CHOOSING YOUR PACEMAKER
If you’ve been told that you need a pacemaker, you’ll probably want to learn a little more about them. Educating yourself is a good place to start. This guide reviews what pacemakers do, how pacemakers work, and some key pacemaker functions to consider before choosing your implant. Getting involved in decision-making about your pacemaker begins with knowing that you have a choice of many different devices on the market. Learning about their different functions and capabilities will help you find the pacemaker that best fits your lifestyle.

A Pacemaker is Your Decision Too

Many patients are hesitant to ask questions, request specific devices, or treatment. It’s a common misconception among patients that their doctor is in the best position to make decisions about their care. But doctors and healthcare providers are actually encouraging their patients to take a more active role in their care. Recently the American College of Cardiology, the American Heart Association, and the Heart Rhythm Society issued guidelines stressing the importance of talking with patients about their preferences when considering treatment options, having a detailed review of the benefits and risks of each treatment option, and shared decision making.⁠¹ A major goal of the health care system is to be “respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions.”⁠²

There are benefits to participating in decisions about your treatment. Evidence shows that patients who are actively involved in their care experience better health outcomes and incur lower costs.⁠³ You are in the best position to know the life you have lived before and the life you want for yourself after having a pacemaker implanted. Being an active partner in decisions about your care will help you and your doctor to better plan your treatment. Talk with your doctor about your family health history, activities, and hobbies. This will ensure that you will be able to return to the quality of life that you enjoyed before having the implant.

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What Does a Pacemaker Do?

If you've been diagnosed with bradycardia, it means your heart is beating too slowly—less than 60 times a minute—or irregularly. If you’re reading this guide, your doctor has likely recommended a pacemaker to restore your heart to its normal rhythm. A pacemaker is designed to keep your heart beating fast enough and in the right rhythm so it can efficiently pump blood through your body. The main purpose of a pacemaker is to help your heart function just like a healthy heart.

A pacemaker helps your heart function just like a healthy heart by making sure it beats fast enough and in the right rhythm.

How Does a Pacemaker Work?

A pacemaker is just one part of an entire pacing system. That system includes the pacemaker—a small pulse generator with a microcircuit computer and a special battery—and one or more thin, insulated wires called leads. Pacemakers weigh about an ounce and can fit easily in the palm of your hand. The lead transmits signals from the heart to the pacemaker and back again. When it detects that the heart is not beating normally, the pacemaker will then send a small electrical signal through the lead, causing the heart to contract. Pacemakers deliver small amounts of electricity. The battery in a pacemaker can last from five to ten years.

There are several types of pacemakers:

- A single chamber pacemaker has a single lead placed in one chamber of the heart.
- A dual chamber pacemaker has two leads, one in the right atrium and one in the right ventricle.
- A triple chamber pacemaker—also called a biventricular pacemaker—has three leads: one in the right atrium, one in the right ventricle, and one in the left ventricle. The triple chamber pacemaker is used for cardiac resynchronization therapy (CRT).
- Rate-responsive pacemakers have sensors that automatically adjust to your activity level.
- There are pacemakers that are FDA-cleared for magnetic resonance imaging (MRI).
How Is a Pacemaker Implanted?

The procedure to implant a pacemaker is performed under local anesthesia. A small 2-inch long incision will be made by your collarbone near the shoulder. The lead(s) will be guided into the vein leading to the heart. The doctor will connect the lead(s) to the pacemaker, which is inserted under your skin. The incision will be closed and the pacemaker will be tested to make sure it is working properly. The surgery to insert a pacemaker can be same-day surgery or might require an overnight stay. Patients usually go home within 24 hours of the procedure. After pacemaker surgery, you might experience redness, swelling, or soreness at the incision site. Limit movement of your arm and avoid heavy lifting so you don’t disturb the implantation site. Try to avoid any quick or sudden movements that might dislodge the leads. Your doctor will have a list of activities that you should avoid after your procedure. There might be a small lump under the skin where the pacemaker is located, so avoid wearing tight clothing that could rub or irritate the skin at the implant site. Carefully follow your doctor’s instructions and keep your incision clean and dry.

As with any operation, it may take a few weeks before you can get back to your normal daily activities. An identification card with your name, your doctor’s name and phone number, and information regarding your device will be given to you. Keep it with you so you can show it to medical, dental, or security personnel. Having an implanted device like a pacemaker means you will need to avoid strong magnetic fields that can affect the proper functioning of your device.

Whether you love gardening, taking your grandchildren to theme parks, dancing, or playing golf, you can find a pacemaker that will keep your heart healthy for the activities you enjoy.

Key Pacemaker Functions

Not all pacemakers are the same. Pacemakers come with different types of sensor technology and programming capabilities. There are also pacemakers that are FDA-cleared for magnetic resonance imaging (MRI). Learning about some key functions will help you find a pacemaker that will let you return to the activities you enjoy. Taking time to consider the functions you need in a pacemaker will give you confidence that it will work effectively for your unique lifestyle. Whether you love gardening, taking your grandchildren to theme parks, dancing, or playing golf, you can find the right pacemaker to keep your heart healthy for the activities you enjoy.
Taking time to consider the functions you need in a pacemaker will give you the confidence that it will work effectively for your unique lifestyle.

Pacemaker Programming
Pacemakers are programmable so your doctor can adjust the pacemaker to your specific condition. Modern pacemakers have many settings and features that let your doctor fine-tune its response to meet your exact needs. The pacemaker programmer is kept in the hospital or clinic and lets your doctor program, reprogram, and test your device.

Types of Pacing
Pacemakers can be programmed to work continuously or only when your heart needs pacing. After the decision to implant a pacemaker has been made, the next most important step is choosing the pacing mode because it will primarily determine the clinical outcome.¹

Demand Pacing Pacemakers can be programmed to work only when your heart needs pacing. If your heart is beating properly, the pacemaker remains on standby; it only sends electrical signals to your heart when needed. All pacemakers today are capable of demand pacing.

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Rate Responsive/ Rate Adaptive Pacing Some pacemakers have rate responsive or rate adaptive sensors, which automatically adjust based on your activity level. Fixed-rate pacemakers can’t ensure an adequate heartbeat when your activity level varies,² but rate adaptive pacemakers can. They can sense when your heart rate should increase (ex: when you’re active or exercising) and when your heart rate should decrease (ex: like when you’re asleep) and will make rate adjustments automatically.

Sensors that automatically monitor pacemaker patients have many benefits:

- Increased patient safety
- Improved quality of life
- Increased battery longevity
- Cost effectiveness
Sensor Types
Sensors that automatically monitor pacemaker patients have many benefits including increased patient safety, improved quality of life, increased battery longevity, and cost effectiveness. Each pacemaker manufacturer utilizes different types of sensors for rate responsive pacing. There are two pacemaker sensor categories: 1) those that measure movement or activity; and 2) those that measure physiological response like changes in the heart muscle, breathing, body temperature, or oxygen levels. There are also pacemakers that combine activity and breathing, called blended sensors. Talk with your doctor about the different sensor types available and work together to determine which pacemaker sensor will best match your activity and exercise routine.

Sensors in Adaptive Pacemaker Systems

<table>
<thead>
<tr>
<th>What Is Measured</th>
<th>Response Speed</th>
<th>Sensor Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Movement</td>
<td>Fast</td>
<td>High</td>
</tr>
<tr>
<td>Heart Rate (QT interval)</td>
<td>Fast</td>
<td>High</td>
</tr>
<tr>
<td>Respiratory Rate (Breathing)</td>
<td>Moderate</td>
<td>High</td>
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Closed Loop Stimulation (CLS) is the latest in sensor technology and provides a greater sensitivity to information coming from your autonomic nervous system. It is one of the most advanced physiologic rate regulation sensors. CLS is a unique heart rate response feature that reacts to your body’s response to acute mental stress. The unique algorithm is able to adjust the heart’s response just like a healthy sinus node would. This type of sensor adjusts when your heart rate accelerates and blood pressure rises—when you are surprised, frightened, or experiencing mental stress. Since every patient has different exercise tolerances and various degrees of cardiovascular disease, it is important that the device be able to adjust to each unique patient. If you enjoy amusement parks, or are prone to mental stress, a pacemaker with CLS capability would be something to consider.

Talk with your doctor about the different sensor types available and work together to determine which pacemaker will best match your activities, stress level, and exercise routine.
Pacemaker Monitoring

Another important function to consider when choosing your pacemaker is its monitoring system. Pacemakers come with a monitor that can transmit data from the pacemaker to your physician. The monitor allows your doctor to assess your condition during regular office visits (in-office) or remotely with a remote monitoring system. The process of checking your pacemaker is called an “interrogation.” This process transmits information on battery life, lead function, and medical data on your condition.

In-office monitoring During in-office monitoring or interrogation, a programming tool is placed on your chest (you don’t have to remove your clothing) to collect information that will tell your doctor if you’ve had any irregular heart rhythms or if any electrical pulses were delivered.

Remote monitoring Pacemakers with remote monitoring use remote, wireless technology or analog landlines and transmitters to deliver information to your doctor by e-mail, fax, or phone. Your doctor can receive alerts and information on arrhythmia events, battery status, and the condition of the leads from practically any location as long as there is access to wireless or landline technology.

Using Transmitters Remote monitoring transmitters can be used at home. It can be placed on your nightstand while you sleep. This lets your doctor receive cardiac data and information on changes in your heart rhythm. If you like to travel, you’ll want a pacemaker that has remote monitoring capability that will let your doctor monitor your pacemaker even when you are out of town. Remote monitoring is not available in all pacemakers and may work differently in different pacemakers. Make sure you talk with your doctor about where you will want to take your pacemaker so you can review the remote monitoring capability of different pacemakers.

Remote monitoring can send data and information on:

- How often the pacemaker has paced your heart
- How well the leads are functioning
- Increased rates in response to exercise or activity
- Abnormal heart rhythms such as atrial fibrillation
- Voltage delivered for pacing
- Battery life
- How well your pacemaker is working
MR Conditional Pacemakers

Why should you think about magnetic resonance imaging (MRI) if you are a candidate for a pacemaker? A survey conducted by the National Council on Aging reported that after the age of 65, your chance of needing medical imaging such as MRI doubles. In addition, the survey found that patients with pacemakers are 50-75 percent more likely to need an MRI exam. MRI is used to evaluate the health of tissue, organs, spine, and joints. It can help your doctor detect the presence of disease, make a diagnosis, and determine treatment plans. If you have arthritis, hand, wrist, shoulder, elbow, hip, knee, or other joint pain, or have a family cancer history, you may be a candidate for an MRI.

Many pacemakers are not approved by the Food and Drug Administration (FDA) for MRI scans. Today, there are pacemakers available that are MR conditional. Patients must wait six weeks post-implant of the pacemaker before getting an MRI. If you feel you might need an MRI in the future, talk with your doctor about an MR conditional pacemaker. Another important consideration is the cost: If you choose a pacemaker that is not FDA-cleared for MRI, your future MRI scan may not be covered by Medicare, for example.

An estimated 50-75% of patients who currently have an implantable cardiac electronic device will need magnetic resonance imaging (MRI) during their lifetime.

There are many reasons why you might need an MRI in the future, those include:

- Sports-Related or Soft Tissue Injuries
- Chronic Back Pain
- Kidney Stones
- Joint Pain or Rheumatoid Arthritis
- A Family Cancer History: Breast, Colon, Pancreatic, etc.
- Radiation Therapy
- Cardiac Ablation Therapy
Conclusion

If you need a pacemaker, you will be joining the millions of people around the world who have a pacemaker. Pacemakers are well-proven devices that have been around for decades. There may be special restrictions or considerations for pacemaker patients, but in general, pacemakers will restore your overall health and condition and may allow you to resume many of your prior activities.

By doing your homework and understanding the different pacemaker devices and functions available, you will be able to have detailed discussion with your doctor about what is important to you. Taking an active role in your choice of pacemakers will ensure that your device will meet your daily needs and activities.

My Heart Club is an educational website dedicated to helping patients make informed decisions about their treatment for irregular or abnormal heart rhythms. Our mission is to be a trusted resource for those who want to know more about arrhythmia - what it is, how it’s diagnosed, and what treatment options are available to treat it.

Sources

1 2015 ACC/AHA/HRS Guideline for the Management of Adult Patients With Supraventricular Tachycardia
2 Crossing the Quality Chasm: A New Health System for the 21st Century, 2001 Institute of Medicine report
3 Health Affairs Health Policy Briefs 2/14/13
7 Ibid.
Questions about your pacemaker or ICD? Get the answers at

myheartclub.com