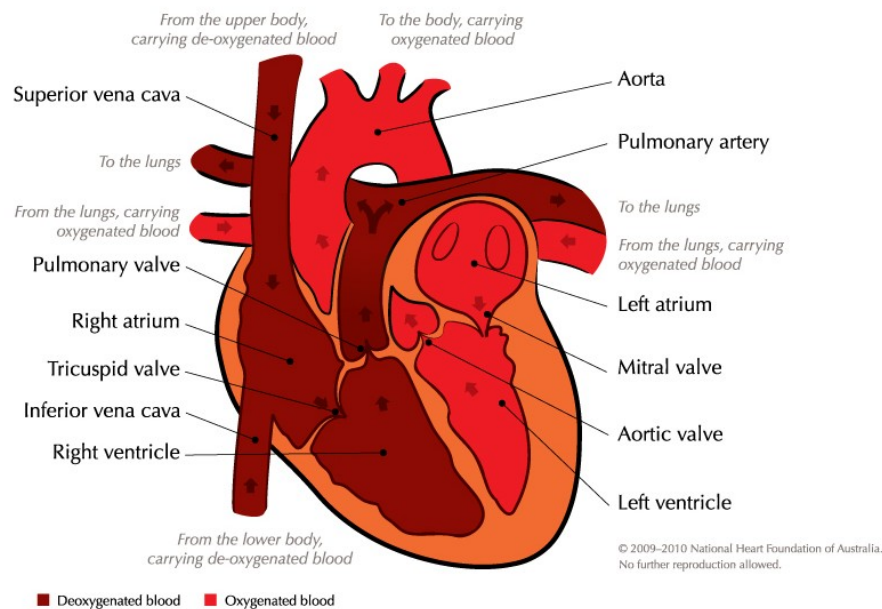


Artificial heart pacemakers

Your heart is a muscle that pumps blood around your body. It has four chambers:

- the left and right atria (blood receiving chambers)
- the left and right ventricles (the blood pumping chambers).

The left ventricle (left heart) pumps blood into the aorta and through to your body. The right ventricle (right heart) pumps blood into the pulmonary artery and through to your lungs.



In a normal heart, the atria contract (squeeze) first, pushing blood into the ventricles. The ventricles then contract, pumping the blood out through the pulmonary artery to your lungs and out through to the aorta to the rest of your body. This process repeats with each heartbeat, usually around 60 to 100 times every minute.

Normally, the contraction of the atria is set off by tiny electrical signals that come from your heart's 'natural pacemaker' – a small area of your heart called the 'sinus node' that is located in the top of the right atrium. These signals travel rapidly throughout the atria to ensure that all the muscle fibres contract at the same time, pushing blood into the ventricles.

These same electrical signals are passed on to the ventricles, via the atrioventricular (AV) node. This causes the ventricles to contract a short time later, after they have been filled with blood from the atria.

Sometimes your heart's electrical system might not work properly, so your heart beats abnormally. If your heart's ventricles are beating too slowly, you might need an artificial heart pacemaker to make it beat regularly again, so enough blood flows around your body.

What is an artificial pacemaker?

An artificial pacemaker is a small device that is put just under the skin of your chest (below your collar bone) to help your heart muscle pump blood regularly. Like your heart's own electrical system, it uses small electrical currents to stimulate your heart muscle to make it contract. An artificial pacemaker will not be rejected by your body.

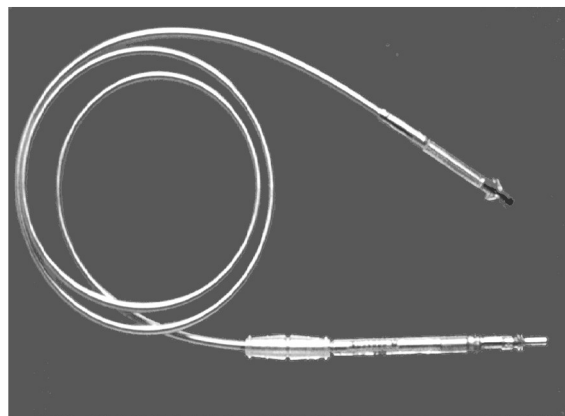
An artificial pacemaker has a 'pulse generator' and one or more leads.

The pulse generator is a tiny, sophisticated computer powered by a very reliable lithium battery (the type of battery used in cameras and watches). A pulse generator lasts many years and is about the size of a 50 cent piece.

The leads connect the pulse generator to the inner wall (or sometimes the outer surface) of your heart. Each lead is made of a metal coil covered by soft plastic insulating material, with small metal electrodes that attach to your heart.



Pulse generator



Lead

There are three types of artificial pacemakers.

- **Single chamber pacemakers** set the 'pace' of only one of your heart's chambers, usually the left ventricle, and need just one lead.
- **Dual chamber pacemakers** set the 'pace' of two of your heart's chambers and need two leads. These are more sophisticated and use information about the electrical activity of the atria to set the ventricles' pumping rate. Dual chamber pacemakers are ideal if you have 'heart block' (when electrical signals can't get through to your ventricles), but are not suitable for everyone.
- **Biventricular pacemakers** use three leads, one in the right atrium (one of the top pumping chambers in your heart) and one in each of the ventricles (left and right). Biventricular pacemakers are a newer type of pacemaker and are complex devices.

Do I need an artificial pacemaker?

Certain diseases or conditions may damage your heart's electrical system, causing your heart to beat too slowly ('bradycardia') or too quickly ('tachycardia'). If you have bradycardia or tachycardia, you may need an artificial pacemaker to help your heart to beat normally.

An artificial pacemaker may also help your heart to beat normally if you have heart block or 'sick sinus syndrome' (when the sinus node or atria are damaged, making your heart beat too slowly during physical activity). These are degenerative diseases that you may develop when you get older, but are rare before 70 years of age.

You may need a biventricular pacemaker if your heart pumps very poorly but not necessarily slowly, such as with heart failure. A biventricular pacemaker helps your heart muscle to contract in the right order at the right time. This helps it to beat more efficiently and reduces heart failure.

How does an artificial pacemaker work?

A pacemaker delivers a small amount of electricity into your heart's atrium or ventricle. This makes your heart contract and pump blood around your body at a particular rate. You don't feel the electrical impulses.

An artificial pacemaker's lead and pulse generator can also be used to 'sense' your heart's natural rhythm. If your heart is beating normally by itself, the artificial pacemaker will switch off and let your heart's natural pacemaker work. It will turn back on when it senses your heart is no longer beating normally.

What happens when the pacemaker is put into my body?

You can have an operation to put an artificial pacemaker into your chest, but usually it will be put into your chest while you are in a cardiac catheterisation laboratory ('cath lab').

You will be given local anaesthetic and sedated before the procedure. A small incision will be made under your collar bone and the lead of the artificial pacemaker will be threaded through one of your veins to the right ventricle of your heart. Your cardiologist will use an X-ray to help them to find the right place to connect the lead to your heart. The lead will be attached to your heart with fine soft plastic hooks or a small metal screw. It takes about one hour to put a single chamber pacemaker into your body.

If you need a biventricular pacemaker, your cardiologist will attach a second lead to the left ventricle of your heart. This is a more complex procedure and can take another hour or two.

Your cardiologist will connect the lead(s) to the pulse generator, which is hidden under your skin.

You might feel uncomfortable just after the procedure. After a day in hospital, you should be well enough to go home.

If you have any questions about the procedure, or feel pain or discomfort, talk to your doctor.

Will I need to have check-ups?

If you have an artificial pacemaker, you will need to see your doctor or go to a clinic regularly to have tests to make sure it is working properly. Your doctor can 'fine-tune' your artificial pacemaker from outside your body (without another operation) using a radiowave programmer. This won't hurt.

You will need to have your artificial pacemaker checked about every six months. When the batteries begin to go flat, the pulse generator (but not the leads) can be replaced easily under local anaesthetic. A pulse generator usually lasts about 10 years before it needs replacing.

Will a pacemaker affect my lifestyle?

If you have an artificial pacemaker, you can do most normal daily activities, such as driving a car, swimming, having sex and playing non-contact sports.

Pacemakers are protected from electrical interference. You can still use or be near microwave ovens, televisions, shop theft detectors, any type of mobile or portable phone, and most electrical tools. Pacemakers may set off airport security machines, but airport security machines won't damage your pacemaker. If you have a pacemaker, you should tell airport security staff.

X-rays, computed tomography (CT) scans and most medicines will not affect your pacemaker.

However, you must **never** have a magnetic resonance imaging (MRI) scan if you have a pacemaker. **Always** tell radiology and medical staff that you have a pacemaker before having any medical treatment or procedure.

If you have any questions or concerns, talk to your doctor.

Further information

If you want to know more about artificial heart pacemakers or have any general heart health questions, call our Health Information Service on 1300 36 27 87 (for the cost of a local call) or email health@heartfoundation.org.au.

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