



Pacemakers



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About this booklet

This booklet is for people who are about to have, or have already had, a pacemaker implanted. It explains:

- why you need a pacemaker
- how a pacemaker works
- how it is implanted, and
- what to do, and what not to do, to make sure that your pacemaker works well.

Although some people can find it difficult to ignore completely the fact that they have a pacemaker, modern pacemakers are extremely comfortable and reliable. You can be confident that, with appropriate follow-up, very little can go wrong.

This booklet does not replace the advice your cardiologist, cardiac physiologist or specialist nurse may give you, but it should help you to understand what they tell you.

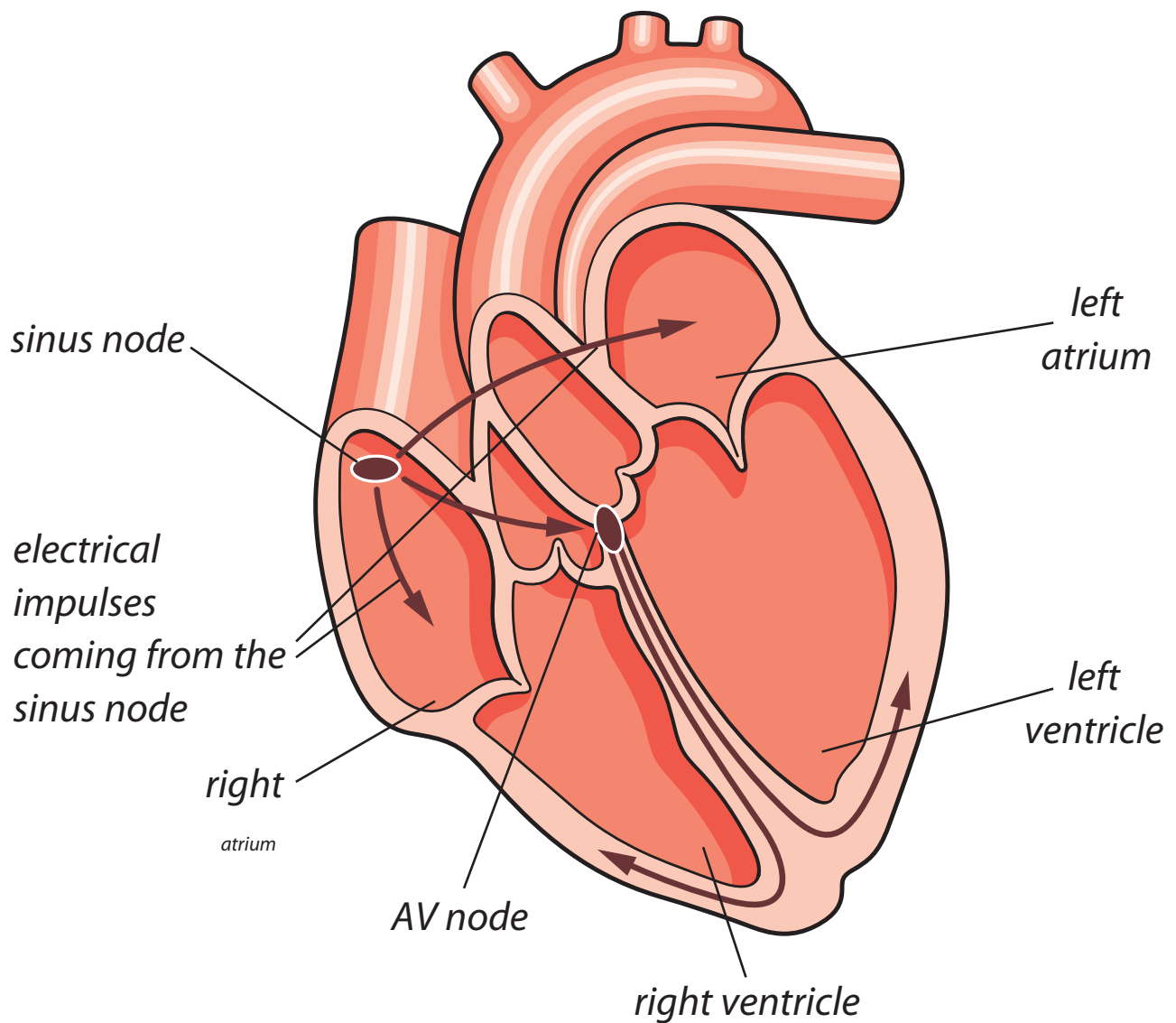
How does the heart beat normally?

To understand how a pacemaker works, it helps to know how the heart beats normally, and how it pumps blood around your body.

A normal adult heart has a regular heartbeat which is usually between 60 and 100 bpm (beats per minute) while you are resting. When you exercise, this may go up to a much higher rate, depending on your age and level of fitness.

Your heart has its own 'natural pacemaker', called the **sinus node**. This sends out regular electrical impulses that travel through an 'electrical pathway' in the heart, causing the chambers of your heart to contract and pump the blood through the heart and out to your lungs and the rest of your body. (See the illustration on the next page.) This is what causes you to feel a **pulse**.

Normal electrical signals in the heart



Why do I need a pacemaker?

If there is a problem with the electrical conduction system in your heart, you may need to have a pacemaker implanted. This could be because you have one of the following conditions.

- **Sick sinus syndrome (sinus node disease)** is when the sinus node (your heart's own pacemaker) stops working properly.
- **Heart block** (also called **AV block** or **atrioventricular block**) is when there is a problem with the AV node. There is a delay or block in the electrical impulses travelling between the atria and the ventricles.
- **Atrial fibrillation** is an abnormal and often irregular heart rhythm that originates in your atria (the top two chambers of the heart). The rhythm may be too fast, or too slow. If the atrial fibrillation causes your heart to beat too slowly, you may need a pacemaker.
- **Cardio-inhibitory syncope** is when someone collapses and temporarily loses consciousness. It happens when there is a pause of a few seconds in the heart rhythm. This can happen in people with atrial fibrillation.
- **Heart failure** which causes 'dyssynchrony', which is when the ventricles (the bottom two chambers of the heart) don't pump in time with each other. This can cause

symptoms of breathlessness and feeling very tired.

Below we explain more about how a pacemaker can help with each of these conditions.

If you have sick sinus syndrome (sinus node disease)

Sick sinus syndrome is the name given to a number of different conditions where the sinus node (your heart's own pacemaker) doesn't work properly. This can cause sudden pauses in the heart rate, or make the heart rate become too fast or too slow. It can also cause the heart rate to alternate between a fast and slow rate, known as tachybrady syndrome.

Sick sinus syndrome is most common in older people as the condition of the heart is affected by age. Sometimes, a heart attack or heart surgery, or certain medicines, can also cause damage to the sinus node.

The symptoms of sick sinus syndrome vary, and depend on how your heart rate is affected – for example, if your heart is beating too fast or too slow. You may only feel unwell for brief episodes, but common symptoms include palpitations, dizziness and syncope (collapsing).

If you have sick sinus syndrome, your cardiologist may recommend that you have a pacemaker, and you may need to take certain medicines.

If you have heart block

Heart block is when there is a problem with the AV node, and there is a delay or block in the electrical impulses travelling between the atria (the top two chambers of the heart) and the ventricles (the bottom two chambers).

There are many causes of heart block, but it is commonly caused by ageing, which can cause scarring of the electrical pathway in the heart. It can also be caused by heart disease – such as coronary heart disease, myocarditis or cardiomyopathy – which damages the heart muscle, affecting the electrical pathway. Certain medicines can also cause heart block. In some rare cases, there may be congenital complete heart block, where a person is born with the condition.

Not everyone with heart block needs a pacemaker. It depends on how severe your heart block is, how slow your heart rate is, and whether you experience symptoms such as syncope (collapsing), dizziness or confusion.

Most people can arrange beforehand with their doctor or cardiologist when they will have their pacemaker fitted. However, some people with heart block may develop slow heart rhythms which can be life-threatening, and they may need to have a pacemaker fitted as an emergency. If this happens, you may be provided with temporary pacing to cover you until your permanent pacemaker can

be implanted. For more on this, see page 48.

For more information on slow heart rhythms, see our booklet *Heart rhythms*.

If you have atrial fibrillation (AF)

Atrial fibrillation is an abnormal heart rhythm which originates in your atria (the top two chambers of the heart), and can sometimes be too fast or too slow. If it causes your heart to beat too slowly, you may need a pacemaker.

Sometimes a pacemaker is used to treat atrial fibrillation which is causing the heart rate to be very slow, and which could be causing symptoms such as feeling light-headed, faint or weak, or syncope (collapsing).

If you have fast atrial fibrillation that cannot be kept under control with medicines, you may have a treatment called **AV node ablation**, which involves having a pacemaker inserted. First, the AV node (the node between the atria and ventricles) is 'ablated' (destroyed) by applying an electrical current directly to it, to try and control the heart rate more effectively. The diagram on page 6 shows where the AV node is. A pacemaker is then implanted to make sure that your heart doesn't beat too slowly. For more information, see our booklet *Atrial fibrillation*.

A pacemaker can make sure your heart doesn't beat too slowly, but it cannot turn your atrial fibrillation into a normal heart rhythm, and it cannot control fast heart rhythms.

If you have cardio-inhibitory syncope

This is when someone collapses and temporarily loses consciousness. It happens when there is a pause of a few seconds in the heart rhythm. This can happen in people with atrial fibrillation.

Some people who have cardio-inhibitory syncope may benefit from having a pacemaker implanted. If your doctor suspects that you have episodes of cardio-inhibitory syncope, you may have a special test, called a tilt table test, to find out if a pacemaker will help you. The tilt table test is specifically for people who have had episodes of syncope. Some people with unexplained syncope may have a monitoring device called a loop recorder fitted. This may be useful when symptoms happen less often. For more information, see our booklet *Tests for heart conditions*.

If you have heart failure

Heart failure is a condition where your heart becomes less efficient at pumping blood around your body.

Heart failure may cause 'dyssynchrony', which is when the ventricles (the bottom two chambers of the heart) don't pump in time with each other, and which can cause symptoms of breathlessness and feeling very tired. If this happens, your doctor may recommend that you have a treatment called **cardiac resynchronisation therapy (CRT)**. This involves having a special type of pacemaker fitted, called a **bi-ventricular pacemaker**. We explain more about this type of pacemaker on page 16.

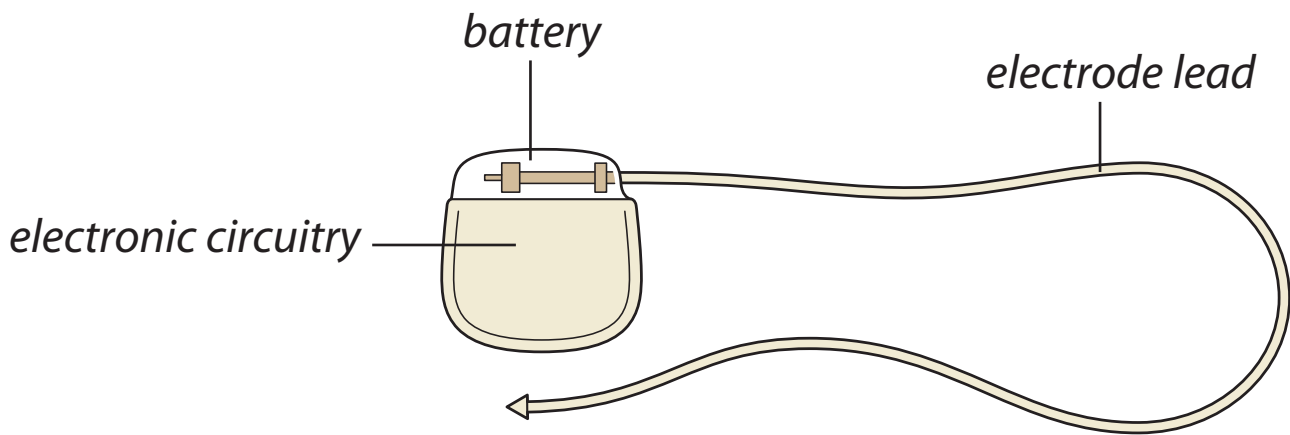
How does a pacemaker work?

A pacemaker contains a **pulse generator** (the pacemaker box) and one, two or three **electrode leads**. These leads are thin pieces of insulated wire that deliver electrical impulses to and from the heart. Pacemakers with one lead are called single-chamber pacemakers. Pacemakers with two leads are called dual-chamber pacemakers. Pacemakers with three leads are called bi-ventricular pacemakers.

The pacemaker box is made up of several different parts including the power supply (the battery) and the electronic circuit. It contains special software and memory so that it can monitor and store information about your heart rhythm and heart rate. It also has a special circuit that allows the pacemaker to be checked and altered by a computer at the hospital.

The pacemaker is contained within a protective metal casing. It weighs only about 20 to 50 grams (1 to 2 ounces) and is smaller than a matchbox. (See the photo on the front cover.) Sometimes the pacemaker is combined with an ICD (implantable cardioverter defibrillator) – a device, similar to a pacemaker, that can treat fast, life-threatening heart-rhythm problems by delivering an electrical shock if necessary. This device is a little bit bigger than a

Pacemaker



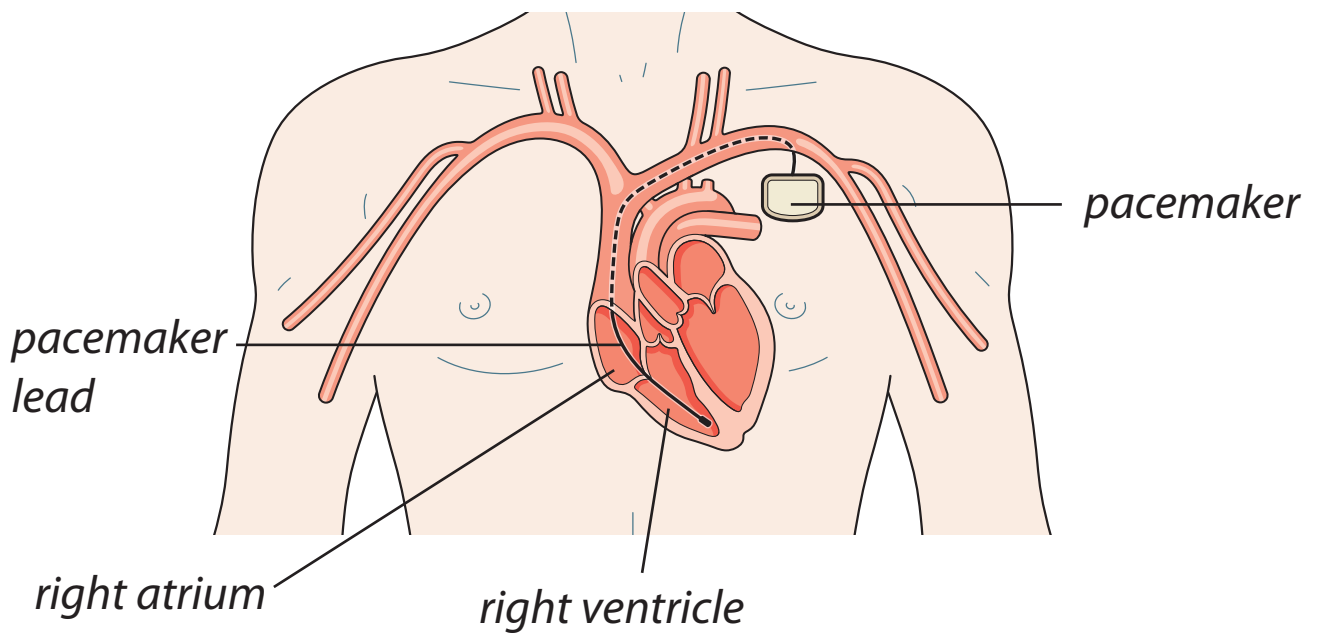
*Actual size = about 4 centimetres (1½ inches) by
4.5 centimetres by 8 millimetres (¼ inch)*

pacemaker and also slightly heavier. (See page 18 for more information on ICDs.)

Most pacemakers are powered by a lithium battery which usually lasts between six and ten years before it needs to be replaced. The battery life depends on how hard the pacemaker has to work and how the pacemaker is programmed to work for your particular heart condition. The batteries are not rechargeable.

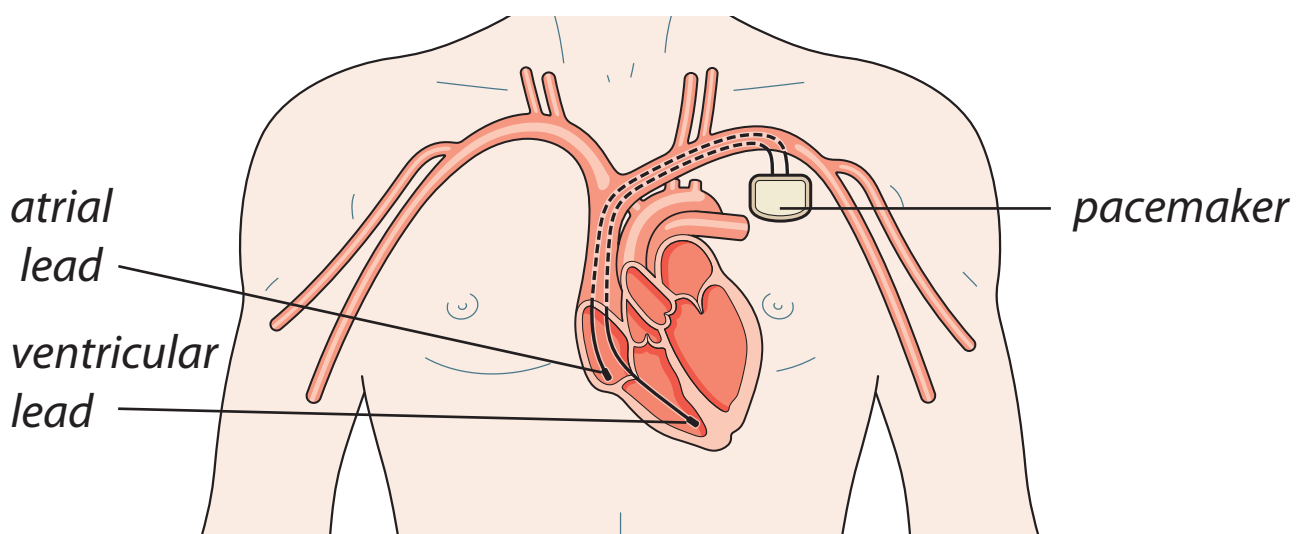
The electrode leads conduct electrical impulses from the battery down into your heart. Each electrical impulse sent by the pacemaker stimulates the heart to contract and produce a heartbeat. The rate at which these electrical impulses are sent out is called the **discharge rate**. The pacemaker also monitors the electrical activity within your heart.

Single-chamber pacemaker



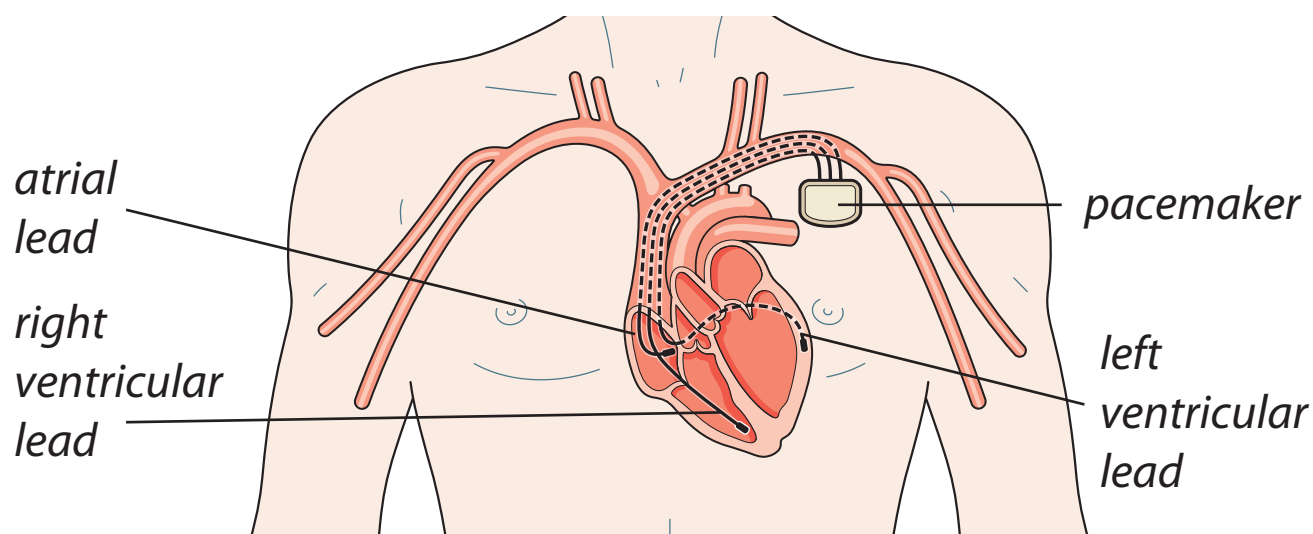
Single-chamber pacemakers have one lead which goes either to the right ventricle (as shown above) or to the right atrium.

Dual-chamber pacemaker



Dual-chamber pacemakers have two leads. One goes to the right atrium and the other to the right ventricle.

Bi-ventricular pacemaker



In a bi-ventricular pacemaker, one lead goes to the right atrium, one to the right ventricle and one to the left ventricle. This type of pacemaker is used in cardiac resynchronisation therapy (CRT). See page 21.

Your pacemaker will be working all the time, but that doesn't necessarily mean that it is constantly 'pacing' your heart. ('Pacing' is when the pacemaker sends out electrical impulses to stimulate the heart.) Your pacemaker can be set at many different settings, depending on the condition your doctor is treating you for. We describe some of these settings below.

Most pacemakers are set to work **on demand**. This means that, if the pacemaker senses that your heart has missed any beats, or if it is beating too slowly, it will send out electrical impulses at a steady rate. If the pacemaker

senses that your heart is beating naturally by itself, it won't send out any electrical impulses.

A **fixed rate** pacemaker setting paces your heart the whole time.

Some types of pacemakers can also speed up the rate at which your heart is paced when you are active or exercising. The pacemaker does this by using a special sensor that recognises your body movements or breathing rate – which is how your heart would respond if it were working normally. This sensor controls the pacemaker rate while you are exercising, and then allows the rate to go back to normal when you stop.

Your pacemaker will be programmed to send electrical impulses to your heart at a rate that suits your particular needs. Even after the pacemaker has been implanted, it can be reprogrammed if necessary, using a special computer that transmits signals to and from the pacemaker. This is usually done at the pacemaker clinic when you go back for follow-up appointments.

Pacemakers can also store and analyse information about your natural heart rhythms. During follow-up appointments at your pacemaker clinic, your cardiac physiologist can retrieve this information and use it to check how well your heart and your pacemaker are working.

Some pacemakers can be followed up from your home, using special software or electrical connections installed in your home. This has the advantage of allowing the hospital pacing team to keep a very close eye on your pacemaker without you having to come into hospital. This is particularly useful if you live a long distance from the hospital or if your pacemaker needs very frequent follow-up. However, this is fairly new technology and is not yet available with most pacemakers.

Some people who need a pacemaker and who may also be at risk of developing dangerous abnormal heart rhythms will have an **implantable cardioverter defibrillator (ICD)** fitted. An ICD can pace the heart in the same way that a pacemaker does, but it can also deliver controlled electrical shocks, if necessary, if there is ever a fast, life-threatening heart rhythm.

For more information about ICDs or heart rhythms, see our booklets *Implantable cardioverter defibrillators (ICDs)* and *Heart rhythms*.

Which type of pacemaker will I need to have?

As a general guide, the type of pacemaker you have will depend on the reason why you need it.

If you have sick sinus syndrome

The type of pacemaker most often used for this condition is a dual-chamber pacemaker. For some people, a single-chamber pacemaker may be used instead – for example, if there is no evidence of heart block.

If you have heart block

If you have heart block, you will most probably have a dual-chamber pacemaker inserted, although this choice will depend on how well your sinus node (your heart's natural pacemaker) is working. If you have heart block and also have chronic atrial fibrillation or another underlying medical condition, your cardiologist may insert a single-chamber pacemaker.

If you have atrial fibrillation

If you have paroxysmal atrial fibrillation (atrial fibrillation that comes and goes), and your doctor recommends that you have a pacemaker to control your heart rate, you will probably have a dual-chamber pacemaker.

If you need a pacemaker for heart block and you also have well-controlled atrial fibrillation, you will probably have a single-chamber pacemaker with a lead connected to the right ventricle.

If you have cardio-inhibitory syncope

A dual-chamber pacemaker is used for this condition.

If you have heart failure

Some people who have heart failure may have one of these two treatments:

- cardiac resynchronisation therapy with a pacemaker (CRT-P), or
- cardiac resynchronisation therapy with a defibrillator (CRT-D).

Cardiac resynchronisation therapy with a pacemaker (CRT-P)

*Also known as **bi-ventricular pacing**.*

This involves having a bi-ventricular pacemaker. This has three leads – one to the right atrium, one to the right ventricle, and one to the left ventricle.

A bi-ventricular pacemaker is only recommended as a way to try to treat heart failure for people who have dyssynchrony (when the ventricles are not beating in time with each other – see page 12). It also helps people who have severe symptoms, or if certain electrical patterns are seen on an ECG, or if their left ventricle is not pumping well and they are already being treated with medicines for heart failure.

CRT-P can help your heart to pump more efficiently, which can help to control your symptoms. It won't cure your heart failure, but it can improve your overall outlook and slow down the progression of your heart failure.

Although doctors choose very carefully those patients who are suitable for resynchronisation therapy, a very small number of people find that having this treatment does not improve their symptoms.

Cardiac resynchronisation therapy with a defibrillator (CRT-D)

This is where you have a single device implanted, which combines a bi-ventricular pacemaker and an ICD (implantable cardioverter defibrillator). It is used for people who have heart failure and who might also be at risk of developing fast, life-threatening heart rhythms. If you get one of these heart rhythms, the ICD can deliver an electrical shock to your heart to restore your normal heart rhythm.

For more information about ICDs or heart rhythms, see our booklets *Implantable cardioverter defibrillators (ICDs)* and *Heart rhythms*.

Some pacemakers can be programmed to work for two different problems which need a pacemaker. For example, if you have heart failure that's causing the ventricles to beat out of time with each other and a heart block that needs pacing, you would have one pacemaker implanted and it would be programmed to work for both conditions.

How is the pacemaker fitted?

Some people have a pacemaker implanted as a day case (which means that you don't need to stay in hospital overnight), while others have an overnight stay in hospital. Sometimes people may need to stay in hospital for a few days.

The procedure usually takes about an hour, but it can take longer for some people, particularly those who are having a bi-ventricular pacemaker. It is usually done with sedation and a local anaesthetic, so you will feel relaxed during the procedure.

Your pacemaker will be inserted under very sterile conditions, but you will be given some antibiotics before and after having the procedure. This is to reduce your risk of developing an infection.

Most pacemakers are fitted by **transvenous implantation** (which is also called **endocardial implantation**). In a very small number of people, **epicardial implantation** may be used instead.

Transvenous implantation

Also called **endocardial implantation**.

The pacemaker is usually implanted on your left side, as

this is closer to the heart and allows for the wires to be inserted easily into the heart. (See the diagram on the next page.)

An incision (cut) is made just under your left collarbone, and the wires (leads) are inserted there, into one of the blood vessels that lead into the heart. The cardiologist guides these leads into the correct chambers of your heart, using X-ray screening to make sure they are correctly placed, and then connects them to the pacemaker box. The pacemaker box is then fitted into the small 'pocket' which the cardiologist has made between your skin and your chest muscle, below your left collarbone. This may cause some bruising and swelling or tenderness, but this should settle down in the week after the procedure.

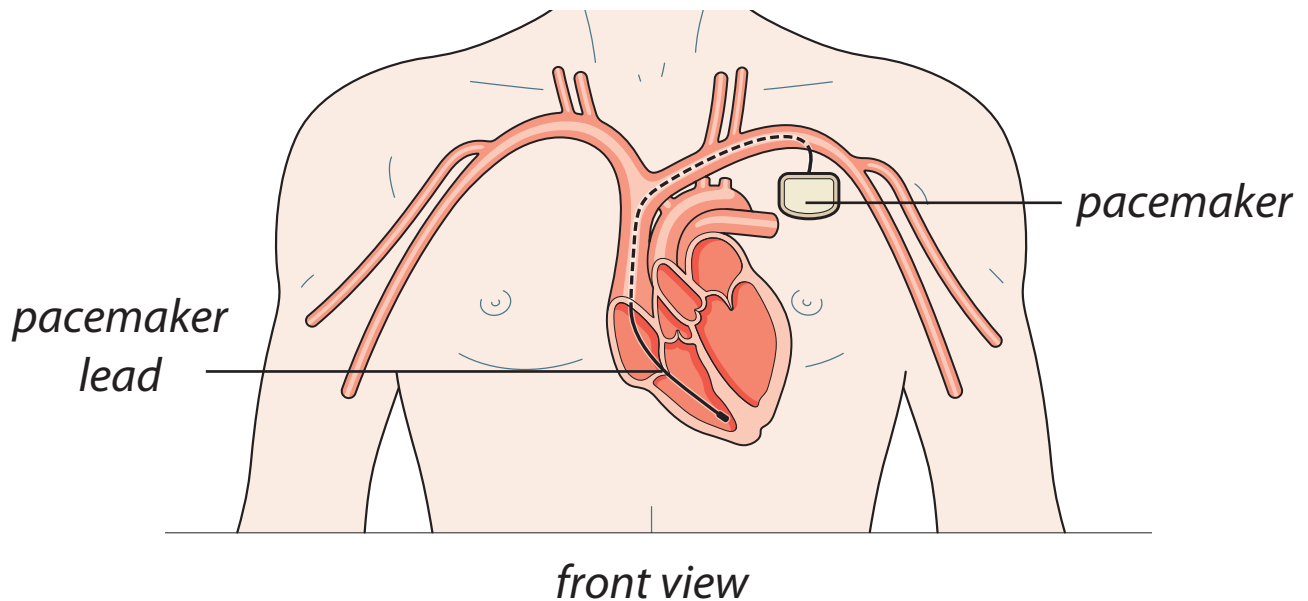
Modern pacemakers are now so small that they are almost completely hidden by the chest tissue. However, if you are very thin, your pacemaker may be placed under your muscle, so that it doesn't show under your skin. This also provides extra protection to the pacemaker.

In a very small number of people, the pacemaker may be placed in a different position, such as under the breast or under the arm and over the ribs.

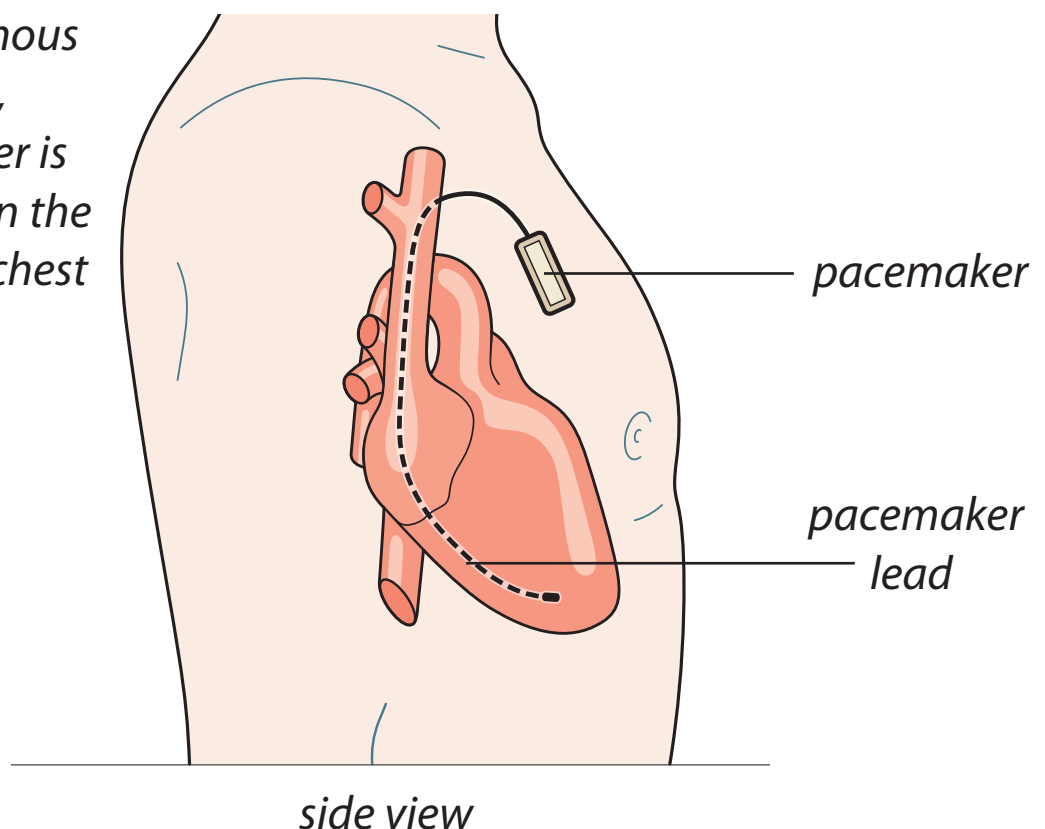
Before connecting the leads to the pacemaker, they are carefully checked to make sure that they will sense

electrical signals coming from the heart and stimulate the heart appropriately. The settings are then adjusted to suit your needs.

Transvenous implantation



With transvenous implantation, the pacemaker is fitted between the skin and the chest muscle.



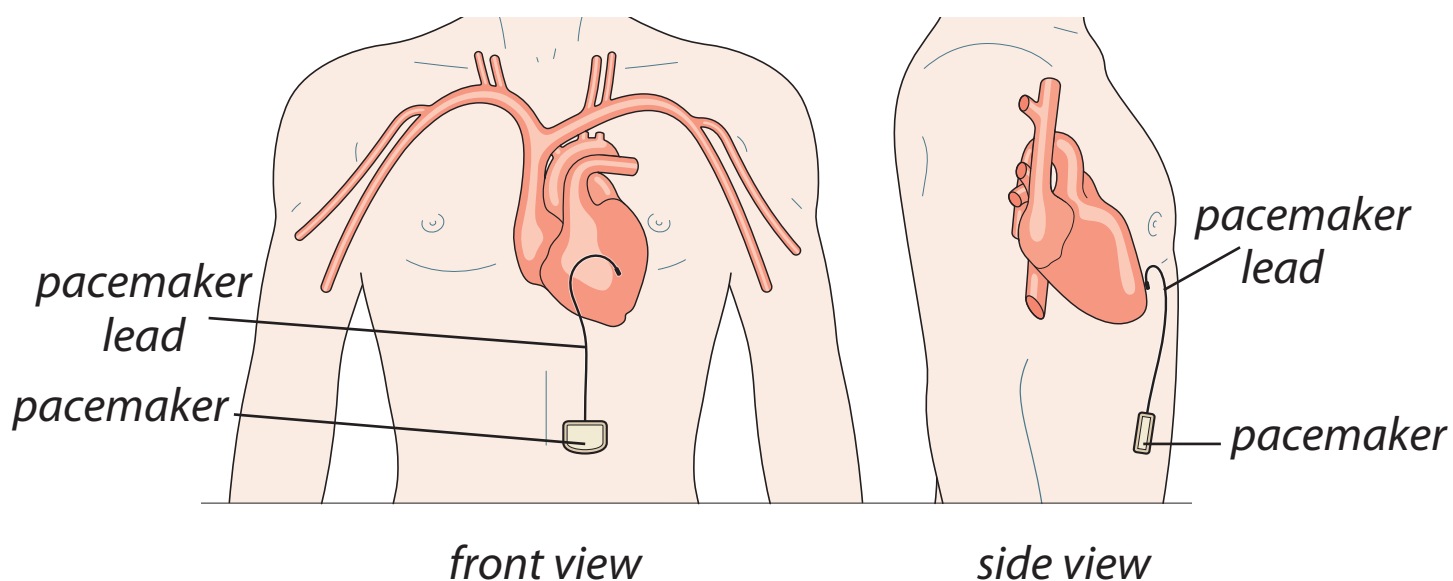
During the procedure you may feel a bit uncomfortable and you may feel some pushing and pulling, and may be asked to take some deep breaths in or give a cough, but you should not feel any pain. If you do get any pain or discomfort, you should tell the doctor or nurse, who can give you some pain relief.

The incision is then stitched up or glued, and covered with a protective dressing.

Epicardial implantation

Here, the electrode lead is attached directly onto the outer surface of your heart – the epicardium – through a small incision (cut) in the wall of your abdomen or chest.

Epicardial implantation



The pacemaker box is often placed under the skin of your abdomen.

This method is usually used for people who are having heart surgery and who also need to have a pacemaker implanted, so it is done during the heart surgery. It may also be used if it is difficult to get to your blood vessels using the more conventional transvenous implantation method.

After having your pacemaker fitted and before you leave hospital

After your pacemaker has been inserted, the nursing staff on the ward or recovery area will regularly assess you, by monitoring your blood pressure and heart rhythm and checking your incision site (where the cut was made) for any bleeding or swelling.

You will need to stay in bed for a little while after the procedure. Once the sedation has worn off and you begin to wake up, you will be allowed to eat and drink. The nurses will encourage you to get back on your feet again, and help to build your confidence for when you get home.

You will need to be careful not to put too much pressure on the arm nearest the pacemaker site (usually the left arm), or to lift that arm up too far. Your doctor and the hospital staff will advise you on the best way to sit up, and how far you can move your arm. This helps to prevent the pacemaker leads moving before they settle into the heart's tissue. (This moving of leads is called **lead displacement**.) It is important to follow the same advice for a while when you get home too.

Before you go home, the nursing staff will tell you if you had sutures (stitches) to close the wound and, if so, which type. Some types dissolve by themselves and others need to be removed after about seven days. If your stitches are not dissolvable, you will need to visit your practice nurse to have the stitches removed. Some people will have their skin glued back together using a special skin glue rather than having stitches. The glue is waterproof and will dissolve by itself.

You may have a protective dressing over the wound, and maybe some extra padding over it as well, to provide pressure to help stop any bleeding. You must not get the dressing or padding wet. After you leave hospital, follow the instructions your nurse gave you for how long to leave the dressing on. You can ask the nurse for a waterproof dressing to take home with you, to help while showering.

If your wound was closed using skin glue, you can shower straight away, but you should gently pat the area dry rather than rubbing it.

Wearing looser clothes in the first few weeks while the wound is healing can help to protect the wound site.

You may be given antibiotics to take for the first few days after you get home.

You may feel some pain or discomfort and there may be some bruising around the place where the pacemaker was inserted, but these problems usually disappear in a few days. Your doctor may prescribe painkillers which you can take if you need to while you are in hospital, or when you're at home again.

You will have a chest X-ray before you leave hospital, to make sure the pacemaker leads are in the right position and to check for any complications.

A cardiac physiologist will check your pacemaker and leads electronically using a special programmer, to make sure the chosen settings are correct for your medical condition.

Before you leave hospital, you will be given a **pacemaker identification card**. This has details of the make and model of your pacemaker. You should always carry this card with you in case of an emergency. You will also be given an information booklet about your particular type of pacemaker.

You may also be given a letter to give to your GP explaining that you have had a pacemaker fitted.

John's story

John, aged 87, describes how a pacemaker saved his life 17 years ago.

"I fainted one day in the post office, but blamed the heat. Shortly after, I collapsed at home and my daughter called 999. The paramedics discovered my heartbeat was dangerously slow and took me to hospital, where I received temporary pacing. Later, they inserted a permanent pacemaker. I was given a local anaesthetic and was awake chatting to the doctor the whole time. It only took 40 minutes and I went home a couple of days later.

My recovery was straightforward and a few weeks later I returned for another pacing check. After that I went back for a pacing check once a year.

Thirteen years after my pacemaker was first inserted – that's four years ago now – the battery started to run low, so I went back into hospital and the pacing box was changed. That procedure didn't go quite so smoothly, and it took longer. Unfortunately I wasn't told to stop taking my aspirin beforehand, so I had much more bruising than normal. Having a pacemaker has never been a problem. It saved my life."

Possible complications

Infection

There is always a small risk of getting an infection at the place where the pacemaker has been implanted. If, after you get home, your wound becomes a lot redder or more swollen, or if you get a discharge from the wound or develop a high temperature, contact your pacemaker clinic immediately. This is because, if you have an infection at the pacemaker site, it could spread and you may need to have the pacemaker replaced. However, this doesn't happen often.

Bleeding

As with any surgical procedure that involves having an incision (cut), there will be some bleeding, but if pressure is applied to the wound site, the bleeding should stop. Sometimes it may take longer for the bleeding to stop and this may cause some extra bruising. If this happens, the nursing staff may need to apply pressure dressings to the wound site to help stop the bleeding and provide protection. This is particularly common if you are on warfarin, aspirin or other medicines which reduce the risk of blood clotting.

In some rare cases the person may need to go back to the operating theatre for the doctor to control the bleeding.

Bruising

Bruising is common after the procedure and you may have quite a bit of bruising on your chest and arm around the wound site for some weeks. For some people the bruising may last longer than this. If you're concerned that the bruising is spreading or getting worse, contact your pacemaker clinic or your GP.

Lead displacement

There is a small risk that one of the pacemaker leads might move out of position. To reduce the risk of this happening, it is best to avoid strenuous physical activity until after your first pacemaker check, which is about four to six weeks after you have your pacemaker fitted. You also need to be careful about how much you move your arm on the pacemaker side. For more on this, see *Moving your arm in the first six weeks* on page 35. However, to help your recovery, it is very important that you return gradually to your normal daily activities after having your pacemaker implanted.

Pneumothorax

There is a small risk of developing a pneumothorax. This is when air leaks from your lungs into your chest during surgery. Your doctors will check for this on the chest X-ray you have before you leave hospital. This may resolve itself, but in some cases a chest drain may need to be inserted to treat it.

Technical problems

It is very unusual nowadays for pacemakers to have technical failures – such as the pacemaker battery failing, or one of the leads fracturing or not working properly. However, if you go for regular follow-up checks at your pacemaker clinic, the staff there can detect any problems if they do happen.

Most people have no problems after having a pacemaker implanted, but **if you feel dizzy or breathless**, or experience any of the symptoms you had before you had your pacemaker fitted, you should contact your GP or call your pacemaker clinic immediately.

If you have any questions about your pacemaker, or if you are ever concerned that your pacemaker is not working properly, contact your pacemaker clinic. The cardiac physiologist can give you more advice.

Everyday life with a pacemaker

Modern pacemakers are comfortable and very reliable and should allow you to return to your normal lifestyle very quickly. Some people may find that the pacemaker improves their quality of life, and unpleasant symptoms such as fainting, dizziness or breathlessness can become a thing of the past. Here are some general guidelines to help your recovery.

Moving your arm in the first six weeks

Before you leave hospital, your doctors and nurses will advise you about what you can and can't do after having your pacemaker inserted. This applies especially in relation to how far you can move your arm.

As a general guide, for the first six weeks don't lift above shoulder height the arm on the same side as your pacemaker. And if you're washing or combing your hair, you should move your arm very slowly. This is because sudden stretching movements may displace the pacemaker lead (or leads) in the heart. (This is called lead displacement – see page 33.) After six weeks, the lead (or leads) should have become embedded in the heart and should not be able to move.

This is why it is very important to return *gradually* to

normal daily activities and to keep your affected shoulder mobile by *gently* moving the arm on the side of the pacemaker.

Also, avoid lifting heavy objects with the arm on the pacemaker side.

Will I be able to feel the pacemaker inside me?

Some people are aware of the pacemaker being there, but get used to it quickly. You shouldn't feel the pacemaker working. Some people may experience a 'twitch' when their pacemaker is working. If this happens, tell your pacemaker clinic so they can change the settings to stop this happening.

At first, your pacemaker may feel uncomfortable when you lie in certain positions, or perhaps when wearing certain clothes, but it can't be damaged by either of these things.

Having showers and baths

It is important to keep the wound dry for the first few days while it heals. This is especially important if you have removable stitches in place. If your wound has been glued back together, you can shower straight away, but you should gently pat the area dry rather than rubbing it.

Driving

Whatever type of driving licence you have, if you have had a pacemaker implanted, you must tell the DVLA (Driver and Vehicle Licensing Agency) that you now have a pacemaker. You will need to fill in a medical questionnaire which you can download from the website www.gov.uk/pacemakers-and-driving, and send it to the DVLA. The address is on the form. The rules about driving can sometimes be complicated so, if you need help filling in the form, ask at your pacemaker clinic or your GP surgery.

If you have a licence to drive a car or motorcycle

You can start driving again one week after having your pacemaker inserted, as long as you don't have any other conditions that would disqualify you from driving.

If you have a licence to drive a bus, coach or lorry

You will not be allowed to drive these types of vehicles for six weeks after your pacemaker is fitted.

The DVLA will review your case as quickly as they can and, as long as there are no other conditions that disqualify you from driving, you will then be allowed to start driving again. The DVLA may ask your cardiologist to provide medical details of your condition before clearing you to drive.

Telling your motor insurance company about your pacemaker

Whatever sort of driving licence you have, you need to tell your motor insurance company that you have had a pacemaker fitted. If you don't, your insurance may not be valid.

Sports

Your doctor and nurses will advise you on what sort of activities you can do after your pacemaker has been fitted, but it is important not to do any strenuous activity before your pacemaker follow-up appointment. This is usually about four to six weeks after your pacemaker has been fitted. After this, you can carry on – or take up – most activities and sports.

If you ever play contact sports such as football, rugby or martial arts, you should take care to avoid collisions that may damage your pacemaker. Your cardiologist and pacemaker clinic staff will be able to give you information about this. For example, they may suggest you wear a protective pad over your pacemaker site.

Can everyday equipment interfere with my pacemaker?

Pacemakers are made to the highest standards and are rigorously tested. As a result, problems are rare. All pacemakers have a protective outer metal casing to shield them from outside interference. And they have a special circuit to detect and remove unwanted electrical activity.

For more information about interference, read the information booklet about your specific type of pacemaker that you were given after you had your pacemaker implanted. If you have any questions about what you can and can't do, contact your pacemaker clinic or the pacemaker manufacturer.

At home

Electrical equipment that you use at home – such as hairdryers and microwave ovens – will not be a problem, as long as you use them at least 15 centimetres (6 inches) away from your pacemaker. You should also be able to use household tools such as drills, mowers and electric screwdrivers, as long as they are in good condition and well maintained. For information about using electrical shavers, contact your pacemaker manufacturer or ask at

your pacemaker clinic.

If you use an induction hob for cooking, keep a distance of at least 60 centimetres (2 feet) from your pacemaker, as this type of hob generates an electromagnetic field that may interfere with your pacemaker settings.

Phones and computer equipment

Mobile phones and cordless phones

You can safely use your mobile or cordless phone, but make sure to keep the phone more than 15 centimetres (6 inches) from your pacemaker. Always use the ear on the opposite side to your pacemaker, and don't put the phone in a shirt pocket over your pacemaker. For more information, see the information booklet about your pacemaker that was given to you when you had the pacemaker fitted.

Hands-free kits and bluetooth

There has been no evidence suggesting that these devices affect pacemakers, but some manufacturers recommend that you use the ear on the opposite side to your pacemaker.

iPods, MP3 players, palm PCs and pocket PCs

You can use iPods and other brands of disk-based or

solid-state MP3 players and palm or pocket PCs, as long as you don't place them directly over the pacemaker. Keeping at least 15 centimetres (6 inches) between the device and your pacemaker avoids any possible risk of the effects of interference. Also, avoid putting the headphones within 3 centimetres (just over 1 inch) of your pacemaker. And don't put them in a pocket near the pacemaker or let them dangle around your neck, even when you are not using them.

WiFi, wireless LAN and wireless internet for computers

There is no clear evidence to say that these interfere with pacemakers.

Video-game machines

There is no clear evidence that devices such as Wii, Playstations or Xboxes have an effect on pacemakers, but games manufacturers advise you to contact your pacemaker manufacturer for more guidance.

Electronic 3D glasses for 3D TV viewing

Electronic 3D glasses should be kept a minimum of 15 centimetres (6 inches) away from your pacemaker. Don't wear them while they are plugged in to charge. If you ever feel unwell while using the glasses, stop using them immediately.

TENS machines and body-toning equipment

TENS machines (devices used for pain relief – for example, for treating joint pain and arthritis) and body-toning equipment rely on fast, short, high-voltage pulses. If you have a pacemaker, contact your pacemaker clinic or manufacturer for more information about using these devices. You would usually need to test the TENS machine in the pacemaker clinic to make sure there is no interference between the machine and your pacemaker.

Airport security systems

Airport screening systems very rarely cause problems with pacemakers. However, the security metal detector can detect a pacemaker so, when you're travelling, make sure you carry your pacemaker identification card with you, so that you can tell the security staff that you have a pacemaker. They may do a hand search or check you with a hand-held metal detector. Make sure the metal detector is not placed directly over your pacemaker.

Some countries may still insist that you go through the security system. It is unlikely that your pacemaker will be affected by going through these systems, but it's best to move quickly through the security system and not to stand close to it for too long.

Security systems in shops

Many shops have anti-theft detectors in their doorways. If you walk steadily through and don't linger, there should be no effect on your pacemaker. It's best not to stand too close to this type of security system for long.

Metal detectors

Metal detectors can affect pacemakers, so you should speak to your pacemaker clinic before using one.

Magnetic devices

Small magnetic devices, such as magnetic fasteners on items of clothing (usually on jackets), could affect your pacemaker. Clothes with magnetic fasteners usually carry a warning label. You should avoid wearing a magnetic fastener directly over your pacemaker.

At work

Some workplaces have strong electromagnetic fields which can interfere with your pacemaker – for example, arc-welding. If you are concerned about any equipment used at your workplace, your pacemaker clinic will be able to give you detailed advice. The MHRA (Medicines and Healthcare Products Regulatory Agency) also has up-to-date information. Their contact details are on page 45.

Medical and dental tests and treatments

Some hospital equipment may interfere with pacemakers. Some types of equipment used in surgery can also cause problems.

MRI scans are not normally used if you have a pacemaker, due to the MRI's strong magnetic field, so you must not have this test unless your doctor has discussed it very carefully both with you and with the staff at your pacemaker clinic. A very small number of people now have an 'MRI-safe' pacemaker, but these are still quite rare. If you have one, it will be shown on your pacemaker identification card.

Most other medical and dental tests will be fine, but always make sure that you tell whoever is treating you that you have a pacemaker.

For more information

Each pacemaker manufacturer gives detailed instructions about which sources of electromagnetic interference you should avoid. If you have any questions about your pacemaker, or if you are ever concerned that your pacemaker is not working properly, contact your pacemaker clinic. The cardiac physiologist or cardiologist there can give you more advice.

If the pacemaker clinic cannot help you, you may want to contact the MHRA (Medicines and Healthcare Products Regulatory Agency). Their contact details are:

Medicines and Healthcare Products Regulatory Agency (MHRA)

Devices Division

151 Buckingham Palace Road

London SW1W 9SZ.

Phone: 020 3080 6000

Adverse Incident Centre: 020 3080 7080

Email: aic@mhra.gsi.gov.uk

Website: www.mhra.gov.uk

Follow-up appointments

It is very important to have regular follow-up appointments at your pacemaker clinic to get your pacemaker checked. Your appointments may be every 3 to 12 months, depending on the type of pacemaker you have and how well it has been working. You will have to have follow-up appointments for the rest of your life.

Pacemaker checks are not painful or invasive as they are done on the outside of your body. At each appointment, a cardiac physiologist or cardiologist will check the discharge rate of the pacemaker, measure the strength of the electrical impulse and record the effects of the impulse on your heart. In this way, they can find and correct any faults.

Most modern pacemakers can store information about the state of the battery and the performance of the pulse generator. At your follow-up appointment, the cardiac physiologist or doctor can get this information easily from the pacemaker. And, if necessary, your pacemaker can be re-programmed to the best settings for your condition.

Changing the battery

Your pacemaker will eventually need a new battery, although the batteries usually last between six and ten years (and sometimes even longer). Changing the battery involves replacing the complete pacemaker box with a new unit. The original lead (or leads) can usually be left in place. However, very occasionally there may be problems with the lead (or leads) and they may also need to be replaced. Having a new battery fitted is usually a straightforward procedure. It is similar to the procedure of inserting the pacemaker described on page 23. It may be done as a day case, or you may need to stay overnight in hospital.

Temporary pacing

Some people are given **temporary pacing** while they are in hospital.

Temporary pacing is sometimes used if a person's heart rhythm is very unstable and it is not safe to wait to put in a permanent pacemaker. For example, it may be used as an emergency measure when someone develops a severe bradycardia (a very low heart rate), or serious heart block, often due to a heart attack. Sometimes, temporary pacing is used in a planned way – for example, as a temporary measure during surgery.

There are two main ways of doing temporary pacing – **external temporary pacing** which is done from outside the body, and **internal temporary pacing** which is done inside the body.

External temporary pacing – also called transcutaneous pacing – is done by using a special pacing function on a defibrillator machine. This sends regular electrical impulses through the chest wall to the heart to act as a pacemaker. If the person is conscious, they may be given sedation and pain relief. This is a very temporary measure used in a sudden emergency.

Internal temporary pacing – also called transvenous pacing – is done by inserting a pacing wire into the right side of the heart by passing it through a vein in the groin or the neck. This is done using local anaesthetic, along with sedation if necessary. This wire stays in the vein and is connected to a pacing box that stays outside the body. This is usually done as an emergency procedure because a person's heart rhythm has become unstable – for example, following a heart attack. A permanent pacemaker is then sometimes needed if the heart rhythm does not return to normal.

Sometimes temporary pacing is planned beforehand. For example, if someone who has heart block is having surgery, temporary pacing may be used because of the risk of a general anaesthetic affecting the heart rhythm. If the chest is already going to be cut open – as in coronary artery bypass surgery, for example – the pacing wires can be attached to the outside of the heart muscle (epicardial pacing).

Internal temporary pacing is not used for a long time because, if the wires are left in for too many days, the risk of infection increases.

How your support can help

For over 50 years the British Heart Foundation has pioneered research that's transformed the lives of people living with heart and circulatory conditions. Since 1961, when the first pacemaker was implanted in the UK, your continued support has helped fund research to make pacemakers much smaller and more sophisticated.

We aim to play a leading role by continuing to support vital research. The number of people dying from heart and circulatory disease each year in the UK is falling. But this means that more people are living with the disease, so there is still a great deal to be done.

Our next big challenge is to discover how to help the heart muscle repair itself, and find a cure for heart failure. Visit our website **bhf.org.uk/findthecure** to find out about our Mending Broken Hearts Appeal and see how your support can help make a difference.

What is a cardiac arrest?

A **cardiac arrest** is when a person's heart stops pumping blood round their body and they stop breathing normally.

A person who is having a heart attack may develop a dangerously fast heart rhythm which can cause a cardiac arrest and be fatal.

It is sometimes possible to shock the heart back into a normal heart rhythm by giving defibrillation. This means giving the heart an electrical shock using a **defibrillator**. For every minute that a person is in cardiac arrest before defibrillation, their chances of survival are reduced by about 10%. However, by doing CPR (cardiopulmonary resuscitation) you can double someone's chance of survival. We explain how to do this on page 54.

Your workplace may have an automated external defibrillator (AED) which can be attached to a person and used to shock the heart back into a normal rhythm if necessary. You should find out where the AEDs are and who is trained in how to use them. The BHF offers a free Heartstart course on CPR (cardiopulmonary resuscitation) and the use of AEDs (see page 59).

What to do if someone has collapsed and is not responding, and may be in cardiac arrest

Think DRS, ABC.

D = Danger

Check for **danger**. Approach with care, making sure that you, the person and anybody nearby are safe.

R = Response

Check for **response**. To find out if the person is conscious, gently shake him or her, and shout loudly, 'Are you all right?'

S = Shout

If there is no response, **shout** for help.

You will need to assess the person and take suitable action. Now, remember **ABC – airway, breathing, CPR**.

A = Airway

Open the person's airway by tilting their head back and lifting their chin.



B = Breathing

Look, listen and feel for signs of normal breathing. Only do this for up to 10 seconds. Don't confuse gasps with normal breathing. If you're not sure if their breathing is normal, act as if it is not normal.

C = CPR

If the person is unconscious and is not breathing normally, they are in **cardiac arrest**.

Call 999 immediately.

- Send someone else to call 999 for an ambulance while you start CPR.
- **Or, if you are alone with the person, call 999 before you start CPR.**



How to do CPR

If you have not been trained to do CPR, or if you're not able, or not willing, to give rescue breaths, do hands-only CPR. This is described in step 1 on the next page. Keep doing the chest compressions – at a rate of about 100 to 120 times a minute – until:

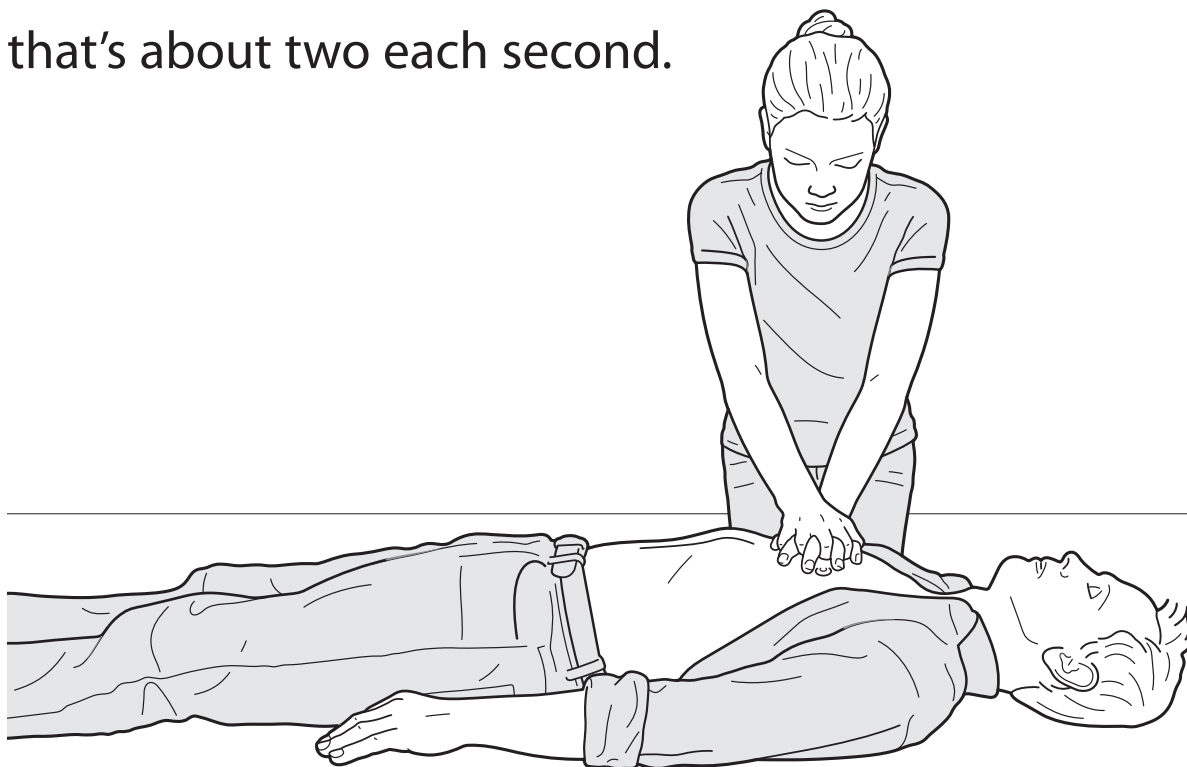
- the ambulance crew arrives and takes over, or
- the person starts to show signs of regaining consciousness, such as coughing, opening their eyes, speaking, or moving purposefully **and** starts to breathe normally, or
- you become exhausted.

CPR

1 Chest compressions

Start chest compressions.

Place the heel of one hand in the centre of the person's chest. Place the heel of your other hand on top of your first hand and interlock your fingers. Press down firmly and smoothly on the chest 30 times, so that the chest is pressed down between 5 and 6 centimetres each time. Do this at a rate of about 100 to 120 times a minute – that's about two each second.

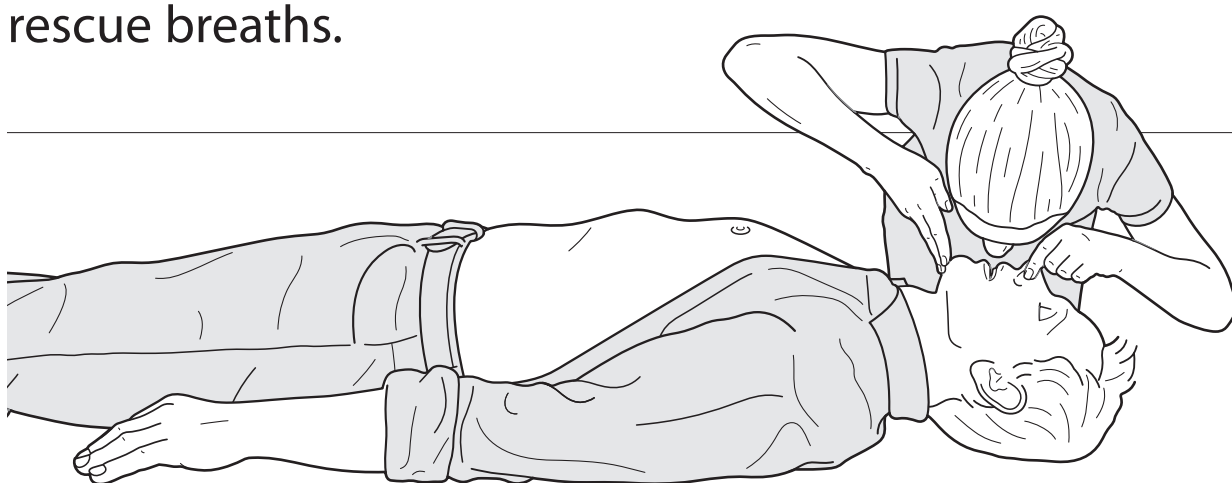


2 Rescue breaths

After 30 compressions, open the airway again by tilting the head back and lifting the chin, and give two of your own breaths to the person. These are called rescue breaths.

To do this, pinch the soft parts of the person's nose closed. Take a normal breath, make a seal around their mouth with your mouth, and then breathe out steadily. The person's chest should rise and fall with each breath. It should take no more than 5 seconds to give the two rescue breaths.

Then give another 30 chest compressions and then 2 rescue breaths.



3 Continue CPR

Keep doing the 30 chest compressions followed by 2 rescue breaths until:

- the ambulance crew arrives and takes over, or
- the person starts to show signs of regaining consciousness, such as coughing, opening their eyes, speaking, or moving purposefully **and** starts to breathe normally, or
- you become exhausted.

For more information

British Heart Foundation website

bhf.org.uk

For up-to-date information on heart disease, the BHF and its services.

Heart Helpline

0300 330 3311 (a similar cost to 01 and 02 numbers)

For information and support on anything heart-related.

Genetic Information Service

0300 456 8383 (a similar cost to 01 and 02 numbers)

For information and support on inherited heart conditions.

Booklets and DVDs

To order our booklets or DVDs:

- call the BHF Orderline on **0870 600 6566**, or
- email **orderline@bhf.org.uk** or
- visit **bhf.org.uk/publications**

You can also download many of our publications from our website. For a list of resources available from the BHF, ask for a copy of our catalogue *Take heart*. Our booklets are free of charge, but we would welcome a donation. (See page 2 for how to make a donation.)

Heart Information Series

This booklet is one of the booklets in the *Heart Information Series*. The other titles in the series are as follows.

Angina

Atrial fibrillation

Blood pressure

Cardiac rehabilitation

Caring for someone with a heart condition

Coronary angioplasty

Diabetes and your heart

Having heart surgery

Heart attack

Heart rhythms

Heart transplantation

Heart valve disease

Implantable cardioverter defibrillators (ICDs)

Keep your heart healthy

Living with heart failure

Medicines for your heart

Pacemakers

Peripheral arterial disease

Physical activity and your heart

Primary angioplasty for a heart attack

Reducing your blood cholesterol

Returning to work with a heart condition

Tests for heart conditions

Our services

For more information about any of our services, contact the **Heart Helpline** on **0300 330 3311** or visit **bhf.org.uk**

Emergency life support skills

For information about Heartstart – a free, two-hour course in emergency life support skills, including what to do if someone seems to be having a heart attack – call the **BHF Helpline** on **0300 330 3311** or visit **bhf.org.uk**

Heart Matters

Heart Matters is the BHF's **free**, personalised service that provides support and information for people who want to improve their heart health. Join today and enjoy the benefits, including *heart matters* magazine and an online members' area. Call the **Heart Helpline** on **0300 330 3311**, or join online at **bhf.org.uk/heartmatters**

Heart support groups

Local heart support groups give you the chance to talk about your own experience with other heart patients and their carers. They may also include exercise classes, talks by guest speakers, and social get-togethers. To find out

if there is a heart support group in your area, contact the **Heart Helpline** on **0300 330 3311**.

Make yourself heard – Heart Voices

Heart Voices gives you the skills, confidence and knowledge you'll need to influence health services for the benefit of heart patients and their families across the UK. It aims to develop a nationwide network of representatives to speak out on behalf of heart patients and their carers, and to provide them with training and opportunities to have their say and get involved.

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Have your say

We would welcome your comments to help us produce the best information for you. Why not let us know what you think? Contact us through our website **bhf.org.uk/contact**. Or, write to us at the address on the inside front cover.

Acknowledgements

The British Heart Foundation would like to thank all the GPs, cardiologists, nurses and other health professionals who helped to develop the booklets in the *Heart Information Series*, and all the patients who commented on the text and design.

Particular thanks for their work on this booklet are due to:

- Sue Jones, Pacing/ICD Services Manager, St George's Healthcare NHS Trust, London
- Angela Hall, Lead CRM Specialist Nurse, James Cook University Hospital, Middlesbrough, and
- Dr D J Wright, Consultant Cardiologist, Liverpool Heart and Chest Hospital.



**British Heart
Foundation**

Coronary heart disease is the UK's single biggest killer.

For over 50 years we've pioneered research that's transformed the lives of people living with heart and circulatory conditions. Our work has been central to the discoveries of vital treatments that are changing the fight against heart disease.

But so many people still need our help.

From babies born with life-threatening heart problems to the many Mums, Dads and Grandparents who survive a heart attack and endure the daily battles of heart failure.

Join our fight for every heartbeat in the UK. Every pound raised, minute of your time and donation to our shops will help make a difference to people's lives.

**FIGHT
FOR EVERY
HEARTBEAT**

bhf.org.uk