

Patient information from the BMJ Group

Cardiac arrest

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Cardiac arrest

A cardiac arrest is a medical emergency. When someone has a cardiac arrest it means their heart stops beating and you can't feel a pulse. If you find someone like this it's vital to get their heart started again as quickly as possible. You or someone with you will need to dial 999 to get medical help. If you have training in cardiopulmonary resuscitation (CPR), you may also be able to increase someone's chances of surviving a cardiac arrest.

We've brought together the best research about cardiac arrest and weighed up the evidence about how to treat it.

What is a cardiac arrest?

When a person has a cardiac arrest, blood isn't pumped to their lungs, the rest of their body, and back to their heart. It's a dangerous medical emergency that needs urgent treatment.



Cardiac arrest is a medical emergency that needs to be treated immediately.

To understand what happens during a cardiac arrest it helps to know a little bit about your heart. To read more, see [How your heart works](#) .

A cardiac arrest isn't the same thing as a [heart attack](#) . Heart attacks happen when a blood clot blocks the flow of blood to the heart. However, a heart attack can lead to cardiac arrest.

Cardiac arrest

You are more likely to have a cardiac arrest if: ^[1]

- You have **heart disease**
- You've had a heart attack
- You have **heart failure**
- You're middle-aged or older
- You're a man.

What are the symptoms of a cardiac arrest?

If you have a cardiac arrest, you will pass out (become unconscious). If you were standing up, you will fall to the ground. This is because too little blood is getting to your brain and the rest of your body.

Before a cardiac arrest you may:

- Feel sick
- Feel dizzy
- Get pains in your chest
- Find it hard to breathe.

To confirm that someone is having a cardiac arrest, a doctor or paramedic will check whether they have a pulse. They may also look at the rhythm of their heart using an electrocardiogram (ECG). The ECG shows the electrical activity in the heart as a line on a moving graph or screen. Doctors look at the size, shape, and spacing of the line to see what is happening to the heartbeat. ^[2]

When a person has no heartbeat (or pulse), no **blood pressure**, and no electrical activity in the heart, the ECG line is flat. This is called **asystole**. It usually means that the person's heart hasn't had any oxygen for some time. But sometimes it's still possible to get a normal heartbeat back. If asystole continues for five to 10 minutes, the person is usually declared dead.

In a cardiac arrest, the heart is not pumping normally in one of several ways:

- There is no activity in the heart at all. This is called asystole. An ECG shows a flat line.

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- The heart is beating fast (150 to 200 beats a minute). The beats start in the lower chambers (ventricles) of the heart instead of the upper chambers. Doctors call this pulseless ventricular tachycardia.
- The heart beats very fast (more than 300 beats a minute) and very irregularly. The beats again start in the ventricles instead of the upper chambers of the heart. Doctors call this ventricular fibrillation.

In all of these cases, the person has no pulse and is not breathing.

How common are cardiac arrests?

Cardiac arrests happen in a large number of people.

Each year in the UK, about 75,000 people who are not in hospital have a cardiac arrest.

[3]

What treatments work for cardiac arrests?

A cardiac arrest is a medical emergency. Someone having a cardiac arrest should be given cardiopulmonary resuscitation (CPR) or electric shock treatment as soon as possible. Otherwise, they will die. Several drugs have also been tried for cardiac arrest, but we're not sure if they help.

- If you find someone who is having a cardiac arrest, you can improve their chances of survival by using **cardiopulmonary resuscitation** (CPR). This involves pressing down on their chest and breathing into their mouth. To learn more, see [Cardiopulmonary resuscitation](#).
- Another way to get a person's heart started again is to give their heart an electric shock with a machine called a **defibrillator**.
- Once a person's heart is restarted, cooling their body temperature for 12 to 24 hours is likely to help them survive and reduce their risk of serious brain damage.
- Several drugs have been tried in people having a cardiac arrest. But we need more research to say whether any can help.

Which treatments work best? We've looked at the best research and given a rating for each treatment according to how well it works.

Treatment Group 1

Treatments for cardiac arrest

Treatments that are likely to work

- [Defibrillation](#)
- [Cooling the body \(therapeutic hypothermia\)](#)

Treatments that need further study

- [Amiodarone](#)
- [Lidocaine](#)
- [Procainamide](#)

Treatments that are unlikely to work

- [Bretylium](#)

What will happen to me?

Without emergency treatment, cardiac arrests are nearly always fatal. That's why it's so important to dial 999 straight away.

Even if treatment gets someone's heart beating again, about 8 in 10 people will be in a coma after a cardiac arrest. ^[4] Sadly, many of these people die later, without regaining consciousness. However, of the people who are in a coma, about 2 in 10 will become conscious again.

Although people do survive cardiac arrests, some are left with permanent brain damage. ^[4] This may mean they can't lead a normal life again. If a person's brain is starved of oxygen for more than about four minutes, brain damage is usually irreversible.

It's hard to say who is likely to recover after a cardiac arrest. But people who are least likely to recover are those who: ^[4]

- Were already very ill before they had their cardiac arrest
- Had a long period when their heart wasn't beating
- Had poor results on tests for reflexes after their cardiac arrest.

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Surviving a cardiac arrest

Although a cardiac arrest is dangerous, some people do recover. Doctors talk about the **chain of survival**. This is a sequence of events that gives someone the best chance of surviving. It goes like this: ^[5]

- Someone recognises the signs of a heart attack or cardiac arrest
- They call 999
- Someone starts [CPR](#) straight away
- The patient is treated with an electrical defibrillator as soon as possible. This is often done by paramedics, but some public places now have easy-to-use, automatic defibrillators that can be used before the emergency services arrive
- The patient gets advanced care from trained paramedics, such as having a breathing tube fitted, and is taken to hospital.

Treatments:

Defibrillation

In this section

A defibrillator is a machine that gives your heart an electric shock. This can make your heart beat normally again.

Doctors, paramedics, and other medical professionals have been equipped with defibrillators for years. More recently, defibrillators have been designed so that they can be used by members of the public. Some public places, such as railway stations or offices, have defibrillators for use in an emergency.

Defibrillators made for the public are automatic. Some even play recorded instructions telling you what to do. You start by attaching two pads to the patient's chest. The device then monitors the person's heartbeat to make sure that an electric shock is the right treatment. You won't be able to trigger the defibrillator unnecessarily. Although these defibrillators are made to be as simple as possible to use, it's best to have training in how to use them safely and correctly.

If you are helping someone who is using a defibrillator, you may be asked to give CPR before and after electric shocks are given. To read more, see [Cardiopulmonary resuscitation](#) .

One electric shock may be enough to make a person's heart beat normally again. But many people need more shocks. ^{[8] [9] [10]} One study found that three shocks from a modern type of defibrillator helped 98 in 100 people to get a normal heartbeat again. ^[10]

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A drug called adrenaline is sometimes used to try to stimulate the heart between electric shocks. This drug is usually used by doctors or paramedics after an ambulance arrives, or at hospital.

Doctors will keep trying to get your heart to beat normally if they can feel a pulse at any time, or get some sort of rhythm on an [electrocardiogram](#). Even if they think there is no chance of recovery, they usually still keep trying to resuscitate someone for about 15 minutes.

Amiodarone

In this section

Amiodarone is a drug that's used to control the electrical signals that tell your heart to beat. It works on the nerves around your heart. It is sometimes given to people who are having a cardiac arrest, when [defibrillation](#) has already failed to restart their heart.^[7] The brand name for amiodarone is Cordarone.

Amiodarone can cause [low blood pressure](#) or a slow heartbeat.^[11] But these problems may not be very important to someone who is having a cardiac arrest.

There's no good evidence that amiodarone helps people survive a cardiac arrest.^{[11] [12]}

Lidocaine

In this section

Lidocaine is a drug that's sometimes used to try to restart a person's heart when [electric shocks](#) haven't worked. The brand name is Minijet Lignocaine.

Lidocaine can cause [low blood pressure](#), so other drugs have to be given to raise it.^[13]

There isn't any good-quality evidence that lidocaine helps people survive a cardiac arrest.^{[13] [14] [15]}

Procainamide

In this section

Procainamide (brand name Pronestyl) isn't used very often to treat cardiac arrest. Injecting procainamide into a [vein](#) takes several minutes. So doctors prefer to use another drug that can get into your body more quickly.^[1]

There's no evidence that procainamide can help people survive a cardiac arrest.^[16]

Bretylium

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In this section

Bretylium isn't available in the UK. It doesn't seem to help people survive a cardiac arrest and it can cause a harmful drop in blood pressure, which is hard to put right.^[17]

Cooling the body (therapeutic hypothermia)

In this section

Therapeutic hypothermia is a newer treatment for cardiac arrest. It involves cooling a person's body temperature to between 32°C and 34°C (90°F and 93°F) and keeping it there for 12 to 24 hours. Doctors think that this can help prevent brain damage by slowing how fast normal blood flow returns to the brain. If regular blood flow returns too quickly, this may trigger the release of chemicals that can cause damage.

There are several ways to reduce a person's body temperature. Doctors may use a blanket or mattress filled with air or fluid, a special cooling cap, or ice packs. Cold fluid can also be put into a person's vein through a drip (an intravenous infusion, or IV).^[18] The patient is not awake during cooling and is given muscle relaxants to prevent shivering. After the cooling period, the person is gradually warmed until their body temperature returns to normal.^[19]

A review of studies (a systematic review) found that people who had their body cooled within six hours of entering hospital were more likely to survive and less likely to have serious brain damage. Among people who had cooling:^[18]

- About 57 in 100 didn't die while in hospital, compared with 42 in 100 who didn't have this treatment.
- About 54 in 100 had little or no brain damage, compared with 35 in 100 who didn't have the treatment.

There is disagreement about whether starting the cooling in the ambulance, before a person arrives at hospital, may also help.^[20] The most recent studies suggest it isn't helpful.^{[21] [22]}

Cooling the body isn't without risk. Problems reported by doctors include blood vessel and blood clotting problems, heart rhythm problems, infections, and inflammation of the pancreas.^[19] However, the review found that these problems were only slightly more common among people who had this treatment than among those who did not.^[18] The difference was so small that it could have been down to chance.

Further informations:

How your heart works

Your heart is divided into four chambers. The two chambers at the top are called the **left atrium** and the **right atrium**, and the two at the bottom are called the **left ventricle** and the **right ventricle**.

Every time your heart beats, several things happen.

- Your heart relaxes so blood can get into the two upper chambers.
- The two upper chambers then get smaller, squeezing blood into the two lower chambers.
- The two lower chambers then get smaller and pump blood out to your lungs and the rest of your body.
- **Veins** throughout your body then return the blood back to your heart, and the cycle begins again.

Normally, your heart beats about 60 to 80 times a minute. But it can beat as many as 150 times a minute if you are exercising hard and your body needs more oxygen.

Cardiopulmonary resuscitation

Cardiopulmonary resuscitation (CPR) can help someone survive a cardiac arrest. ^[6]
Doing CPR is tiring, but it's best to keep on until the emergency services arrive. If there are other people around who can help, you can take turns doing CPR.



With CPR, you can help someone's heart and lungs work until medical help arrives.

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You do CPR by:

- Pressing down on the person's chest to make blood leave their heart
- Breathing into their mouth to give them oxygen. However, if you don't want to breathe into someone's mouth, it's better to just press on their chest than do nothing at all. [\[6\]](#)

The idea is to manually help someone's heart and lungs work until medical help arrives. CPR won't usually get someone's heart beating again. That's why you need to keep going until the emergency services arrive.

CPR needs to be done correctly to work. It's best to go to an organised class to learn how to do basic life support, and to practise. We've listed the key steps here. [\[7\]](#)

Gently shake the person's shoulders and ask them loudly if they are all right.

If there is no response, shout for help.

Turn the person on to their back and make sure that air can get down their windpipe by:

- Placing your hand on their forehead and tilting their head back
- Using your fingertips to lift their chin.

Take no more than 10 seconds to:

- Look to see if their chest is moving
- Listen for breath sounds
- Feel if they are blowing air out onto your cheek.

Don't waste time trying to find a pulse, as it can be hard to be sure whether you can feel one.

If the person isn't breathing normally, ask someone to call 999 for an ambulance and to get a [defibrillator](#) if one is available. If you are alone, use your mobile phone to call for an ambulance. Then start performing CPR:

- Kneel by their side
- Place the heel of one hand in the centre of their chest
- Place the heel of your other hand on top of the first hand

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- Interlock the fingers of your hands
- Position yourself directly above the person's chest and, with your arms straight, press down on the breastbone (sternum) 5 to 6 centimetres (2 to 2 1/3 inches).

This is called **chest compression**. (Don't press on the person's ribs, the bottom end of their breastbone, or their stomach.)

After each compression, release all the pressure on the person's chest, without taking your hands off their breastbone.

You should do 100 to 120 compressions every minute (around two a second).

The compression and the release should take the same amount of time.

After 30 compressions:

- Open the airway again by tilting the person's head and lifting their chin
- Pinch the soft part of the person's nose closed
- Allow their mouth to open, but keep their chin up
- Take a normal breath and place your lips around the person's mouth, making sure that no air leaks out
- Blow steadily into their mouth for about one second and watch their chest rise
- Keeping their head back, take your mouth away, and watch their chest fall as air comes out
- Take another normal breath and blow this into the person's mouth. Two breaths should not take more than 5 seconds.

Put your hands back on their breastbone, and give 30 more compressions followed by two more breaths.

Stop to recheck the person only if they start showing signs of regaining consciousness (such as coughing, speaking, opening their eyes, or moving purposefully) and they start to breathe normally. Otherwise, keep doing CPR until an ambulance arrives. Try not to interrupt the pattern of 30 compressions followed by two breaths. If you can keep the life support going, you are more likely to save the person's life.

Breathing problems

If your breaths do not make the chest rise as in normal breathing, then before your next attempt:

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- Check the person's mouth and remove any visible obstruction
- Make sure their head is tilted back and their chin is lifted up.

Chest compressions alone

If you can't, or don't want to, blow into the person's mouth, it is still worthwhile giving chest compressions.

- Do them continuously at a rate of 100 to 120 a minute.
- Someone else may be prepared to blow into the person's mouth.

Glossary:

heart disease

You get heart disease when your heart isn't able to pump blood as well as it should. This can happen for a variety of reasons.

heart failure

When the heart loses its ability to push enough blood through the blood vessels, it is called heart failure.

veins

Veins are blood vessels that carry blood back to your heart after your blood has delivered oxygen and food to the tissues.

blood pressure

Blood pressure is the amount of force that's exerted by your blood on to your blood vessels. You can think of it like the water pressure in your home: the more pressure you have, the faster and more forcefully the water flows out of the shower. Blood pressure is measured in millimetres of mercury (written as mm Hg). When your blood pressure is taken, the measurement is given as two numbers, for example 120/80 mm Hg. The first, higher, number is called the systolic pressure, and the second, lower, number is the diastolic pressure. The systolic number is the highest pressure that occurs while your heart is pushing blood into your arteries. The diastolic number is the lowest pressure that happens when your heart is relaxing and is not pushing your blood.

electrocardiogram

An electrocardiogram is a test that measures the electrical activity in your heart. The test doesn't hurt. It tells doctors how well your heart is working. It is called ECG for short.

low blood pressure

If your blood pressure is about 100/60 or less, your doctor may say that you have low blood pressure. Low blood pressure is usually not a problem unless it becomes too low to push blood to your brain and the rest of the body. If you have low blood pressure, you may sometimes feel dizzy when you stand up.

systematic reviews

A systematic review is a thorough look through published research on a particular topic. Only studies that have been carried out to a high standard are included. A systematic review may or may not include a meta-analysis, which is when the results from individual studies are put together.

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