in the abdomen should avoid ESWL. Before considering ESWL, discuss the procedure with your doctor, including the implications for your implanted device.

Magnetic resonance imaging (MRI)

[Magnetic resonance imaging](#) is a noninvasive diagnostic tool that uses a powerful magnet to produce images of internal organs and functions.

ICDs and pacemakers contain metal, and therefore are not normally allowed near MRI machines. The strong magnetic field can interfere with the function of implanted devices.

Still, some types of implanted devices don't preclude MRIs. Or the benefits for the MRI may outweigh the risks. As always, talk with your doctor about the specific considerations for your particular implanted device.

Always let imaging technicians, such as those supervising an MRI, know about your implanted device.

Radiofrequency ablation (RFA) or microwave ablation

Both [ablation procedures](#) are used to treat arrhythmias. Both use a long, thin tube called a catheter to eliminate abnormal electrical signals in the heart by administering energy to a specific part of the heart tissue.

If you have an ICD, you should consult with your doctor about the risks of ablation. The procedure may require special precautions for ICD patients.

Often, ablation is performed before a pacemaker is implanted. If an ablation procedure is warranted even though you already have a pacemaker, your doctor may evaluate and reprogram your pacemaker after the procedure. The radio frequencies used during ablation may alter your pacemaker's function. Studies have shown that most implanted pacemakers are not adversely affected.

High-frequency, short-wave or microwave diathermy

This medical procedure uses high-frequency, high-intensity electromagnetic waves for physical therapy. **Such therapy is not recommended for those with an ICD or pacemaker.**

The electromagnetic waves used in diathermy may interfere with either device's pulse generator. This can permanently damage your implanted device.

Therapeutic radiation

Used for cancer treatment, for example, this can damage the circuitry of ICDs and pacemakers. The degree of damage is unpredictable – and may vary with different systems – but the risk builds with increased radiation.

ICDs have been shown to be more sensitive to radiation therapy interference than pacemakers. If you have an ICD and therapeutic radiation is still warranted, your implanted ICD should be

shielded from the radiation as much as possible. Your ICD may need to be relocated if it lies directly in the targeted radiation field.

Transcutaneous electrical nerve stimulation (TENS)

This procedure uses electrical signals to relieve acute or chronic pain by placing a medical device with electrodes on the skin and connecting it to a pulse generator.

If you have an ICD, TENS treatment may be acceptable, provided certain precautions are taken. TENS interferes with some types of ICDs, but not with others. Note: TENS is not recommended for use on the torso.

When it comes to pacemakers, most studies have shown that TENS rarely inhibits bipolar pacing. TENS may sometimes briefly interfere with unipolar pacing, but this can be addressed by reprogramming the pulse generator.

CT and CAT Scans

Specialized diagnostic X-rays called computed tomography (CT scan) or computed axial tomography (CAT scan) provide multiple images of areas inside the body. Some CT or CAT scanning devices may interfere with ICDs. Before having a CT or CAT scan, discuss precautions and considerations beforehand with your doctor and the imaging technician.

X-rays, such as those used in CT or CAT scans, don't appear to interfere with pacemakers. Still, always alert the imaging technicians that you have a pacemaker implanted before undergoing a CT or CAT scan.

Electrocauterization

This procedure stops bleeding during surgery. If you have an ICD, you and your doctor should carefully weigh the benefits and risks. The procedure may be acceptable if certain precautions are taken.

Electrolysis

This procedure removes unwanted body hair.

If you have an ICD, your doctor may recommend special precautions before undergoing electrolysis. Your device manufacturer may also provide recommendations that are important to follow.

ICD patients should be prepared to provide a note from their physician before electrolysis can be performed.

Devices that pose little or no risk

In general, consumer appliances and electronics don't affect the performance of ICDs and pacemakers. On rare occasions, some of these devices may inhibit pacemakers by a single beat. But the pacemaker's regular signals are quickly restored.

Even though these devices may pose little risk, still strive to keep all motors and antennae at least six inches away from your ICD or pacemaker.

Household appliances and electronics

- Electric shavers
- Electric blankets
- Heating pads

- E-readers
- Electronic tablets
- Microwave ovens
- Kitchen appliances, such as mixers, blenders, toasters and coffeemakers
- Ionized air filters
- Computers
- AM/FM radios
- CD/DVD/VHS players and recorders
- TV transmitters and remotes
- Home wireless devices, such as modems, routers and headsets
- Video game wireless controllers
- TV and stereo speakers
- Bluetooth® wireless technology, including headsets
- Hair dryers
- Irons
- Hand-held back massagers
- Electronic weight scales

Garage, shop and lawn equipment

- Garage door openers
- Hedge trimmers
- Weed trimmers
- Leaf blowers
- Electric lawn mowers
- Electric drills (including cordless drills)
- Power saws, routers and sanders
- Laser levels
- Stud finders
- Light metalworking tools (including soldering irons)
- Keyless entry car remotes
- Battery-powered flashlights
- Metal detectors for recreational use
- GPS devices
- Radio-controlled toys and devices

Office machinery and electronics

- Computers
- Printers and scanners
- Photocopiers
- Security badge scanners

Other devices with little risk

- Salon-style hair dryers
- Tanning beds
- Hot tubs
- Casino slot machines
- Massage chairs and massage pads
- Low voltage power lines (often found in residential areas)

Medical procedures that pose limited risk

Several medical procedures are permissible for those with ICDs or pacemakers. Still, be sure to discuss any possible risks with your doctor before undergoing such treatments.

In general, the following pose limited risk if precautions have been taken:

- Heart rate monitor
- [Electrocardiogram](#) (EKG or ECG)
- [Echocardiogram](#)
- Acupuncture, with or without electrical stimulus
- Ultrasound diagnostic imaging
- Hyperbaric oxygen therapy
- External defibrillation including use of AEDs
- Stereotaxis®
- Dental ultrasonic scalers, cleaners and drills (Note: Some patients may feel a pacing increase during dental drilling.)
- Diagnostic radiation (such as screening X-rays and mammography)
- Electroconvulsive therapy (such as used for certain mental disorders)
- Pills swallowed for video endoscopy
- Laser surgery
- Pet Emission Tomography (PET scans)
- Bone density tests using x-rays, as well as ultrasounds on the heel or hand
- Devices designed to treat sleep apnea

Carry your wallet ID card

If you have an ICD or pacemaker, always carry a wallet ID that will alert emergency personnel about your device in case you're incapacitated.

- Download a free [ICD wallet ID card](#)
- Download a free [pacemaker wallet ID card](#)

Always tell healthcare professionals, including dentists and diagnostic imaging technicians, that you have an implanted device. Also make the on-site nurse or doctor at your place of work aware that you have an ICD or pacemaker.