



CRT/ICD/S-ICD/EV-ICD patient information



Working together to improve the diagnosis, treatment
and quality of life for all those affected by arrhythmias

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Glossary

Atria The top chambers of the heart that receive blood from the body and from the lungs. The right atrium is where the heart's natural pacemaker (sino atrial node - SAN) can be found

Arrhythmia An abnormal heart rhythm

Bradycardia A slow heart rate, normally less than 60 beats per minute

Cardiac arrest When the heart completely stops beating

Cardioversion The use of a small synchronised energy shock to stop fast heart rhythms

Defibrillation The use of a higher non-synchronised energy shock to stop fast heart rhythms

Extravascular Implantable Cardioverter Defibrillator (EV-ICD) Similar to the S-ICD, the implanted device constantly monitors the heart and will deliver small electrical signals to correct the heart rhythm, or an electrical shock if the rhythm continues to be too fast

Important Information

This booklet is intended for use by people who have, or are about to have an ICD/CRT implanted, and their carers. The information within this booklet comes from research and previous patients' experiences and gives a brief explanation of how the device works.

This booklet should be used in addition to the information given to you by doctor, nurse and physiologist. If you have any questions about any of the information given in this booklet, please ask your nurse, doctor, cardiac physiologist or ICD clinic.

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Heart attack Occurs when one of the coronary arteries becomes blocked by a blood clot. The blood supply to part of the heart muscle is blocked, causing part of the heart muscle to die

Implantable Cardioverter Defibrillator (ICD)

A device that monitors the heart rhythm continuously and treats dangerously fast heart beats the device sits on the side of your chest, and the lead goes next to the sternum (S-ICD) or under the sternum (EV-ICD)

Pulse generator The part of the ICD which contains the battery and electric circuits

Subcutaneous Implantable Cardioverter Defibrillator (S-ICD)

Is implanted to deliver an electrical shock to the heart to restore normal (sinus) rhythm if required

Ventricles The two lower chambers of the heart. The right ventricle pumps blood into the lungs and the left ventricle pumps oxygenated blood around the body

Ventricular tachycardia (VT) A fast heart rhythm which causes the heart to pump less efficiently, and can lead to dizziness, fainting and unconsciousness. If not treated with medication or an electric shock, the rhythm can lead to ventricular fibrillation

Ventricular fibrillation (VF) A fast, irregular, dangerous heart rhythm which causes the heart to stop pumping blood efficiently. This rhythm needs a shock to stop it and return the heart back to a normal rhythm. A cardiac arrest can soon follow if the rhythm is not treated quickly with a shock

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Why might I need an ICD?

Your cardiologist will advise you. However, if the doctor has suggested that you need a defibrillator you may have experienced OR will be at risk of experiencing an abnormal, fast heart rhythm that can cause you to become unwell, unconscious, or your heart to stop beating.

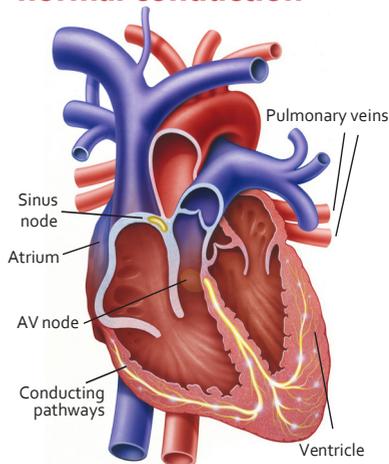
How the heart works normally

The heart is a muscle; its function is to pump blood and oxygen around your body to all of your vital organs. It has four chambers, two at the top (the right and left atria) and two at the bottom (the right and left ventricles). The heart also has an electrical system, which sends impulses (beats), through the heart causing it to contract and pump blood around the body.

Each normal heartbeat begins in the natural pacemaker of the heart (the sino-atrial or SA node) which lies at the top of the right atrium. It then travels across the two top chambers and down through a small junction (the atrioventricular or AV node) which lies between the upper and lower chambers. It then spreads across the bottom chambers (ventricles) causing the heart to contract and pump blood to the lungs via the right ventricle and oxygenated blood around the body via and the left ventricle.

Sometimes the electrical system in your heart does not work as well as it should. This can cause your heart to beat too quickly or too slowly. A defibrillator can stop fast heart rhythms that start in the ventricles, the bottom two chambers of the heart. This fast heart rhythm is called ventricular tachycardia or VT. Some people can have an even faster, irregular heart rhythm called ventricular fibrillation or VF. This is life-threatening if it is not treated quickly with an electric shock delivered to the heart. You will need to have some tests before the decision to have an ICD fitted is made, such as an electrocardiogram, an echocardiogram, blood tests, and maybe a few others. Your cardiologist will advise as to what is needed.

The heart and normal conduction



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What is an Implantable Cardioverter Defibrillator (ICD)?

ICD stands for implantable cardioverter defibrillator; often called an ICD or defibrillator. It is made up of an electronic device containing a battery and electronic circuitry, and is connected to one or more wires known as leads. There are two types of ICDs being implanted today:

- transvenous (through the veins and into the heart) ICD systems and
- the subcutaneous S-ICD, which does not touch the heart but sits just under the skin.

Both types of ICDs can recognise and monitor your heart rhythm and can give you some treatments if needed.

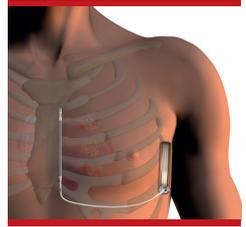
What can the ICD do?

Most modern ICDs have three main functions; Your cardiologist and cardiac physiologist will select settings that are best for you.

- If your heart beats too fast, the ICD can give you a burst of extra beats at an even faster rate which will possibly return your heart back to a normal rhythm. This is called anti-tachycardia pacing (ATP).
- If the anti-tachycardia pacing does not bring your heart back to a normal rhythm, or if the ICD senses a faster rhythm called ventricular fibrillation, the ICD can then give one or more high energy shocks. This is called defibrillation. An ICD is valuable in preventing heart attacks and sudden death in individuals who have dangerous heart rhythms.
- If your heart rhythm is too slow, the device can give your heart extra beats by working as a pacemaker. This is called bradycardia pacing. However, you may not need this function. This is something your cardiologist and cardiac physiologist will decide.

What is an S-ICD?

S-ICD stands for Subcutaneous Implantable Cardioverter Defibrillator. If your doctor has suggested that you need an S-ICD, you may have experienced or be at risk of experiencing an abnormal, fast heart rhythm. The S-ICD recognises and monitors your heart rhythm and will deliver electrical therapy to shock your heart back into normal (sinus) rhythm if required. The S-ICD is a sophisticated, battery-powered, electronic device that is placed just under the skin on the left side of your chest. The device is connected to one insulated wire (lead), placed just under the skin alongside the breast bone, that senses the heart's electrical signals.



What is an EV-ICD?

EV-ICD stands for Extravascular Implantable Cardioverter Defibrillator. The device constantly monitors the heart to check if your heart is beating too fast, or irregularly, if so, the EV-ICD will send small electrical signals to correct the heart rhythm (known as anti-tachycardia pacing/ATP). If the heart rhythm continues to beat too fast, it will deliver another shock to reset and return to sinus rhythm.

What is the difference between an ICD and S-ICD/EV-ICD?

A traditional implantable cardioverter defibrillator (ICD), otherwise known as a transvenous ICD (TV-ICD), has one or more leads that enter through your veins into the heart and across the valve, allowing the device to provide pacemaker functions as well as defibrillation. The S-ICD and EV-ICD performs exactly the same function as the ICD, however, the device sits on the side of your chest, and the lead goes next to the sternum (S-ICD) or under the sternum (EV-ICD). An EV-ICD also has anti-tachycardia pacing and pause prevention pacing (NOT bradycardia pacing like the TV-ICD). It is able to monitor your heart rhythm. It can accurately keep a check on your heart rhythm and send the right electrical signals if needed. These devices are implanted to give you the best treatment for your heart rhythm condition.

What is cardiac resynchronisation therapy (CRT)?

Cardiac resynchronisation therapy (CRT) devices are used to help treat heart failure and can be either a permanent pacemaker, or an ICD. They work by making the lower heart chambers (ventricles) pump at the same time (synchronously) and

improve the overall function of the heart so that you potentially feel less breathless and have more energy.

There are two different types of CRT device:

- CRT Pacemakers
- CRT ICDs

CRT pacemakers (CRT-P)

These devices work in the same way as traditional pacemakers. They help the heart to beat in a regular rhythm and are especially useful when the heart's natural pacemaker stops working properly. An implanted pacemaker sends out electrical signals which make the heart beat in a normal way. A traditional pacemaker has either one or two leads which are put into the right side of your heart. One lead will be put into the lower right chamber (right ventricle) and a second lead may be put in the right upper chamber (right atrium). However, if you have heart failure you may need a more advanced type of pacemaker.

The main pumping chamber of the heart is on the left side, called the left ventricle. In a normal heart, both the right and left ventricles pump out blood at the same time in a coordinated way. In heart failure, the left side may not pump at the same time as the right, meaning the two sides of the heart lose their coordination. This leads to the heart being unable to pump effectively and you may become breathless, dizzy and have less energy. Over time, the heart may get even weaker and you may feel more unwell.

The main difference with a CRT pacemaker is that an additional lead is placed on the left side of the heart and electrical signals can make the left ventricle beat at the same time as the right. This can restore the heart's coordination and make the heart pump more efficiently. In two out of three people implanted with a CRT pacemaker, symptoms of breathlessness improve and they have more energy and generally feel healthier.

CRT ICDs (CRT-D)

People who have had a fast-abnormal heart rhythm, or who are at risk of developing one in the future, and who also need a CRT-pacemaker, may be suitable for a combined device. This is called a CRT-defibrillator, or CRT ICD, and works in much the same way as the standard ICD. It also has the advantage of improving symptoms of heart failure, in the same way as the CRT-pacemaker. Your cardiologist will advise you as to what is best for you.

Who might need a CRT device?

These devices do not work for all types of heart failure and you will need to have a heart scan (echocardiogram) to check the pumping function of your heart and an ECG (electrocardiogram) to check the electrical function. It is also important to note that any device fitted is not a replacement for your heart failure medication.

Why might I need a CRT pacemaker?

- If you have a problem with the electrical pathways in the heart, which means your heart beat is too slow and the left side of your heart is beating out of time with the right.
- If your overall heart function is markedly less than normal and you suffer with symptoms of heart failure despite medication and lifestyle changes.

Why might I need a CRT ICD?

- If you have previously had ventricular tachycardia or ventricular fibrillation or if you are felt to be at risk of these due to your type of heart failure, or an inherited heart condition. For Instance, LQT Syndrome, Brugada Syndrome or a similar genetic disorder that causes an irregular heart rate. Or you may even have an ICD fitted if you have experienced a Sudden Cardiac Arrest (SCA)
- If you have had a heart attack or have a significant cardiomyopathy (disease of the heart muscle) as this can cause damage to the pumping action of the left ventricle as well as causing problems with the electrical pathways in the heart.

Deciding whether or not to have an ICD

An ICD can be lifesaving but, like any invasive procedure, there are some associated risks. Having an ICD implanted is a big commitment and it is important you have read and discussed all the information before you decide to go ahead.

Around one in every ten patients will have some kind of complication from the procedure. These range from common conditions which are irritating but rarely dangerous such as a big bruise around the generator, (called a haematoma) or displacement, of a lead, which would need repositioning in a second procedure, to rare events which may be serious. These include damage to other structures such as the lung, or heart, which sometimes requires a chest drain to be inserted. This would delay your discharge from hospital and can make you very unwell.

Any procedure carries a risk of infection. You will be given antibiotics to reduce these chances, the doctor will wear a sterile gown and gloves, and your skin will be thoroughly cleaned, but it is impossible to sterilise skin entirely. Fortunately, device infections are rare, but they can be very problematic. Sometimes, the device and all leads have to be removed and the whole process started again.

Later on, once the procedure is over, the main thing that you need to be aware of is that the device can give you a shock. Some people will feel this, unless they have fainted due to a fast heart rhythm, and many people find it unpleasant (though how much is quite variable). It can feel like suddenly being punched or kicked in the chest. This is a necessary trade off when you have a fast, dangerous heart rhythm but the device can also be confused by other fast heart rhythms that are not dangerous. The programming of ICDs is improving all the time but is not perfect. The device will not take a chance and if unsure whether a shock is needed it will do so, rather than risk failing to shock something life threatening. Each year, around three to four people in every one hundred with ICDs will receive a shock they didn't need.

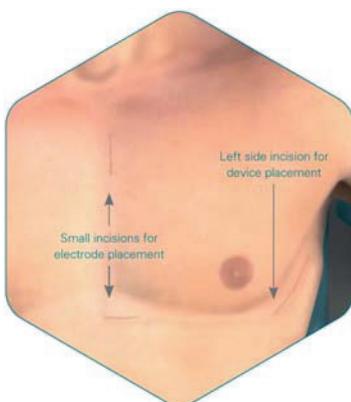
Your cardiologist will have explained to you why you need to have an ICD and the benefits of having an ICD fitted. The risks and benefits will all be explained to you and if you agree to go ahead, you will be asked to sign a consent form when it is implanted.

How is the device implanted?

Your ward nurse and a porter will take you to the cardiac pacing theatre or catheter lab. Once you are in the pacing theatre, another nurse will check your details again and you will be asked to lie on a trolley or narrow operating table. The procedure may be performed under a general anaesthetic (most S-ICDs are implanted like this), but often it will be performed with just sedation, which will make you relaxed and sleepy.

Before the TV-ICD implant procedure starts, the doctor will inject some local anaesthetic under the skin just below your collarbone (usually the left side). This will numb the area and allow the doctor to pass a small lead or electrode through a vein into your heart. You may have two or three leads inserted depending on what your doctor recommends. The leads are then connected to the pulse generator box, which is about the size of a large matchbox. This will be placed under the skin.

Before the S-ICD procedure begins, depending on your hospital/doctor's practice, general or local anaesthesia will be administered to make you feel comfortable during the procedure. An incision is made on the left side of the chest, next to the rib cage, where the S-ICD device will be inserted. One or two small incisions are made over the breastbone to allow the lead to be placed under the skin.



The S-ICD is implanted just under the skin using a left-sided incision and one to two smaller incisions along the breastbone to place and secure the system components.

The area will then be stitched with dissolvable or non-dissolvable stitches. If your stitches need to be removed by your GP, Practice Nurse, or District Nurse, you will be informed before you leave hospital.

What happens after the ICD is fitted?

After the procedure and once all the checks have been made, you will be taken back to the cardiology ward. You will be asked to lie in bed for a couple of hours then you can get up and eat and drink as normal. Since the wound can feel quite bruised and sore, especially for the first day or two, your nurse will give you regular painkillers. It is very important that you tell your nurse immediately if you have any pain at all. You will also be given some antibiotics to take before, and perhaps after, the procedure to minimise the risk of infection.

The wound, should be kept clean, and dry until it has fully healed, although it is fine to have a shower after the first three or four days. Ask your nurse for a protective dressing so that you can bathe without wetting the wound. Report any wound problems to your nurse.

If a TV-ICD system is implanted, there is a small chance that the leads can move out of position. To minimise this risk you should not lift the arm on the same side as the defibrillator (usually the left arm) above shoulder level for at least one to two weeks after the procedure. If a S-ICD system is implanted, the arm restrictions described for the TV-ICD do not apply, however it is advised to avoid arm movements that could create pressure on the wound. Local advice may vary so check with your nurse/doctor before leaving hospital.

However, it is important to do gentle arm and shoulder exercises to keep the arm mobile. You should avoid any vigorous or violent movement of that arm until you have had your first ICD check-up.

Your cardiologist will visit you on the ward at the end of the day and you will probably be allowed to go home the next day provided your ICD is checked, there are no complications, and your doctor assesses it is safe. Your ICD will be checked before you go home by a cardiac physiologist or the ICD nurse specialist. This check will involve the use of a special programmer that can look at the device settings and make sure the ICD is working properly. This check takes about 15 minutes.

After this check most patients will also have a chest x-ray to check lead positions and make sure all is well following the implant procedure. Please ask the physiologist or ICD nurse if you have any questions or worries about the device.

At this stage, you will be given an ICD identity card, emergency information, instructions and also a helpline number should you have any queries.

Going home

Although most people feel very pleased to be going home, it is only natural that you may feel a bit worried. This is very common, especially if you have been in hospital for a long time and the ICD has only just been put in.

The nurses and doctors are there to answer any questions you may have.

Arrhythmia Alliance is also a valuable resource providing information over the phone, online, and in leaflets. Similarly, if you feel upset or 'down' once you are at home it is very important that you talk to someone. Please contact your ICD clinic if you have any concerns.

Arm movements - For a TV-ICD system, scar tissue will grow around the lead(s) in your heart after a few weeks, which will prevent them moving out of place. Try to avoid lifting the arm on the same side as the ICD above shoulder height for one to two weeks at least. For an S-ICD system, try to avoid arm movements that could create pressure on the wound.

Wound site - Your wound site should take about six weeks to heal fully. Try to avoid wearing tight clothing over the wound until it has healed completely to avoid excess rubbing over the area. If you notice any redness, soreness or swelling of the area, or any signs of bleeding or oozing from the wound, report this immediately to your ICD clinic as these may be signs of wound infection.

You will probably be able to feel the defibrillator box under your skin as well as other lumps close by. These are the leads that are attached to the box, curled up beside the box under the skin. It is extremely important that you don't try to move the box or leads, but please let someone know if they continue to bother you.

Living with an ICD

Will I feel the treatment from the ICD?

The device will be programmed to the best settings for you. Your cardiologist will do this initially when the ICD is implanted, but settings can be modified during your follow-up appointments in clinic if necessary.

- **Anti-bradycardia pacing pulses**

If your heart is beating too slowly, the ICD can send small impulses through the heart which generate extra heart beats when required. As these impulses are very small they are not painful and are not noticed. Also, sometimes the heart can beat slowly for a few seconds following treatment

for a fast heart rhythm. The device can tell when extra beats are needed and give extra beats as necessary.

- **Anti-tachycardia pacing pulses (ATP)**

If your heart beats too fast, the device can send out faster pacing impulses which can help to get the heart back into a normal rhythm.

This can be done so quickly by the ICD that many people do not know that this has even happened although sometimes it can make you aware of having palpitations or of feeling dizzy.

If the ATP does not correct your fast heart rhythm your device will be able to deliver a shock.

- **Cardioversion shocks**

Your ICD may be programmed to give shocks to your heart during a synchronised specific part of the heartbeat. This type of shock is used to treat ventricular tachycardia. These are full energy shocks and many patients may find them uncomfortable.

- **Defibrillation shocks**

These are full energy shocks which the device will deliver if it senses that your heart is beating so fast that it is life-threatening.

People say this feels like they have been suddenly kicked or punched in the chest. It can be quite painful but the pain will only last for a few seconds. Some people may not feel anything if their heart is beating so fast that they have become unconscious.

If someone is with you when you have the shock, they will probably notice you jolt. No harm will come to anyone who is touching you. Indeed, it can be very comforting and reassuring to have someone put their arm around you as you experience a shock.

What should I do if the ICD gives me a shock?

You may have some warning that your ICD is about to deliver a shock such as feeling palpitations, or feeling light-headed or dizzy and be able to ask for help if possible and sit or lie down on the ground. However this may happen so quickly that you have no warning at all.

Afterwards you should recover quite quickly. Even if you feel well after the shock you should still contact the implant centre as soon as you can to arrange a device check. If you **feel unwell** or if your device has given you **several shocks**, dial 999 for an ambulance. Your ICD will be checked to find out why the shock was given. After a while, it might not be necessary to have the device checked following each shock, unless you feel unwell – your clinic will advise you if this is the case.

It is extremely important to **keep your ICD card with you at all times** so that the make, model and settings of the device can be known straight away.

ICD clinic visits

Your ICD should be checked regularly and visits may be necessary more often just after the ICD is fitted. During each clinic visit, the physiologist or device nurse will examine your ICD using a special programmer. This machine allows them to examine the settings and the battery life of your device. All the information is saved on a computer and confidentially stored in your records.

Your wound will be checked and you may have other tests done such as an ECG. Please also take this opportunity to ask any questions or let the nurse know if you have any problems or worries. You may also see the cardiologist or their registrar at your clinic visit.

Many centres can set you up for 'remote' monitoring. The term remote monitoring means monitoring your heart and implanted device while you are at home - remote from the hospital. You need a special transmitter and, using an integrated aerial, the device automatically sends medical and technical information from your heart, to your doctor and the cardiac physiologists that are treating you. Some newer ICDs can connect to your smartphone instead. This allows your doctor to monitor your condition based on accurate, up to date clinical information at any time, meaning that should you receive a shock and you are feeling well, the care team will be able to check your device and the cause of the shock while you stay at home.

Remote monitoring can also replace some routine clinic visits, saving you time. For further information, please see the Arrhythmia Alliance patient information booklet on Remote Monitoring.

Driving and ICDs/CRT

The Driving and Vehicle Licensing Agency (DVLA) has strict guidelines in relation to patients who require an ICD and whether or not they are safe to drive. There will be some restrictions but these will vary depending on why you have had your ICD fitted. It is very important that you discuss this with your nurse, physiologist or doctor at your ICD centre who will explain this in more detail.

You can access the guidelines on the DVLA website.

You will also need to tell your motor insurance company to let them know that you have had an ICD fitted.

Contacting the ICD Clinic

Most ICD clinics/support services run between 9am and 5pm Monday to Friday. Ask staff at your implant centre about arrangements to contact them outside these hours. However, you should not wait until clinic working hours if you feel unwell, you are safe to be seen in A&E, which is in close contact with the local cardiologist, cardiac physiologist and device nurses.

Physical activity

Is it safe to exercise? The simple answer to this question is yes, but the full answer is influenced by the cause and type of your arrhythmia and the type of exercise you perform.

The likelihood of arrhythmia during exercise is very small but when it occurs it is usually due to an abnormality of heart function and not the presence of an implantable cardioverter defibrillator (ICD). This is especially true if you have suffered considerable damage to your heart as a result of a heart attack (myocardial infarction) or have a heart muscle disease (cardiomyopathy).

The likelihood of arrhythmia is no greater during moderate intensity aerobic exercise than during resting but there are certain types of exercise that increase the risk of arrhythmias. If you exercise hard from rest, without a warm-up, and immediately cease exercise, without a cool down or active recovery period, you increase the likelihood of arrhythmia.

In cardiac rehabilitation exercise programmes, where a warm-up and cool down are the norm, arrhythmia rarely occurs.

Following your initial recovery, normally about four to six weeks, it is recommended that you try to increase your level of activity if possible. You may be offered cardiac rehabilitation or exercise testing to restore your confidence and get you back to normal.

How might exercise affect my ICD?

Your ICD detects abnormal heart rhythms in a number of ways, one of which relates to the speed of the heart during the arrhythmia.



Most arrhythmias treated with ICDs will be significantly faster than your normal heart rate would reach, even with strenuous exercise.

Occasionally, however, the ICD needs to be programmed to recognise abnormal heart rates that are close to those that can be achieved with exercise. For this reason, it is worthwhile checking how your ICD is programmed before undertaking anything other than recreational exercise or exercise to lose weight; your cardiologist, arrhythmia nurse or cardiac physiologist can advise you about how high you can safely raise your heart rate.



If you are concerned about your safe exercise level, you should ask your cardiologist, arrhythmia/ICD nurse, or cardiac physiologist whether an exercise test would be a helpful way to gain reassurance.

When you have an exercise test, your ICD should be disabled during the test. This is to avoid inappropriate shock treatment. If you are concerned, you may also be referred to an exercise specialist within the cardiac rehabilitation team.

If you would like to know how your ICD has been set up, your cardiac physiologist/nurse can give you this information.

Is there any exercise I definitely can't do?

If you are anxious about taking exercise, it may be an idea to have someone accompany you at first, but the aim is for you to be able to exercise independently with confidence. It is advisable to carry your ICD card with you at all times, in case you need to be taken to hospital for any reason.

You should avoid participating in any contact sport and/or any competitive high intensity sports. You should always contact your Device Clinic before commencing any sport/activities that you wish to participate in. They will be able to discuss any potential risks with you on a personal basis. Although the ICD itself is very tough, bruising or breaking the skin over the site where the device is implanted may lead to infection, which can then become very troublesome to treat and resolve. You should also recognise that you are unlikely to be able to obtain insurance for winter sports such as skiing or, indeed any other 'extreme' sports where the effects of a shock may put you or others at risk. This may be possible in some special cases particularly in those patients who have had an ICD implanted for 'just in case' reasons.

Swimming can be undertaken once your implant wound has healed fully. We suggest you do not swim alone in a private pool. Some ICDs are implanted for arrhythmias which may be triggered specifically by swimming (some Long QT Syndromes - check with your cardiologist) but snorkelling is not recommended and SCUBA diving should not be undertaken.

Water sports generally need to be undertaken only if you are accompanied at all times by at least one other person who is able to get you out of the water in case your ICD goes off.

You will not be able to take part in any form of competitive motor sport, as you will not be eligible for an appropriate license.

You should also avoid any sport (or indeed any situation) where you might be exposed to strong magnetic or electrical fields, or a powerful radio source (radio-controlled planes, cars, boats, etc. may be a problem - please check with your local implant centre).



So, what can I do?

It is likely that your underlying heart condition (i.e. the cause of your arrhythmia and therefore the reason you had the ICD implanted) will have more influence on your ability to exercise than the presence of your ICD. Your underlying heart condition may limit your exercise capacity due to shortness of breath, fatigue or chest pain - these should not be ignored.

Research has shown that physical activity and exercise are beneficial for people fitted with an ICD. Aerobic and skilled flowing movement, muscular endurance and flexibility should dominate the exercise and physical activity sessions. Such activities are very well tolerated, effective and lead to optimal carry-over into your daily life. The most favourable fitness improvements occur with a moderate intensity performed frequently.

Physical activity and exercise should be progressed slowly and should use one of the standard approaches of monitoring, e.g. heart rate or perceived effort. An exercise intensity of between 60 to 75% target heart rate (220 minus age) is sufficient to bring about significant health benefits and improve fitness and endurance. If you are taking beta-blocker medication you may not be able to reach these heart rate levels. Instead, you should look to increase your exercise heart rate by 30 to 40 beats above your resting heart rate.

Alternatively, you can use the body's built-in monitor, which is your ability to rate your own effort or exertion. Imagine that sitting down equals 'zero' effort and a score of ten equals the 'most extreme' effort you could perform if pushed to do so. Now in your own mind split the distance between zero and ten by half and try to keep your effort or exertion below a score of five.

The key is to avoid becoming too breathless during exercise, as this will sap your strength and overload your cardiovascular system.

All exercise sessions should start with a warm-up and finish with a cool-down period, both of which should last for ten minutes, so that the cardiovascular system has time to adjust to the alteration in demand. The sequence of exercise should vary from arm work to trunk and legwork, with flexibility and coordination exercises following the more strenuous exercises.

The main part of the training programme should consist of graded aerobic circuit training exercises lasting 25 to 30 minutes and incorporating multi-joint movements with part body weight and moderate resistance.

Static exercise where you are holding tight, or resisting strongly, and 'holding your breath' should be avoided as this type of exercise has no health benefit and is dangerous. The key is to emphasise the skill of the activity, be it aerobic exercise or strength and with practice the task will become easier.

In general, most exercises should be performed standing, with horizontal (lying down) and seated arm exercises kept to a minimum. Seated arm exercise with weights leads to excessive cardiac demand and an increased likelihood of arrhythmia. If seated exercise is to be performed, then the intensity of exercise should be low and the emphasis placed on muscular endurance (lots of repetitions without feeling unduly fatigued).

Gentle leg exercises (for example, alternate heel lifts) reduce the load on the heart during combined (seated) arm work.

A note of caution is required for those few patients who are at risk of ICD lead problems. This situation is often known about immediately post-operatively and your ICD implant team will have informed you about it.

It is normal to restrict your exercise and movement for four to six weeks postimplant but after the first follow-up in the clinic you should be able to resume your normal level of exercise. For TV-ICD systems, there are some lead problems that can arise as a direct consequence of doing highly repetitive, vigorous shoulder movements such as weight lifting which may put a strain on them.

Light to moderate strength activities performed within a normal range of movement, that closely match functional daily activities have been used successfully in patients with an ICD.

Physical fitness soon deteriorates if training is not continued at a level sufficient to maintain the effect. Moderate physical activity as well as leisure and sport are known to benefit health and where possible, these should be pursued most days of the week.

Continuous physical activity of 30 minutes or more is considered most effective, although multiple activity sessions of ten to fifteen minutes, duration, on the same day, have also demonstrated significant health improvement.

Sexual activity

It is very common to be reluctant to resume sexual activity. However the device will not cause any harm to your partner, even if a shock is delivered to you during intercourse.

If you are not sure about what you can and cannot do then discuss the options with your ICD clinic at follow-up.



Other information

Electromagnetic interference

Electromagnetic interference will not damage your ICD but will stop it from delivering any treatment for the period of time that you are in contact with it. Most mechanical and electrical devices that you use in your normal daily activities will not affect your ICD. Ordinary radios, fridges, cookers, computers and microwaves will not affect your ICD as long as they are in good working order.

In case you ever feel dizzy or experience palpitations whilst using an electrical appliance, you should move away from the appliance and phone the physiologist, ICD nurse or doctor at the ICD clinic for advice. Please note: DO NOT use an AliveCor Kardia Mobile with a pacemaker, ICD, S-ICD, CRT or similar implantable device.

Magnets

Do not carry magnets or place a magnet over your chest. Avoid carrying stereo or hi-fi speakers as they contain strong magnets that can interfere with your ICD. ICD therapies may be temporarily disabled, by magnets, and in some cases this may be necessary if you received inappropriate shocks from the ICD. Some hospitals give their ICD patients magnets and full instructions on their use.

Shop doorway security systems

There is a very small risk of interference to your ICD, so you are advised to walk through shop doorways at a normal pace and not to wait around in these areas.

DIY

You can safely use equipment such as electric drills as long as they are in good working order, although you should keep them away from your ICD site.

Electronic ignition systems

Avoid leaning over the alternator in a car whilst the engine is running, otherwise it is generally safe to work as a mechanic.

Medical equipment and other hospital treatments

Most equipment used by your hospital or GP surgery will not cause any problems to your ICD. However, it is advised that you let medical and dental staff know that you have an ICD, as technical support may be required before some treatments. Please take your ID card with you whenever you go to hospital.

It may also be useful to contact your implanting centre for advice before you go into hospital for any investigations or operations that are not associated with your ICD.

However, you should seek advice from your ICD clinic before undergoing an MRI scan as not all devices are MRI safe.

It is safe for you to have x-rays, CT scans and mammograms. Some electrical nerve and muscle stimulators (TENS units) may cause interference with ICDs but this depends on where they are being applied and, if this form of treatment is suggested to you, then your ICD clinic should be contacted for advice.

Operations

If you require an operation, you must tell your surgeon and anaesthetist that you have an ICD. It may be necessary to temporarily switch off (deactivate) the shocks on your ICD for the duration of the operation. This can be done through a programmer, but equally can be done using a magnet taped over your ICD.

This will prevent unnecessary shocks being given during operations, especially when diathermy cautery is used as this can be sensed by the ICD.

Travel

You can safely travel abroad with your ICD, but you are advised to show the security staff your identification card and ask to be searched by hand. This is because the hand-held wands can temporarily interfere with your ICD. Only walk through the metal detector archway if asked to do so, but the metal casing of the device may set off the airport security alarm. The detector will not cause any harm to your ICD provided you walk briskly through the arch. You will need to make sure that your travel insurance company is aware that you have an ICD.

Some insurance companies require written confirmation from your cardiologist that you are fit to travel. Travel companies may also try to increase your insurance premiums and it is suggested that you shop around if this happens. Many ICD clinics carry a list of ICD friendly insurance companies. If you wish, you may be given addresses of ICD clinics in the area that you are visiting. Please contact the ICD clinic at least six weeks before you intend to travel or check the manufacturer's website for information. Please be aware that your doctor may advise against you visiting very isolated destinations.

Arc welding

This should be avoided.

Mobile phones/portable music players

Some studies have shown that mobile phones and portable music players can affect the ICD if held within six inches of the device. It is therefore recommended that you do not keep them in a coat or shirt pocket over the ICD. Keep the handset more than six inches away from the ICD; ideally hold your phone over the ear on the opposite side to the device.

5G radio frequency signals, used to transmit in mobile systems, can very rarely generate electromagnetic interference with cardiac implanted active electronic devices (CIEDs) and temporarily change their functionality.

Although 5G radio signals are at frequencies not considered by previous regulatory standards, extensive investigation has shown that these different (5G) frequencies pose no greater risk of interference (through electromagnetic mechanisms) than the frequencies specified for the older 3G/4G communication technologies.

It has long been the advice that recipients of CIEDs (such as pacemakers and implantable defibrillators) should keep communication devices using 3G/4G radio frequencies (such as mobile phones), when in use, a minimum distance of 15 cm from their CIED to further reduce the already very low risk of any temporary electromagnetic interference. This same advice holds good for communication devices using 5G radio frequencies and no additional or new precautions are required.

It is safe to use an automated external defibrillator (AED) on someone who has a pacemaker or implantable cardioverter defibrillator (ICD). It is important not to place the pads in contact with, or directly over the device. The pads are usually placed on the upper right of the chest and on the left side of the rib cage, so a device should not get in the way. If someone has an implanted device, you will notice a scar and a bump. Place the pad to the side of the device (about 3cm).

The shock produced could affect the functioning of the pacemaker or device, however the benefits of using the AED to save someone's life outweigh this potential risk. If you receive CPR or defibrillation, you should have your device checked afterwards to ensure the settings are still accurate. If you have any questions or concerns, please contact your cardiologist.

Planning to deactivate ICD shocks

People with heart problems, who have received an ICD may later be diagnosed with progressive heart disease or other life-limiting illness. It may well come to a stage where cardiopulmonary resuscitation is unlikely to be helpful or is no longer wanted by the individual. In this situation, it is often appropriate to deactivate ICD shocks. This is to avoid the situation where a person who is dying for another reason receives shocks which are unpleasant, but will not save their life. This can be distressing for the person involved but also for their family and loved ones.

As more and more people in the world have an ICD fitted, we have to be more aware of planning for the end of life. These conversations can be difficult and emotional but it is important to discuss these issues early. Ideally, these discussions should take place while the individual is still able to make their own decisions, but in some circumstances the next-of-kin may need to be involved.

Switching off shock therapies is straightforward but is not always available out-of-hours. An ICD physician or a physiologist has to reprogram the device. The following points are important:

- The device **will no longer provide shock therapy** in the event of fast abnormal heart rhythms (VT or VF)
- Turning off shocks **will not** in itself cause death
- Turning off shocks **will not** be painful, nor will the failure to shock cause pain
- The decision is not irreversible -shocks can be turned back on if the situation changes
- The device will continue to provide pacemaker functioning to prevent slow heart rhythms (these are small impulses that are not painful)
- There will be a plan to ensure healthcare professionals are available to answer questions or concerns that may arise
- A deactivation request form will need to be filled in, with the involvement of the ICD physician
- The palliative care team may be helpful where difficult decisions need to be made

ICD Patient Support

Many patients who have ICDs implanted do have concerns and anxieties after the implant. These may be about the condition for which it has been implanted or fear of shock treatment from it. Some patients also have anxieties after they have had treatment from the ICD. If you do have concerns about this or any other issues, it is important to raise them with either your consultant or the ICD clinic team. They will be able to put you in touch with other patients in a similar situation or someone that you can discuss this with. You need time to be able to talk about these anxieties so make sure you raise them when you go to clinic.

Many implanting centres now have patient support groups and if there is not one in your area you may be able to access one in another area. There is a list of all support groups affiliated to Arrhythmia Alliance on the website:

www.heartrhythmalliance.org.



Working together to improve the diagnosis, treatment and quality of life for all those affected by arrhythmias



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"I now feel reassured and prepared for my upcoming procedure and now know what equipment I need to avoid in future – thank you for your help"

Jenny, Devon

To view our patient resources, scan the QR code below:



Please remember that this publication provides general guidelines only. Individuals should always discuss their condition with a healthcare professional. If you would like further information or would like to provide feedback, please contact Arrhythmia Alliance.

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If you would like further information or would like to provide feedback please contact Arrhythmia Alliance.