HEALTH BASICS

Implantable cardioverter-defibrillator

An implantable device that detects and treats dangerous abnormal heart rhythms

WHAT IT IS
A device that monitors heart rhythm and delivers treatment

WHERE IT COMES UP
Serious ventricular rhythm problems or high sudden-death risk

WHY IT MATTERS
It can stop a life-threatening heart rhythm

WHAT IT IS NOT
Not a disease or a guarantee against cardiac arrest

WHO TO ASK
A cardiologist or cardiac device clinic

HOW IT IS CHECKED
Device interrogation in clinic or through remote monitoring

Overview

An implantable cardioverter-defibrillator, or ICD, is a small electronic device placed inside the body. It watches the heart rhythm and can treat certain dangerous rhythms that begin in the heart's lower chambers, called the ventricles.

An ICD is not a disease or a diagnosis. It is a treatment used for selected people who have had a life-threatening ventricular rhythm or who have a high risk of developing one.

Most ICDs have a pulse generator placed under the skin, usually below the collarbone. The generator contains a battery and computer. One or more insulated wires, called leads, usually run through a vein into the heart. A subcutaneous ICD uses a lead under the skin instead of inside the heart.

An ICD is different from a standard pacemaker. A pacemaker mainly prevents the heart from beating too slowly. An ICD can recognize and treat very fast ventricular rhythms. Most conventional ICDs can also provide pacemaker functions.

Some people receive a cardiac resynchronization therapy defibrillator, or CRT-D. This combines ICD protection with pacing designed to help the heart's lower chambers beat in a more coordinated way.

How it works

The ICD continually checks electrical signals from the heart. Its settings are programmed for the person using it.

If the device detects a fast rhythm, it may first deliver a short series of rapid, low-energy pacing impulses. This is called anti-tachycardia pacing. You may not feel it. The aim is to interrupt the abnormal electrical circuit and restore a safer rhythm.

If pacing does not work, or if the rhythm is too fast or unstable, the ICD can deliver an electric shock. People often describe a shock as a sudden jolt or kick in the chest. The experience is brief, although it can be frightening or painful.

The main rhythms treated by an ICD are:

An ICD records rhythm information before, during, and after treatment. A device clinic can review these records using a programmer placed over the device or a secure remote-monitoring system.

The battery cannot be recharged at home. Clinic checks estimate how much battery life remains. When the battery is becoming depleted, the generator is replaced during a planned procedure. Leads may remain in place if they are working properly.

- Ventricular tachycardia: a fast rhythm starting in the ventricles
- Ventricular fibrillation: chaotic electrical activity that stops the heart pumping effectively

Why it matters for your health

Ventricular tachycardia and ventricular fibrillation can cause sudden cardiac arrest. An ICD may correct one of these rhythms within seconds, before emergency treatment could usually arrive.

An ICD may be considered after a person survives cardiac arrest or has sustained ventricular tachycardia. It may also be considered before such an event when a heart condition creates a substantial risk. Examples include some cases of heart failure with reduced pumping strength, cardiomyopathy, previous heart attack, or an inherited electrical condition.

Not everyone with these conditions benefits from an ICD. The decision takes account of the exact diagnosis, heart function, rhythm history, overall health, expected benefit, personal priorities, and whether the risk may improve with other treatment.

An ICD does not treat every cause of fainting, chest pain, shortness of breath, or cardiac arrest. It also does not repair blocked arteries or strengthen the heart muscle by itself. Medicines and

other heart treatments may still be needed.

Living with an ICD can affect emotional health. Some people worry about receiving a shock, sleeping alone, exercising, or being away from medical care. A cardiac device clinic, cardiology team, or cardiac rehabilitation service can help with practical planning and anxiety related to the device.

What can go wrong

Problems can occur during implantation or later. These include bleeding, bruising, a collapsed lung, blood clots, infection, and damage to a blood vessel or the heart. The clinical team should explain the risks that apply to the planned device and procedure.

A lead can move, fracture, or develop an insulation problem. The generator can also malfunction, although device checks are intended to identify developing problems. A device alert may sound or feel like a vibration. This usually requires prompt contact with the device clinic, but it is not automatically an emergency if you otherwise feel well.

An ICD can sometimes deliver an inappropriate shock . This means it mistakes another fast rhythm, electrical interference, or a lead problem for a dangerous ventricular rhythm. Device programming, medicines, or another procedure may reduce the chance of this happening again.

An ICD may also fail to stop a rhythm. Cardiac arrest still requires an emergency response. Someone with an ICD can receive cardiopulmonary resuscitation and treatment from an automated external defibrillator, or AED, when needed.

Infection can involve the skin pocket or the leads. Increasing redness, warmth, swelling, drainage, wound opening, or fever after implantation needs urgent medical assessment. Device infections sometimes require removal of the full system as well as antibiotic treatment.

A powerful magnet or strong electromagnetic field can temporarily affect ICD function. Everyday household electronics are generally low risk when used normally. Medical procedures such as MRI, surgery using electrical equipment, or radiation treatment need advance planning. Some ICD systems allow MRI under specific conditions; the device's exact model and leads must be checked.

Seek emergency help if:

If you receive one shock and quickly feel well, follow your device team's action plan and contact the clinic promptly. Recommendations about where and when to be assessed may reflect your rhythm history and device findings.

- You receive more than one shock or repeated shocks
- A shock is followed by chest pain, severe breathlessness, fainting, confusion, or ongoing weakness
- You collapse, become unresponsive, or appear not to be breathing normally

What you can do

Keep the ICD identification card with you. It should list the manufacturer and device model. Consider keeping the same information in your phone or emergency medical record.

Ask the device clinic:

Attend scheduled device checks even if you feel well. These checks review the battery, leads, stored rhythms, treatments delivered, and programming. Remote monitoring helps send information between visits but does not replace emergency care.

Before a medical, dental, or surgical procedure, tell the service that you have an ICD. Provide the device card when possible. Do not place a magnet over the ICD unless a qualified clinical team has specifically instructed you to do so.

Follow the manufacturer's advice about mobile phones, headphones, security systems, power tools, and industrial equipment. In general, avoid keeping a phone or magnetic accessory directly over the generator. Airport screening is usually possible, but showing your device card can help staff choose an appropriate screening method.

Keep a record of shocks, alerts, fainting episodes, and contact with the device clinic. Note the date, time, what you were doing, and how you felt. The ICD's stored recording can then be compared with your account.

An ICD can be reprogrammed so it no longer gives shocks while other pacing functions continue. This may be discussed when goals of care change or near the end of life. Turning off shock treatment does not cause death and does not usually require removing the device. You can ask your cardiology or palliative care team to document your preferences in advance.

- What type of ICD you have and whether it also provides pacing
- What to do after one shock or several shocks
- How remote monitoring works and whether transmissions are arriving
- Which device alerts you might hear or feel
- Whether your system can be scanned with MRI

- When driving, work, exercise, and lifting can safely resume

Common questions

Can I feel the ICD under my skin?

Usually, yes. The generator often creates a firm raised area below the collarbone. New or increasing swelling, redness, warmth, skin breakdown, or drainage should be assessed.

Will every fast heartbeat cause a shock?

No. The device uses programmed rate and rhythm information to decide whether treatment is needed. It may monitor the rhythm, use pacing, or deliver a shock. A device check can show what happened.

Can I exercise with an ICD?

Many people return to physical activity after the implant wound and leads have healed. The safe level and type of activity depend on the underlying heart condition, the device position, and the risk of injury or dangerous rhythm. Ask for an individual exercise plan.

Can I drive?

Driving restrictions may apply after implantation, a dangerous rhythm, fainting, or an ICD shock. Rules differ by location and by whether you drive privately or professionally. Ask the device clinic and check the licensing authority's current rules.

Does an ICD need routine replacement?

The generator needs replacement when its battery approaches depletion. This is normally planned using estimates from device checks. Lead replacement is a separate decision based on lead function, infection, and procedural risk.

Can an ICD be removed?

It can, but removal is not routine. Removal may be needed for infection, lead problems, or a change in clinical circumstances. Removing leads that have been in place for a long time is a specialized procedure with its own risks.

Sources

- American Heart Association - Implantable Cardioverter Defibrillator
- NHS - Implantable cardioverter defibrillator implantation



- U.S. Food and Drug Administration - Magnets in cell phones and smart watches may affect pacemakers and other implanted medical devices
- European Society of Cardiology - 2022 guidelines for ventricular arrhythmias and prevention of sudden cardiac death
- American College of Cardiology, American Heart Association, and Heart Rhythm Society - 2017 guideline for management of ventricular arrhythmias and prevention of sudden cardiac death
- Heart Rhythm Society and collaborating organizations - 2017 expert consensus statement on cardiovascular implantable electronic device lead management and extraction