British Heart Foundation

Living with a Pacemaker

David Gillard



FIGHT FOR EVERY HEARTBEAT

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As the nation's heart charity, we have been funding cutting-edge research that has made a big difference to people's lives.

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ABOUT THIS BOOKLET

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

- why you need a pacemaker
- how a pacemaker works
- how it is fitted, and
- how to make sure that your pacemaker works well.

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

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

HOW DOES MY HEART BEAT NORMALLY?

To understand how a pacemaker works, it helps to know how the heart beats normally.

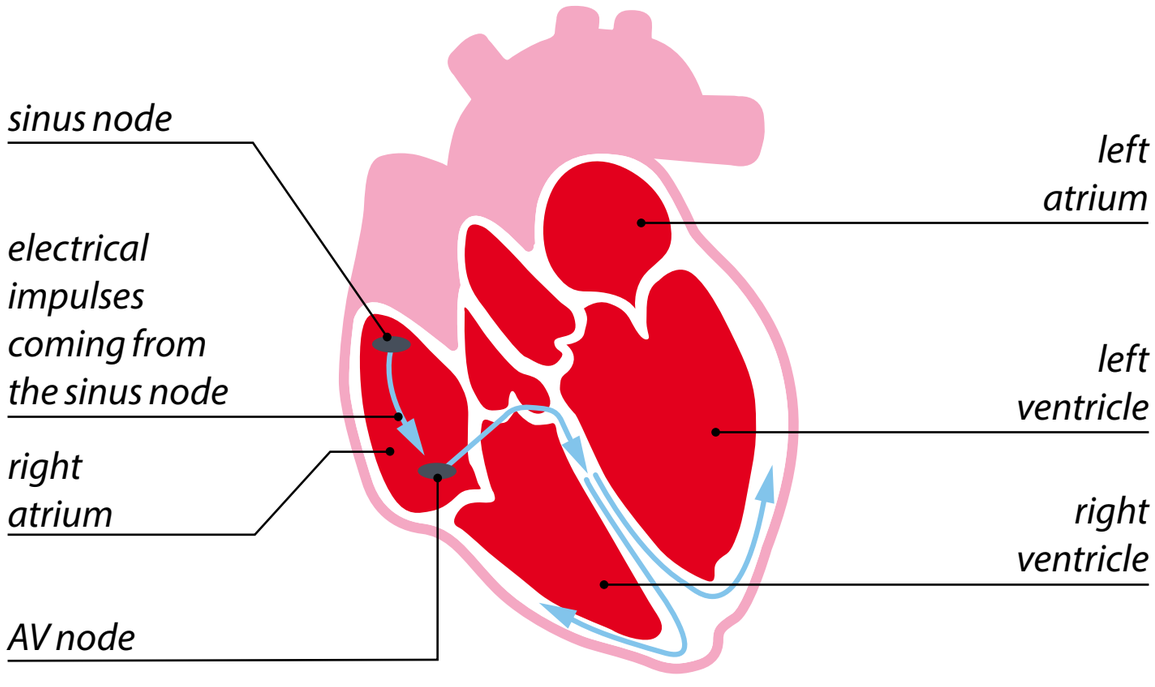
Your heart is a muscle which pumps blood to your lungs, your brain, and the rest of your body. It has four chambers – two upper ones called the right and left **atria**, and two lower ones called the right and left **ventricles**. See the illustration on the next page.

Your heart's pumping action is controlled by tiny electrical impulses that are produced by a part of the right atrium called the **sinus node**. Your sinus node is your heart's natural pacemaker. It sends out regular impulses that travel through an electrical pathway in your heart.

These impulses help to co-ordinate the chambers of your heart as they contract and pump blood through your heart and out to your body. This is what causes your **pulse**.

A healthy adult heart has a regular beat that's usually between 60 and 100 bpm (beats per minute) at rest. When you exercise, it may go up, depending on your age and how fit you are.

Normal electrical signals in the heart



Watch our video showing how a normal heart beats at bhf.org.uk/arrhythmia

A pacemaker is a small electrical device used to treat some **abnormal heart rhythms**.

Generally, you'll need a pacemaker because your heart is beating too slowly, either all of the time or some of the time. When your heart is beating too slowly it means there's a problem with your heart's electrical conduction system. A pacemaker speeds up your heart so that it beats at a normal rate.

Some people need a special pacemaker, called a **cardiac resynchronisation therapy (CRT) pacemaker**, which helps to co-ordinate the pumping action of the heart muscle. People who need this type of pacemaker have a condition called **heart failure**, which means that their heart isn't working as well as it should.

Heart failure may cause **dyssynchrony**. This is when the two lower chambers of the heart (the ventricles) aren't pumping in time with each other. This can make you breathless and cause you to feel very tired. We explain the treatment for this on page 12.

Many different types of heart conditions can cause problems with your heart's electrical conduction system. We describe some of them below and explain how a pacemaker can help, but you should also speak to your doctor or nurse about why you need a pacemaker.

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 your heart rate, or make your heart beat too fast or too slow. It can also cause your heart to alternate between a fast and slow rate (known as **tachybrady syndrome**).

Sick sinus syndrome is most common in older people because the heart is affected by age. Sometimes, having a heart attack or heart surgery, or taking certain medicines, can also damage the sinus node.

The symptoms of sick sinus syndrome vary, depending 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 short periods, but common symptoms include palpitations, dizziness and collapsing (syncope).

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

Heart block

Heart block is caused by a problem with the AV (atrioventricular) node in your heart. The AV node makes the electrical connection between the top and bottom chambers of your heart. See the diagram on page 04. When the AV node isn't working properly, there is a delay or block in the electrical impulses travelling between the atria (top two chambers) and the ventricles (lower two chambers).

There are many causes of heart block, but it's often caused by ageing, which can result in the electrical pathway becoming scarred.

Heart block can also be caused by types of **heart disease** that damage your heart muscle, affecting the electrical pathway. These include coronary heart disease, myocarditis and cardiomyopathy. For more information on these conditions, see our other booklets listed on pages 61 and 65.

Certain **medicines** can also cause heart block.
In some rare cases, you may have been born with the condition. This is known as congenital complete heart block.

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

You'll probably be able to arrange in advance to have your pacemaker fitted. However, if your slow heart rhythm could be life-threatening then you may be given a temporary device until your permanent pacemaker can be fitted. For more on this, see page 50.

See our video at bhf.org.uk/heartblock

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

Atrial fibrillation (AF)

Atrial fibrillation is an **abnormal heart rhythm** – often too fast or too slow – that originates in the top two chambers of your heart (atria). If your heart is beating too slowly, perhaps making you feel light-headed or faint, or causing you to collapse, you might need a pacemaker.

If atrial fibrillation is making your heart beat too fast and it can't be controlled with medicines, you might be given a treatment called **AV node ablation**, which involves having a pacemaker.

During an AV node ablation, the AV node (the node between the top and lower heart chambers, see the diagram on page 04) is 'ablated', or destroyed, with an electrical current. A pacemaker is then inserted to make sure that your heart doesn't then beat too slowly.

For more information on atrial fibrillation and treatment, see our booklet Atrial fibrillation or watch our video at bhf.org.uk/ablation

A pacemaker can stop your heart beating too slowly, but not too quickly. If you have atrial fibrillation, your heart will always produce these abnormal signals (unless you have a successful ablation) but the pacemaker will override them to produce a regular heartbeat.

Cardioinhibitory syncope

This is when someone collapses and temporarily loses consciousness because of a few seconds' pause in their heart rhythm. Sometimes, this is due to atrial fibrillation.

Some people with cardioinhibitory syncope can benefit from a pacemaker. If your doctor thinks you may have cardioinhibitory syncope, he or she may send you for a **tilt table test** to see if a pacemaker will help.

For more information, see our booklet Tests for heart conditions or order our DVD The road ahead: your guide to tests and treatments.

The tilt table test involves lying on a bed while your heart rate, rhythm and blood pressure are measured. The bed is then tilted into a more upright position and more measurements taken.

If you're not experiencing the symptoms very often, you may be given a device called a loop recorder. This monitors your heart so that your cardiologist can see if an irregular rhythm is the problem.

Heart failure

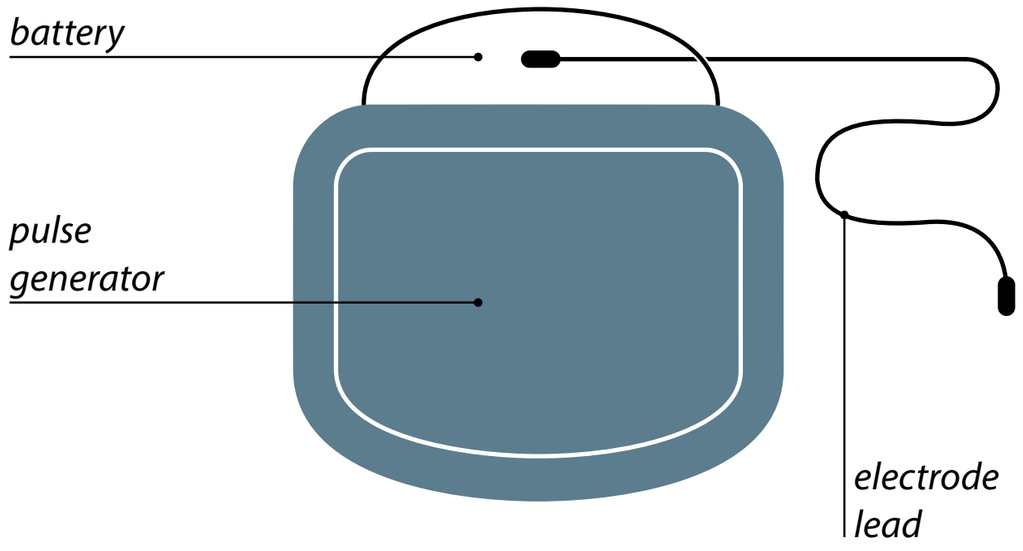
Heart failure is the term used when your heart becomes less efficient at pumping blood around your body.

It may cause dyssynchrony, where the ventricles (the lower two chambers of your heart) aren't pumping in time, making you feel breathless and exhausted. If this happens, your doctor may recommend 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 on page 19.

A pacemaker consists of a box, or **pulse generator**, and one, two or three **electrode leads**, all contained in a metal case. It weighs only about 20 to 50 grams (1 to 2 ounces) and is smaller than a matchbox. The 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 – or cardiac resynchronisation therapy – pacemakers.

Pacemaker



Actual size = about 4 centimetres (1½ inches) by 4.5 centimetres by 8 millimetres (¼ inch). The electrode lead is longer than shown above.

The box includes a power supply (the battery) and an electronic circuit, as well as software and a memory so that it can monitor and store information about your heart rhythm and heart rate. A circuit also allows a computer at the hospital (known as a programmer) to check your pacemaker and adjust it if need be.

Most pacemakers are powered by a lithium battery, which will usually be replaced every six to ten years. The battery life will depend on how the pacemaker is programmed for your particular condition.

The leads send electrical impulses from the battery into your heart and each impulse makes your heart contract, producing a heartbeat. This is known as **pacing**. The rate at which the impulses are sent out is the **discharge rate**. The pacemaker also monitors the electrical activity within your heart.

Your pacemaker will be monitoring your heart all the time but that doesn't necessarily mean that it's constantly 'pacing' your heart. There are many different pacemaker settings, depending on your condition.

Most pacemakers are set to work on demand. This means that if your heart has missed any beats or is beating too slowly, the pacemaker will send out electrical impulses to increase your heart rate. If your heart is beating normally, however, it won't send out any impulses.

A **fixed rate** setting means your pacemaker will be sending out impulses (pacing your heart) the whole time, but this is rarely used.

Some pacemakers can also speed up your heart rate when you're active or exercising. They do this through a special sensor that recognises your body movements or your breathing rate, which is how your heart would respond if it were working normally. When you stop exercising, the sensor then allows your heart rate to go back to normal.

Even after the pacemaker has been fitted, it can be reprogrammed by a computer if necessary. This will usually be done at the clinic when you go for follow-up appointments.

Pacemakers can also store and analyse information about your natural heart rhythms, which your specialist can then use to check how well your heart and pacemaker are working.

Some of the latest pacemakers can be followed up from your home using special software or electrical connections, known as a home monitor. This allows the hospital team to keep a close eye on your pacemaker without you having to go into hospital. This is particularly useful if you live a long way away or if your pacemaker needs to be followed up frequently. However, this is fairly new technology and isn't yet available with all pacemakers.

Sometimes, a pacemaker is combined with an **implantable cardioverter defibrillator**, or **ICD**. This is similar to a pacemaker, although bigger and slightly heavier. It can also treat fast, life-threatening heart rhythms by delivering a controlled electric shock.

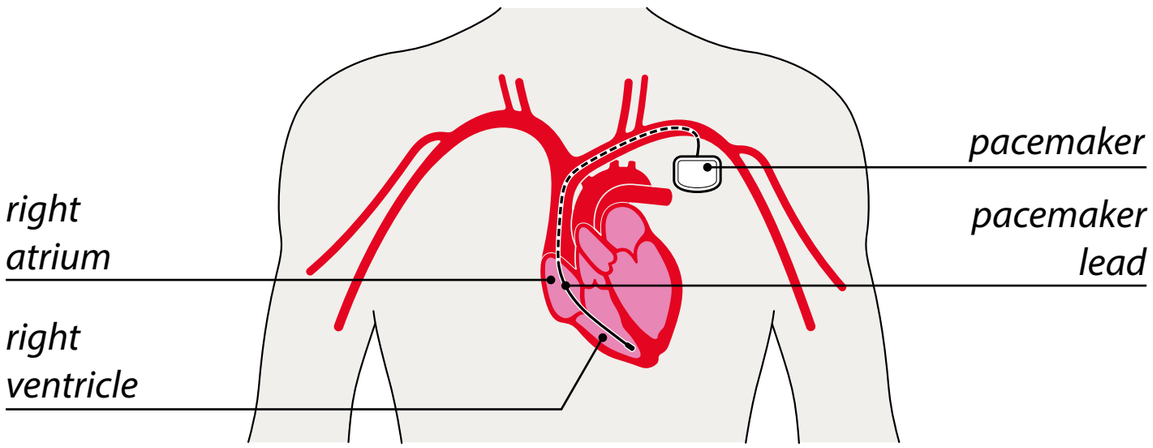
Which type of pacemaker will I need?

As a general guide, the type of pacemaker you have will depend on why you need it. Usually, if you have a slow heart rhythm then you'll have a one- or two-lead pacemaker, known as a **single-chamber** or **dual-chamber** pacemaker. If you have heart failure and meet the conditions described on the following pages, you will have a three-lead cardiac resychronisation pacemaker. Your consultant will discuss this with you.

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

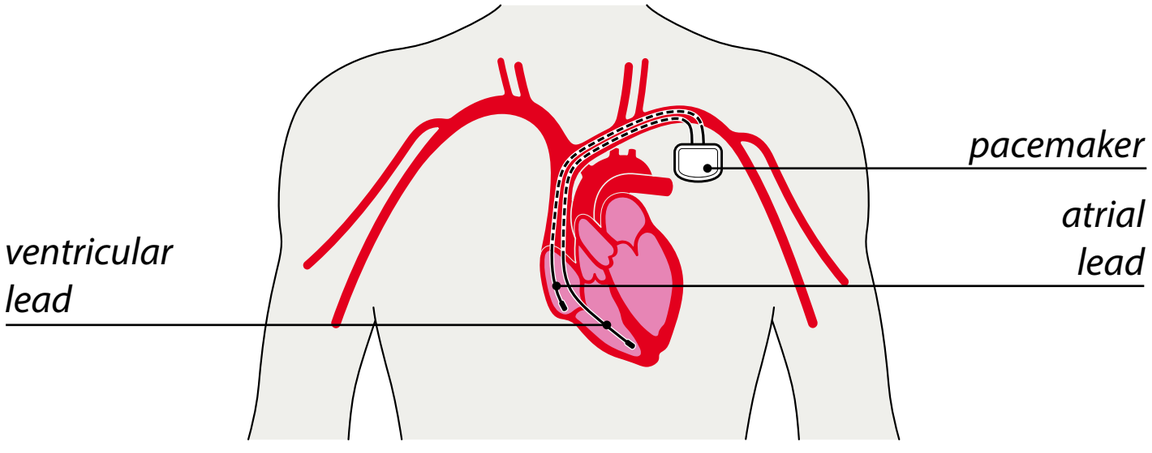
Single-chamber pacemaker

Single- chamber pacemakers have one lead that goes either to the right ventricle (as shown below) 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.



Cardiac resynchronisation therapy with a pacemaker (CRT-P)

Also known as bi-ventricular pacing

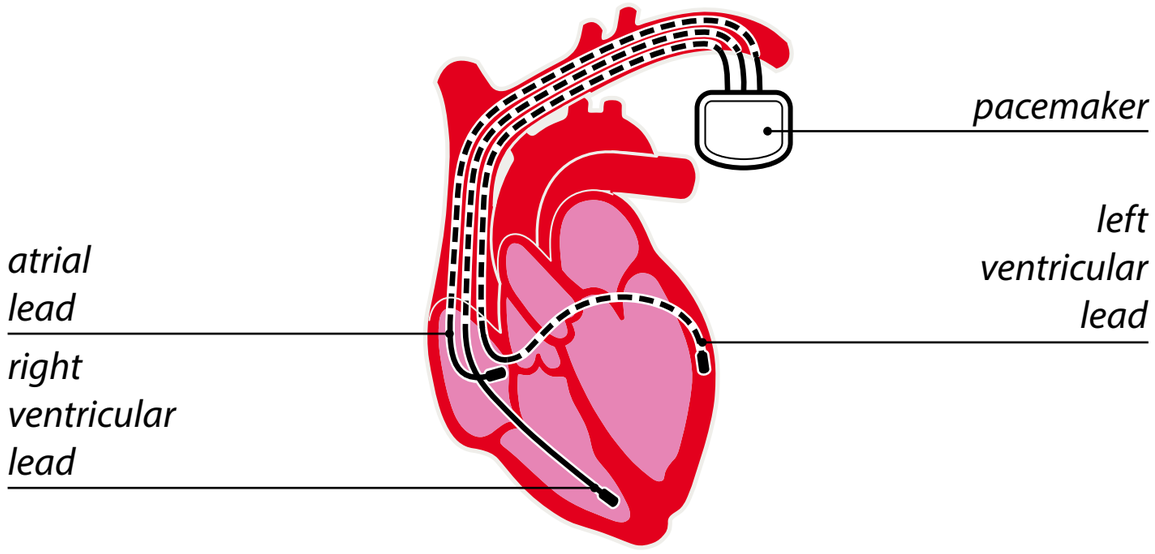
This treatment involves having a pacemaker with three leads, called a bi-ventricular pacemaker. One lead goes to the right atrium (top right chamber of the heart), one to the right ventricle (lower right chamber) and one to the side of the left ventricle.

A bi-ventricular pacemaker is only recommended for people with dyssynchrony (when the ventricles aren't beating in time with each other), or those who have an ECG showing a very specific type of electrical pattern.

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

Although doctors choose those patients who are suitable for resynchronisation therapy very carefully, there are a small number of people who find that this treatment doesn't help.

Bi-ventricular pacemaker



Cardiac resynchronisation therapy with a defibrillator (CRT-D)

This treatment involves having a single device that combines a bi-ventricular (three-lead) pacemaker and an ICD. It's used for people with heart failure who might also be at risk of developing fast, life-threatening heart rhythms. If you have one of these emergencies, the ICD can restore your normal rhythm by delivering an electric shock to your heart.

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

You might have your pacemaker fitted as a day case, or day patient, or you might need to stay in hospital overnight or for a few days.

The procedure usually takes place in a cardiac catheter lab, or cath lab. It usually takes about an hour but can take longer, particularly if you're having a bi-ventricular pacemaker. You'll normally be given a sedative and a local anaesthetic, so you'll be relaxed and feel no pain.

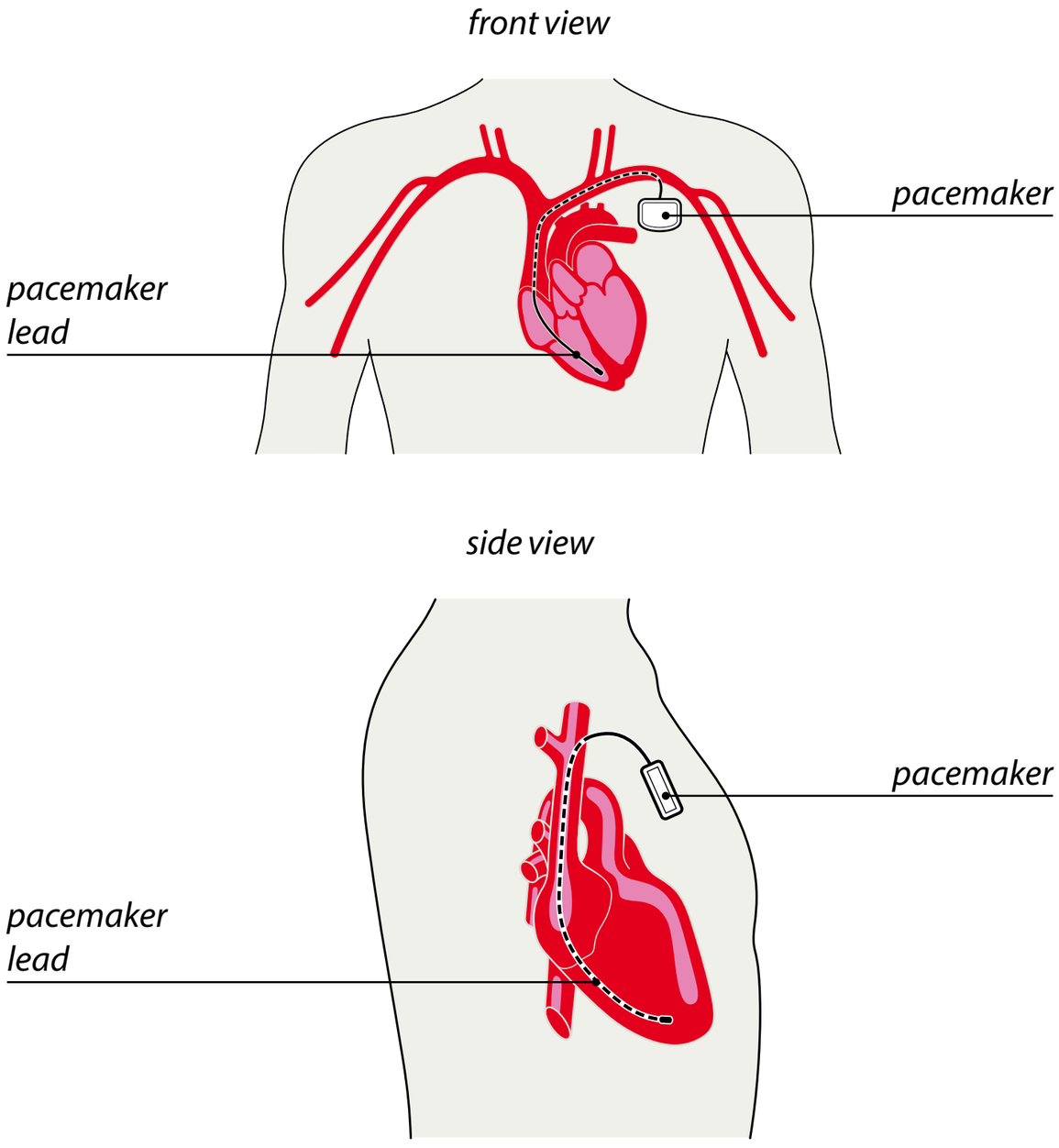
Your pacemaker will be inserted under very sterile conditions and you'll be given antibiotics before, and sometimes after, the procedure to reduce your risk of infection.

Most pacemakers are fitted by **transvenous implantation** (also called **endocardial implantation**). However, in a very small number of people a procedure known as **epicardial implantation** may be used instead. These terms are explained on the following pages.

The pacemaker is usually implanted on your left side, as this is closer to your heart and allows the wires to be inserted easily.

Transvenous implantation

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



A small cut is made just under your left collarbone, and the cardiologist, or specialist, then threads the lead or leads into one of the blood vessels going into your heart. When an X-ray has confirmed that the leads are in the right position, they're connected to the pacemaker box.

The box is then fitted into a small ‘pocket’ that the cardiologist has made below your left collarbone, between your skin and your chest muscle. It may cause some bruising, swelling or tenderness, but this should ease after a week or so.

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

In a very few people, the pacemaker may be placed in a different position, such as under the breast or under the arm.

You might feel a bit uncomfortable during the procedure, perhaps experiencing some pushing and pulling, and you might be asked to take some deep breaths or to cough. You shouldn't feel any pain, however. If you do, tell the doctor or nurse, who can give you some pain relief.

The leads are carefully checked before being connected to the pacemaker to make sure that they will pick up the electrical signals from your heart and will stimulate your heart properly. The settings are then adjusted to suit your needs. Finally, the small cut is stitched and covered with a dressing.

Epicardial implantation

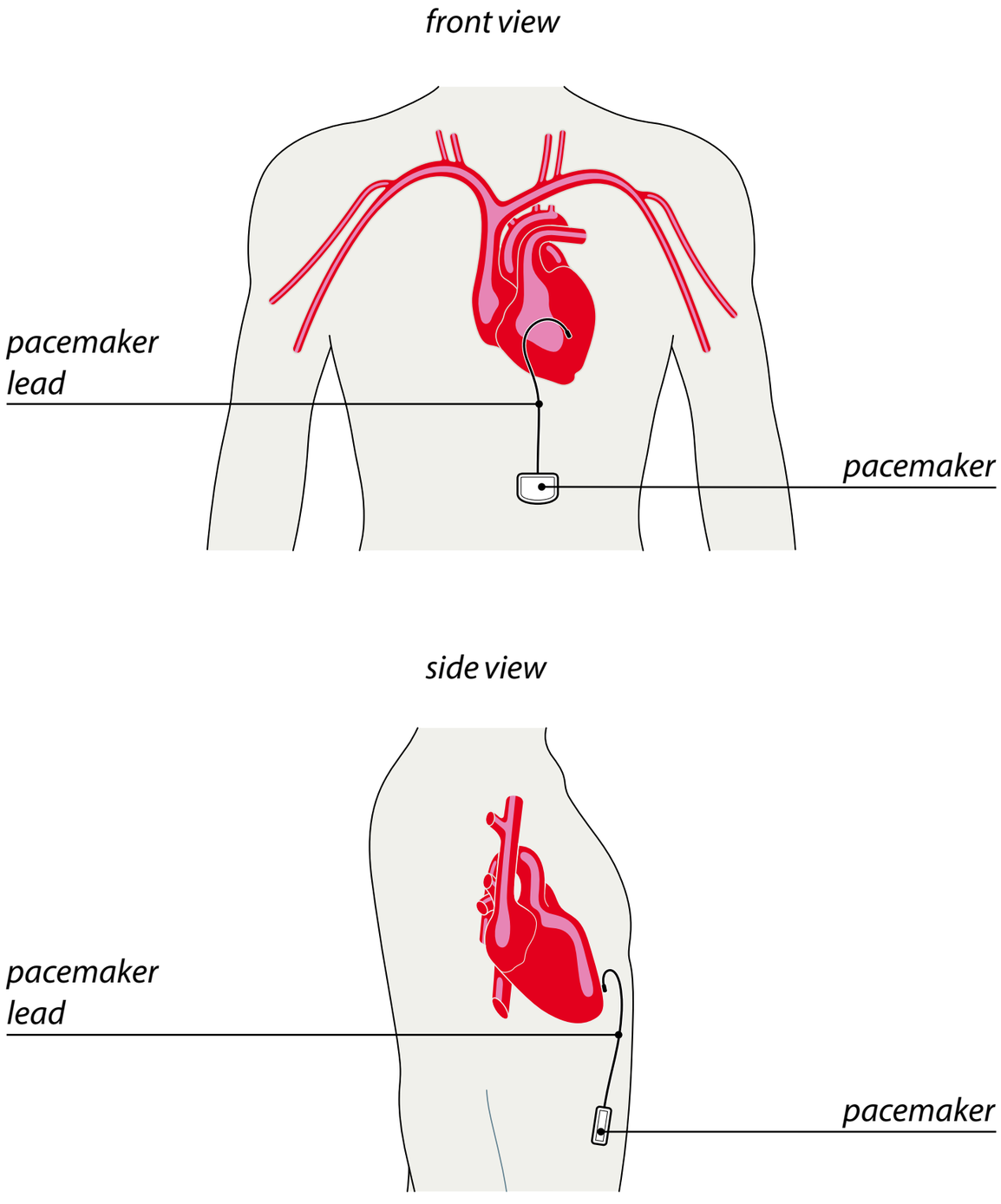
Here the electrode lead is attached directly onto the outer surface of your heart (the epicardium) through a small cut in the wall of your abdomen or chest.

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

This method is normally used for people who are having heart surgery and also need a pacemaker, so the device is implanted at the same time as the heart surgery is carried out. Epicardial implantation may also be used if it's difficult to reach your blood vessels with the transvenous implantation method.

Watch Hilda's story to see how pacemakers are fitted at bhf.org.uk/pacemakers

Epicardial implantation



After your pacemaker has been fitted, the nurses will check your blood pressure and heart rhythm, and also check your wound for any bleeding or swelling.

You'll need to stay in bed for a little while after the procedure. Once the sedation has worn off, you'll be allowed to eat and drink. The nurses will advise you on the best way to sit up and when you can walk around. You'll usually be able to get out of bed quite soon and this will help to build your confidence for when you go home.

You'll have a chest X-ray to make sure the leads are in the correct position and to check for any complications. A cardiac physiologist will also check the settings of your pacemaker and leads. This is simple and painless.

Before you leave hospital, you'll be given a **pacemaker identification card** with details of the make and model of your device. Always carry this card with you in case of an emergency. You'll also be given an information booklet about your particular type of pacemaker and may be given a letter for your GP explaining that you've had a pacemaker fitted.

The nurses will tell you whether your wound has been closed with stitches or special glue. Some stitches dissolve, while others have to be removed after seven days. If your stitches aren't dissolvable, you'll need to visit your practice nurse to have them removed. The glue is waterproof and will dissolve slowly.

Always carry your pacemaker identification card with you in case of an emergency.

LAURA'S STORY

Laura was diagnosed with complete heart block when she was 30 years old and had her pacemaker fitted in 2014.

"I was relieved to have my condition diagnosed. I had done some research and I knew that I would need a pacemaker.

I was discharged the morning after my operation and I took it easy during my recovery. It took me time to get my head around it all but it was a potentially life saving operation for me, which made it all much easier.

I don't feel scared of anything anymore. Since I had my pacemaker fitted I've got married and bought my first home. I'm the happiest I've ever been, and every time I reach a new milestone in my life I appreciate it so much more."



When you go home

You may have a dressing over the wound and sometimes extra padding. After you leave hospital, follow your nurse's advice about how long to leave the dressing on and avoid getting the dressing or padding wet. The nurse may give you a spare dressing to take home in case the dressing gets wet while you're showering. If special glue was used, you can shower straight away. Gently pat the area dry to avoid discomfort.

In the first few weeks, wear loose clothing, including underwear, on your upper body to be more comfortable while the wound is healing. You may be given antibiotics to take for the first few days after you get home. It's essential to follow your doctor's advice about taking them and to finish the course.

You may feel some pain or discomfort at the site where the pacemaker was inserted but this will usually improve in time. Your doctor may prescribe painkillers for you.

Infection

There's always a small risk of infection at the place where the pacemaker has been implanted. If, after you get home or at any time in the future, your wound or the area around your pacemaker becomes redder or more swollen, or you get some pus from the wound or you develop a high temperature, contact your pacemaker clinic **immediately**.

If you're prescribed antibiotics, it's essential that you take them exactly as your doctor advises and that you finish the course. If the site becomes infected then you might have to have your pacemaker replaced, but this is rare.

Bleeding

As with any procedure that involves an incision (cut), there will be some bleeding. Sometimes, it can take longer for the bleeding to stop, which can cause extra bruising. If this happens, the nurse might apply pressure dressings. This is particularly common if you are taking warfarin, aspirin or other medicines that affect how your blood clots. In rare cases, a person might need to go back to the cath lab for the doctor to control the bleeding.

Bruising

Bruising is common after the procedure. The bruises may cover your chest and arm and last for several weeks. However, if you think the bruising is getting worse, contact your pacemaker clinic or your GP.

Lead displacement

There's a small risk that one of the leads may move (lead displacement). To reduce the chances of this happening, you should avoid strenuous physical activity, heavy lifting, or raising the arm nearest the pacemaker (usually the left) above your shoulder until after your first check-up – usually about four to six weeks later. For more on this, see Top tips on moving your arm in the first six weeks on page 39.

Collapsed lung

There's also a small risk of a collapsed lung (pneumothorax) during or after the procedure. This is when air leaks from your lungs into your chest. Your doctors will check for this on an X-ray before you leave hospital. If it does happen, it may get better without any treatment. Sometimes a chest drain, or tube, is put in to allow the air to escape.

Technical problems

Technical problems – such as the pacemaker battery failing or the leads not working properly – are very rare. However, this is one reason why regular follow-up checks at your pacemaker clinic are important.

If you have any questions about your pacemaker, or if you're ever concerned that it isn't working properly, contact your pacemaker clinic.

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

DAVID'S STORY

David had his pacemaker fitted in 2015 after being diagnosed with an abnormal heart rhythm.

"Although I was a bit concerned about how a pacemaker might affect my way of life, my overriding feeling was that I was glad that something could be done for me.

When I had my pacemaker fitted, I was able to go home the same day. I had to avoid lifting my left arm above shoulder height for a week, and was told to avoid sudden movements for about six weeks. But apart from these minor inconveniences, I felt fine straight away. I stopped getting any sensations of irregular heartbeats and light-headedness. I was also able to walk from Land's End to John O'Groats a few months after having my pacemaker fitted and am now doing a fair bit of running and cycling.

Having the pacemaker fitted has removed a worry for me. I'm no longer concerned that my heart might stop, and it's made me feel better about my health in general."



Modern pacemakers are comfortable and very reliable. Most people return to normal life very quickly, and some find that the pacemaker improves their quality of life. As a result of having a pacemaker fitted, unpleasant symptoms such as fainting, dizziness or breathlessness can become things of the past.

Before you leave hospital, your doctors and nurses will advise you about what you can and can't do after the procedure.

Will I be able to feel the pacemaker inside me?
Some people are aware of their pacemaker, but they get used to it quickly. However, you shouldn't be able to feel the pacemaker working, so if you experience a 'twitch' then tell your clinic so that they can change the settings.

At first your pacemaker may feel uncomfortable when you lie in certain positions or, perhaps, when you're wearing certain clothes. Taking regular painkillers will ease this.

TOP TIPS...

on moving your arm in the first four to six weeks

1. **Don't lift your arm on the pacemaker side above your shoulder for the first four to six weeks, or as advised by your doctor or nurse.**

2. **When you're washing or combing your hair, remember to move your arm slowly, as sudden stretching movements may disturb the lead or leads.**

3. **Avoid lifting heavy objects with the arm on the pacemaker side.**

   These steps help to prevent the leads moving (lead displacement) while they're healing securely into place.

4. **Gently rotate your shoulder and move your head from side to side to avoid stiffness in your neck, shoulder and arm.**

It's important that you return to your normal daily activities gradually, but after four to six weeks the lead or leads should be firmly embedded.

Showers and baths

Avoid showers or baths for the first few days unless your doctor or nurse tells you otherwise. It's important to keep your wound dry while it heals, particularly if you have stitches that have to be removed. If your wound has been glued then you can shower straight away, but you should gently pat the area dry rather than rubbing it.

When can I resume sex?

You can resume sex whenever you wish, but in the first few weeks you should avoid sexual positions that may put strain on your upper body or accidentally move the leads. Sex aids such as vibrators are usually safe to use.

Driving

You must tell the Driver and Vehicle Licensing Agency (DVLA) that you have a pacemaker, whatever type of driving licence you have. See **www.gov.uk/pacemakers-and-driving** for information and to download the right form for your type of licence.

The rules about driving can 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 either report your condition online or complete form H1 and send it to the DVLA. The address is on the form.

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 must complete form VOCH1 and send it to the DVLA. The address is on the form. You won’t 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 it can and, as long as there are no other conditions that disqualify you from driving, you'll then be allowed to start driving again. The DVLA may ask your cardiologist for more details before clearing you to drive.

Telling your motor insurance company about your pacemaker

Whatever your type of driving licence, you must tell your insurance company that you've had a pacemaker fitted. If you don’t, your insurance may not be valid.

Sports

Your doctor and nurses will advise you about the activities you can do, but it's important to avoid strenuous exercise before your first follow-up appointment, which will usually be about four to six weeks after your pacemaker has been fitted. After this, you can carry on with, or take up, most activities and sports.

If you play contact sports such as football, rugby or martial arts, however, you should take care to avoid collisions that may damage your pacemaker. Your cardiologist and pacemaker clinic staff will be able to advise you about this. They might suggest you wear a protective pad over the site, for example.

Problems with everyday equipment are rare. Pacemakers have a metal casing to shield them from interference and a special circuit to detect and remove unwanted electrical activity. For more information, read the booklet about your type of pacemaker which you were given when your device was fitted. If you have any questions about what you can and can’t do, contact your pacemaker clinic or the manufacturer.

At home

Electrical equipment that you use at home – such as hairdryers and microwave ovens – will not be a problem, as long as they're at least 12 centimetres (5 inches) from your pacemaker. You should also be able to use household tools such as drills, mowers and electric screwdrivers, as long as they're in good condition. For more details, contact your pacemaker clinic or the manufacturer.

If you use an induction hob for cooking, keep the appliance at least 60 centimetres (2 feet) from your pacemaker, as these cookers generate an electromagnetic field that may interfere with your device’s settings. However, if you're of average height or above, this won't be a concern.

Phones and computer equipment

Mobiles, cordless phones, tablets, iPods and MP3 players

You can use mobiles, cordless phones, tablets, iPods and other brands of disk-based or solid-state MP3 players, as long as you don’t place them directly over your pacemaker. If you keep them at least 12 centimetres (5 inches) away from your pacemaker, you avoid any possible risk of interference.

Avoid having headphones within 3 centimetres (just over an inch) of your pacemaker, so don’t put them in a pocket near the pacemaker or let them dangle around your neck when you’re not using them.

You can safely use your mobile or cordless phone but keep it more than 12 centimetres (5 inches) away 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 booklet you were given when your pacemaker was fitted.

Hands-free kits and Bluetooth

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

WiFi, wireless LAN, wireless internet for computers and 3G/4G networks

There's no clear evidence that these interfere with pacemakers.

Games consoles

There's no clear evidence that devices such as the Wii, PlayStation or Xbox have an effect on pacemakers, but games manufacturers advise you to contact your pacemaker manufacturer for more guidance.

TENS machines and body-toning equipment

TENS machines (used for pain relief – for example, for arthritis) and body-toning equipment rely on fast, short, high-voltage eletrical pulses. Contact your pacemaker clinic or manufacturer for more information about using these devices. A TENS machine will probably need to be tested at the clinic to make sure it doesn't interfere with your pacemaker.

Airport security systems

Airport screening systems rarely cause problems with pacemakers. Carry your pacemaker identification card with you to show the security staff. They may do a hand search or check you with a hand-held metal detector. Make sure the metal detector isn't placed directly over your pacemaker.

Some countries still insist that you go through the security system. If so, it’s unlikely that your pacemaker will be affected. Just walk through without lingering.

Security systems in shops

Many shops have anti-theft detectors in their doorways. As with airport security, walk steadily through and don’t linger; your pacemaker shouldn't be affected. Some stores have 'trolley-ators', which are similar to escalators but secure your trolley while you go from floor to floor. There's a theoretical risk that these could have a temporary effect on your pacemaker, so avoid them if possible.

Metal detectors

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

Magnetic devices and fasteners

There's a very small, theoretical risk that small magnetic devices – such as the magnetic fasteners on a tablet computer case – could affect your pacemaker. So while normal use is fine, it’s sensible to avoid 'hugging' these devices against your pacemaker.

At work

Some workplaces have strong electromagnetic fields that can interfere with your pacemaker – for example, if arc-welding is carried out. If you're concerned about any equipment at your workplace, speak to your pacemaker clinic. The Medicines and Healthcare products Regulatory Agency (MHRA) also has up-to-date information. You can find their contact details on the next page.

Medical and dental tests

Most medical and dental tests won't affect your pacemaker but some equipment may cause interference, so remember to tell the person treating you that you have a pacemaker.

Most scans are safe, including X-ray and CT scans. In the past, MRI scans weren't used on people with pacemakers, however, some of the new models can withstand MRI scanning. Ask at your pacemaker clinic if your device is suitable. If so, this may be shown on your pacemaker ID card.

If you have an accident or go to a hospital accident and emergency department for any reason, tell the doctors and nurses that you have a pacemaker, in case it needs to be checked.

For more information

Each pacemaker manufacturer gives detailed instructions about the sources of electromagnetic interference you should avoid. If you have any questions about this, ask the staff at your pacemaker clinic.
For more information, you can contact the Medicines and Healthcare products Regulatory Agency (MHRA):

Devices Division
151 Buckingham Palace Road
London SW1W 9SZ.
Phone: 020 3080 6000
Email: aic@mhra.gsi.gov.uk
Website: www.mhra.gov.uk

It's very important to have your pacemaker checked regularly at your clinic. These checks aren' t at all painful. Your appointments may be every three to twelve months, depending on your type of pacemaker and how well it’s working. You'll have these follow-up appointments for the rest of your life.

Most modern pacemakers can store information about the state of the battery and how the pulse generator is working. At each appointment, a specialist (cardiac physiologist or cardiologist) will check the battery life and the pacemaker settings (discharge rate), measure the strength of the electrical impulse, and record the effects of the impulse on your heart.

Changing the battery

Your pacemaker will eventually need a new battery. Batteries usually last between six and ten years, sometimes even longer. Changing the battery involves replacing the complete pacemaker box. The original lead or leads are tested, and if they're still working well they'll be left in place. If they're showing signs of wear, however, they too will be replaced. Having a new battery fitted is usually straightforward, similar to having the pacemaker inserted in the first place (see page 21). Again, this may be done as a day case or you may need to stay in hospital overnight.

Some people are given temporary pacing while they're in hospital. This is usually only done if their heart rhythm is very unstable and it's not safe to wait for a permanent pacemaker. For example, temporary pacing may be used when someone develops a very low heart rate (severe bradycardia) or a serious heart block, often due to a heart attack. Sometimes, though, temporary pacing is used in a planned way, for example, as a temporary measure during surgery – see page 51.

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

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

Internal temporary pacing – also called **transvenous pacing** – involves inserting a wire into the right side of the heart by passing it through a vein in the groin or the neck. The person is given a local anaesthetic and sedated, if necessary. The wire is then connected to a pacing box outside the body. This is usually done as an emergency procedure because a person's heart rhythm has become unstable, for example, after a heart attack. If their heart rhythm fails to return to normal, they might need a permanent pacemaker.

Sometimes, temporary pacing is planned beforehand. For example, if someone who has heart block is having surgery, then temporary pacing may be used in case the anaesthetic affects their heart rhythm. If the person is having heart bypass surgery, the pacing wires can be attached to the outside of the heart muscle (epicardial pacing). Internal temporary pacing is only used for short periods because of the risk of infection.

LEADING THE FIGHT...

against heart disease

The BHF is the largest independent funder of cardiovascular research in the UK. Some highlights of our life saving research into pacemakers include:

1. Investigating whether a new form of pacemaker that uses artificial brain cells to time the delivery of electrical impulses to the heart improve life for some people living with heart failure.

2. Funding a clinical trial to test whether a new type of pacing therapy could improve symptoms and quality of life for people with heart failure. Some heart failure patients in the UK aren't currently eligible for available pacing therapies and could benefit from this new treatment, which stimulates the body's own natural electrical activation system to allow the heart to contract normally.

Our life saving research is powered by your support. If you'd like to make a donation, please see the inside front cover for more details.

For more information on the BHF's research into pacemakers, see bhf.org.uk/research

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

A person who is having a cardiac arrest may develop a dangerously fast heart rhythm which can 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.

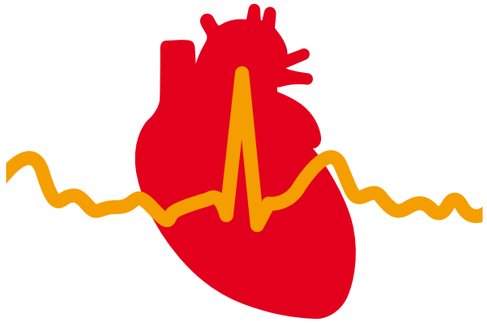
There are now **public access defibrillators** – or **PADs** for short – in many workplaces, shopping centres, train stations, leisure centres and village halls. It's very easy to use a PAD. The machine gives clear, spoken instructions and you don't need training to use one.

Once switched on, the PAD will instruct you how to attach the pads, whether or not a shock is needed and how to deliver it.

Find out where the PADs in your local area are. For more information, go to **bhf.org.uk/defibs**

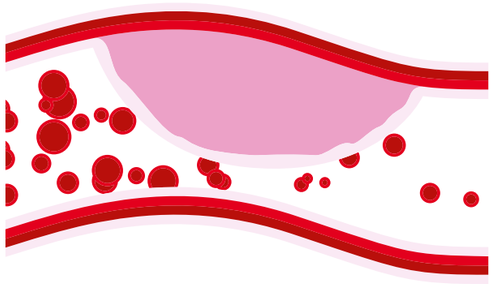
The most important thing you can do to help save a person's life is **CPR – cardiopulmonary resuscitation**. This, along with defibrillation, can double someone's chance of survival in some cases. We explain how to do CPR on the next pages.

CARDIAC ARREST is an **ELECTRICAL** problem



The person will be
UNCONSCIOUS
- Call 999
- Start CPR

A HEART ATTACK is a **CIRCULATION** problem



The person will probably be
CONSCIOUS
- Call 999
- Keep them calm

CALL PUSH RESCUE

If someone has had a cardiac arrest, they will be unconscious, and either not breathing or not breathing normally. The person needs immediate help or they will die within minutes.

First check that it is safe to approach the person.

To find out if the person is conscious, gently shake him or her, and shout loudly, 'Are you all right?' If there is no response, the person is unconscious.

You will need to assess the person's **airway** and **breathing**.



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

Look, listen and feel for signs of normal breathing. Only do this for up to ten 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.

Now remember: **Call Push Rescue**

CALL...

Call for help.

If the person is unconscious and is either not breathing or 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.**



PUSH...

Push hard and fast on the centre of the chest.



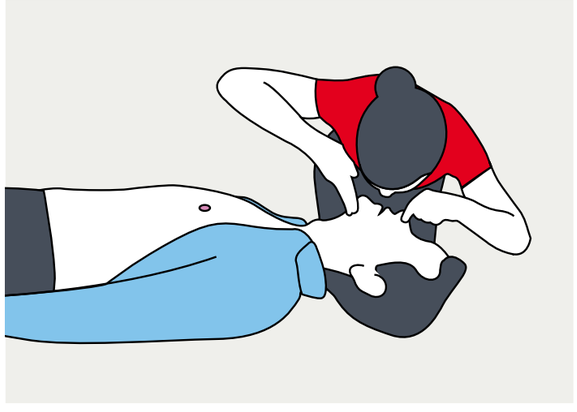
Start chest compressions.

- 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 five and six centimetres each time. Do this at a rate of about 100 to 120 times a minute. That's about two each second.

RESCUE...

Give 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 five seconds to give the two rescue breaths.

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

Keep doing the 30 chest compressions followed by two 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.

If you prefer not to give rescue breaths

If you'd rather not give rescue breaths, call 999 and then deliver **hands-only CPR**. Keep doing the chest compressions – at a rate of about 100 to 120 times a minute.

For more on this, see **bhf.org.uk/handsonly**

British Heart Foundation website

bhf.org.uk

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

Genetic Information Service

0808 802 1234

(A similar cost to 01 or 02 numbers.)
For information and support on inherited heart conditions.

~~Online community~~

healthunlocked.com/bhf

Share your experiences, stories, tips and ideas with other people like you in our online community.

Heart Helpline

0808 802 1234

(A similar cost to 01 or 02 numbers.)
For information and support about your heart condition and keeping your heart healthy.

Twitter

@TheBHF

Get our latest news and views directly into your Twitter feed.

Facebook

facebook.com/bhf

Join the conversation and get our latest news and updates on Facebook.

For more information on the topics covered in this booklet

Living with an inherited heart condition

A series of booklets for people with an inherited heart condition and their families, describing how and why the condition develops, and how it's diagnosed and treated, including:

- Dilated cardiomyopathy
- Hypertropic cardiomyopathy
- Sudden arrhythmic death syndrome
- Inherited abnormal heart rhythms

The road ahead: your guide to heart tests and treatments

A DVD showing real people's journeys through a variety of tests and treatments to help you know what to expect and how to prepare. The films are also available to view online.

You can find downloadable infomation on heart block and myocarditis at bhf.org.uk/publications

Our services

For more information about any of our services, contact the BHF on **0300 330 3322** or visit **bhf.org.uk**

Nation of life savers

The BHF has a vision to create a nation of life savers. As part of that vision, we're doing everything we can to make sure the UK public know CPR and can use public access defibrillators. Join the fight for every heartbeat and help us save the lives of thousands of people across the UK every year. Find out more at **bhf.org.uk/cpr**

- **Heartstart** is a free, two-hour course where you can learn CPR and other emergency life saving skills.
- Our **Call Push Rescue** training kit is available free to eligible secondary schools, and for a small fee to workplaces and community groups. It has everything you need to learn CPR, including a training DVD.

Heart Matters

Heart Matters is the BHF's free, personalised service offering information to help you lead a heart-healthy lifestyle. Join today and enjoy the benefits, including *Heart Matters* magazine and access to online tools. Call the **Heart Matters Helpline** on **0808 802 1234**, 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 **0808 802 1234**.

Help Shape the BHF – Heart Voices

Heart Voices is a growing network of heart patients who use their experiences to make sure our work meets the needs of patients. By signing up, you'll get the chance to shape the BHF by helping us to make new resources to informing our research. Visit **bhf.org.uk/heartvoices** for more information and to sign up.

Booklets and DVDs

To order our booklets or DVDs:

- call the BHF Orderline on **0300 200 2222**
- email **orderline@bhf.org.uk** or
- visit **bhf.org.uk/publications**

You can also download many of our publications from our website.

Our resources and services are free of charge, but we rely on donations to continue our vital work. If you'd like to make a donation, please call our donation hotline on **0300 330 3322** or visit our website at **bhf.org.uk/donate**

Heart Information Series

This booklet is part of the *Heart Information Series*. The booklets in this series are:

- Angina
- Atrial fibrillation (AF)
- Blood pressure
- Cardiac rehabilitation
- Caring for someone with a heart condition
- Coronary angioplasty
- Diabetes and your heart
- Heart attack
- Heart failure
- Heart rhythms
- Heart surgery
- Heart transplant
- Heart valve disease
- Implantable cardioverter defibrillators (ICDs)
- Keep your heart healthy
- Living with a pacemaker
- Medicines for my heart
- Peripheral arterial disease
- Reducing my blood cholesterol
- Returning to work
- Tests

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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:

BHF Customer Services
Compton House,
2300 The Crescent,
Birmingham Business Park,
Birmingham B37 7YE

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

- **Wendy Churchouse**, BHF Arrhythmia Specialist Nurse, Morriston Hospital.

THANK YOU

This booklet is part of the *Heart Information Series*. We distribute 2 million booklets from this series each year. Without your hard work and support the British Heart Foundation wouldn't be able to provide this vital information for people with heart conditions.

Donate to the fight at **bhf.org.uk/donate**

British Heart Foundation

For over 50 years our research has saved lives.

We've broken new ground, revolutionised treatments and transformed care.

But heart and circulatory disease still kills one in four people in the UK.

That's why we need you.

With your support, your time, your donations, our research will beat heart disease for good.

FIGHT FOR EVERY HEARTBEAT

bhf.org.uk

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