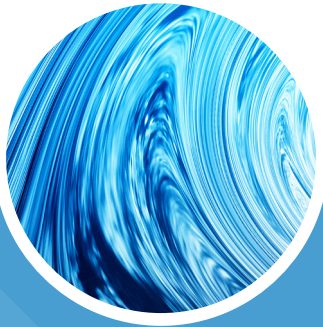
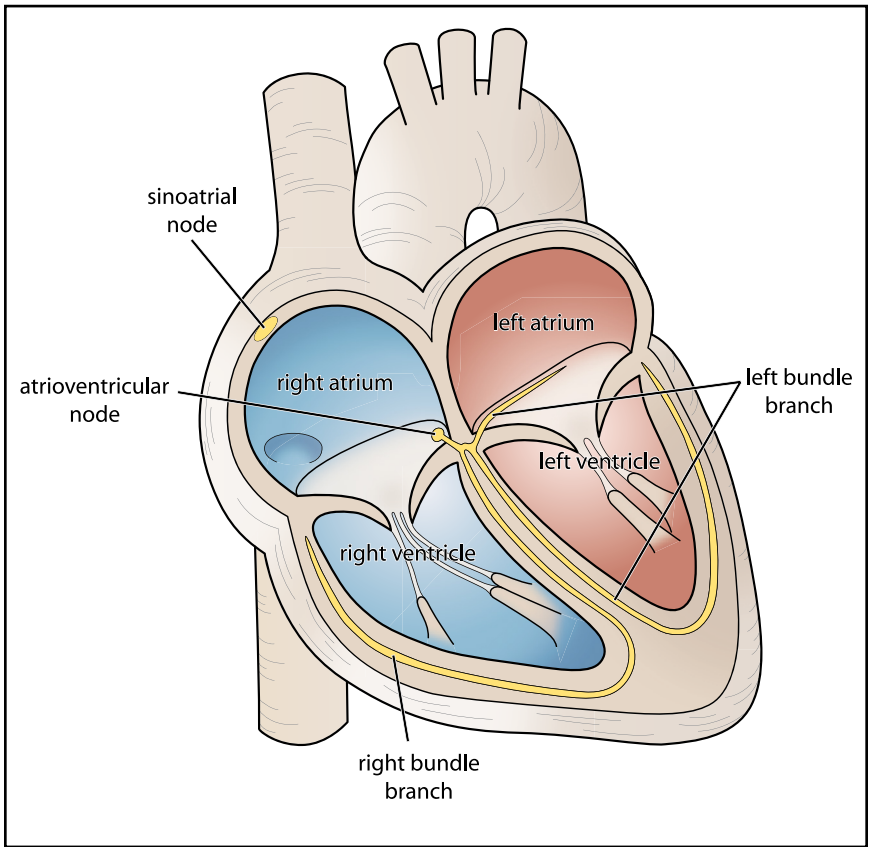


ICD (Implantable Cardioverter Defibrillator)



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The sinoatrial node is your heart's natural pacemaker.

General Information

An implantable cardioverter defibrillator (ICD) is a device that may help correct fast heartbeats coming from the lower chambers of the heart. These rapid rhythms can be life-threatening. An ICD monitors the heart and delivers a shock or special pacing therapy to restore the heart to a normal rhythm.

Your Heart's Electrical System

Your heart has four chambers. Two upper chambers (atria) pump blood to the two lower chambers (ventricles).

In order for the heart to pump, it requires an electrical impulse to start a heartbeat.

Each heartbeat originates from the sinoatrial (SA) node — the heart's natural pacemaker — which is located in the upper right atrium. This impulse travels through the atria, signaling them to contract. The impulse is received by the atrioventricular (AV) node.

The AV node acts as a relay center to delay the impulse before sending it from the atria to the ventricles.

The impulse then spreads throughout the muscle of the ventricles, stimulating them to contract.

Normally, impulses are generated from the sinus node at a rate of 60 to 100 beats per minute (bpm). That is called a normal sinus rhythm. When the heart beats slower than 60 beats per minute, that is called bradycardia. For some people, this doesn't cause any problem, but other people may develop symptoms.

Ventricular Tachycardia or Fibrillation

In ventricular tachycardia or ventricular fibrillation, the electrical signals do not follow the normal path. The electrical signals are sent out from the lower chambers, causing a potentially dangerous rapid beat to occur.

- Ventricular tachycardia is a rapid, regular beating of your heart ventricles. This may cause you to feel lightheaded or faint. You may feel rapid heartbeats.

If it doesn't stop, you could lose consciousness. If left untreated, it could cause death.

- Ventricular fibrillation is a life-threatening, irregular, chaotic rhythm in which the ventricles are unable to pump blood to the body leading to sudden cardiac arrest.

Why Ventricular Tachycardia or Ventricular Fibrillation May Happen

You may be at an increased risk if you:

- had a heart attack
- have disease of the heart valves
- have disease of the heart muscle
- had heart surgery
- have a family history of arrhythmias or sudden death.

Tests You May Have

Your doctor may want you to have several tests to help him or her determine if you would benefit from having an ICD placed.

- **an electrocardiogram (ECG or EKG):** This painless test can be done in your doctor's office. The ECG shows the electrical flow in your heart. This is recorded onto paper.

This test will give your doctor information about your heart rate and rhythm at the time of the ECG tracing.

- **a Holter monitor:** A Holter monitor helps determine how your heart responds to normal activity. A Holter monitor is a small, portable ECG monitor that records your heart rhythm nonstop.

You wear the monitor for 24 to 48 hours. While wearing the monitor, you will keep a diary of your activities and symptoms. Your doctor can compare this to your heart rhythm recordings.

- **an event monitor:** An event monitor records your heart rhythm for up to 30 days. It helps your doctor diagnose arrhythmias that aren't common. Your doctor will tell you how long you need to wear one.

When you feel symptoms, you push a button.

This triggers the monitor to record your heart rhythm for several seconds during your symptoms and after the event. The monitor prompts you to record your symptoms so your doctor can compare your heart rhythm and activity records when you are done wearing the monitor.

There are different types of monitors. They will not interfere with your everyday life.

- **an echocardiogram (echo):** This is an ultrasound test that gives information about how well your heart is pumping. It looks at the movements of the heart muscle and gives information about the how well the valves within the heart are working.

The echo estimates the “ejection fraction,” a measurement of how much blood is pumped out of the pumping chamber (left ventricle) with each heartbeat. A normal ejection fraction is 55 to 60 percent. If the ejection fraction is less than or equal to 35 percent, you may be at increased risk for life-threatening rhythm problems.

- **an electrophysiology study (EPS):** This is a detailed study of your heart’s electrical system. It may be done to check an abnormal heart rhythm (arrhythmia) or to tell if the electrical system in your heart is working the way it should. This procedure is done in the hospital.

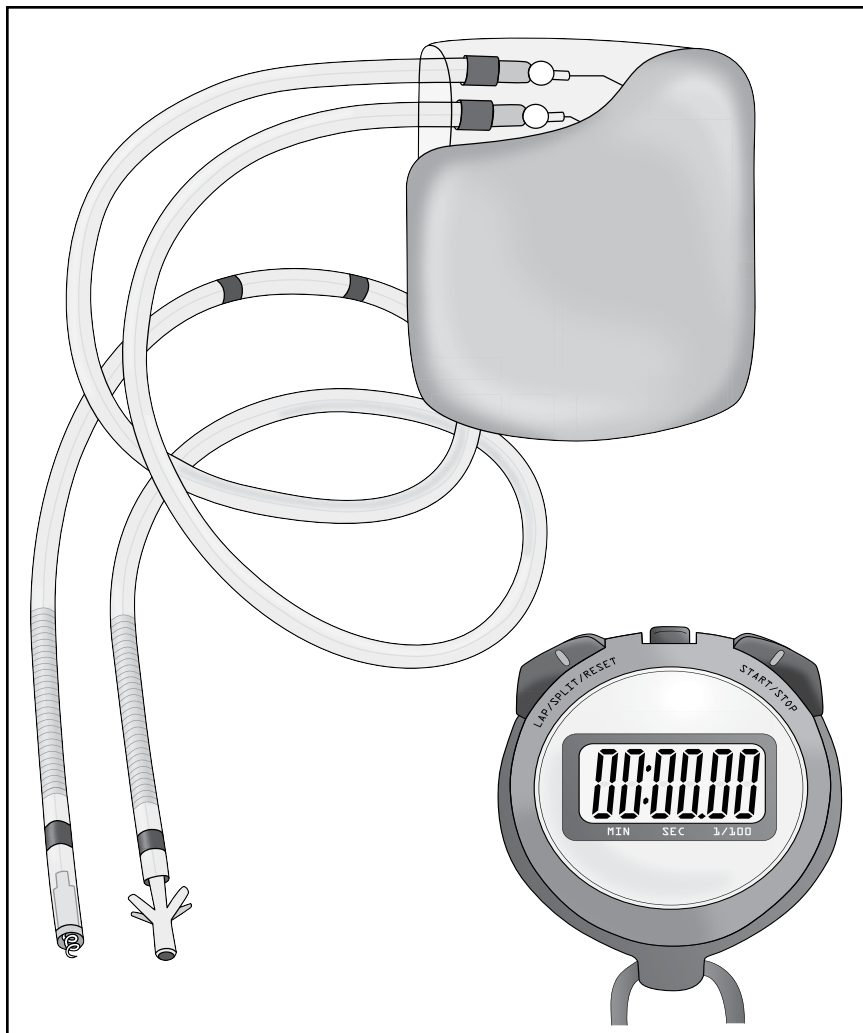
Parts of an ICD

An ICD has two parts:

- **a pulse generator:** this holds the battery and contains a computer that can sense when changes in your heart rate or rhythm are potentially dangerous.
- **lead wires (one to three):** these monitor the electrical impulses produced by your heart and send information back to the generator.

If your heart rate is too fast, or if the leads detect a life-threatening arrhythmia, a shock can be sent through the wire in the lower right chamber of your heart to attempt to reset the rhythm, slow the heart rate, or both.

Some ICDs also may treat fast rhythms with a special type of pacing therapy. Rapid pacemaker impulses may be sent to the lower chamber to “catch up” with, and then slow down the fast beating.



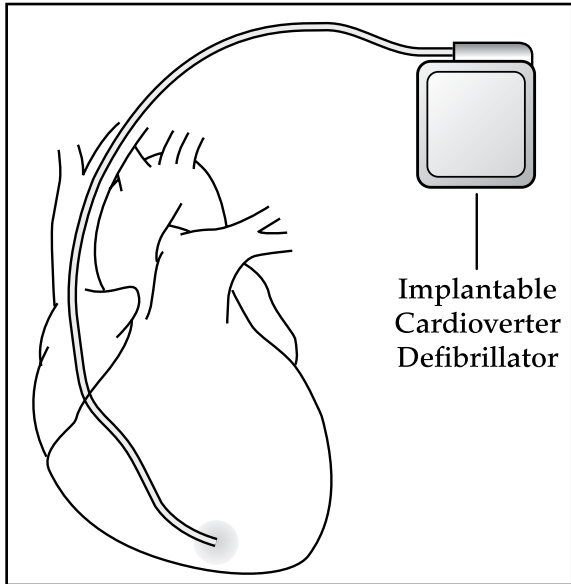
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An ICD is similar in size to a stopwatch.

ICDs also act like pacemakers. Sometimes, the pacemaker is programmed to work in the event of a slow heartbeat that happens following a shock. Sometimes, the pacemaker is programmed to work all the time to correct slow heartbeats or to coordinate the contraction of the lower chambers.

How an ICD is Implanted

Placing an ICD does not require open heart surgery. It is a procedure done in a special procedure or operating room in the cardiac lab. It can be placed on either the left or right side of the chest, but is most often placed on the left, just below the collarbone.



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Talk with your doctor if you have special reasons to have the ICD

The procedure to implant the ICD takes up to 2 hours.

placed on one side or the other, such as being left handed, or if you hunt using a rifle.

The procedure usually takes up to 2 hours. You may spend one night in the hospital before you return home.

Before the Procedure

- Talk with your doctor about your medicine needs. Be sure to ask your doctor about your medicines if you have:
 - bleeding problems or if you take blood-thinning medicines
 - diabetes. You may need to stop taking or adjust your regular dose of medicine for this test. Be sure to find

out what dose(s) to take and when you can return to your usual medicine schedule.

- You will receive directions about when you should stop eating and drinking.
- An intravenous (IV) line will be started to give fluids and medicines during your procedure. One or more blood tests, and an ECG may be done before the procedure.
- Your hair will be clipped and your skin may be scrubbed at procedure sites, including the groin, neck, upper chest and back.
- After your questions have been answered, you will be asked to sign a consent form.
- You will be taken to the procedure room on a cart.
- Your family members will be directed to the waiting area.

During the Procedure

- You will be positioned on the procedure table.
- Your nurse will connect you to several monitors and gently secure you to the table with soft restraints to keep you safe.
- Your nurse will prep your skin over the ICD site and place a sterile drape over the site. You may also have a drape placed in front of your face.
- You will be given a medicine to make you feel drowsy and comfortable.
- The doctor will numb the skin where the incision will be made.
- After making an incision about two inches long under your collarbone, the doctor will make a small “pocket” for the ICD under the skin.

- Through this same incision, the doctor will find a vein that leads to your heart. Your doctor will use a special X-ray monitor to guide the ICD leads into your heart through the vein.
- Your doctor will attach the leads to your heart using small anchors on the tips of the leads. He or she attaches the generator to the leads and puts the ICD in the pocket under your skin.
- You may receive medicine to put you to sleep for a few minutes. While you are asleep, the doctor may test the ICD to make sure a shock would work in the event of a dangerous rhythm. You will not feel this shock.
- Your doctor will close the incision with stitches, special surgical glue, staples, or a combination of these.
- You may be taken to the recovery area.

After the Procedure

- Your nurse will check your vital signs as you recover.
- You will be attached to a heart monitor that will check your heart rate and rhythm, and make sure that your ICD is working correctly. Your nurses will let you know when it is OK for you to be out of bed with the monitor.
- The nurses will help you and give you activity instructions.
- You will likely have a dressing over your incision at first. The nurses will check the dressing and incision for bleeding, drainage or swelling.
- You may feel some discomfort at the incision site for several days. This is normal. Talk with your nurse about how to manage your pain.
- You will have a chest X-ray after your ICD is implanted.

- Your doctor will look at this X-ray to make sure that your lungs are fully expanded and that the leads (wires) are in a good location.
- A representative from the ICD clinic will visit you. He or she will use a special computer or programmer at your bedside to communicate with your ICD and make sure that everything is working. Your ICD settings can be adjusted using this computer.
 - Checking your ICD is called an “interrogation.” Regular checks will be scheduled at the ICD clinic to have your device checked.
 - An electronic “wand” is placed over the ICD. The wand downloads and interprets your ICD settings. Based on your needs, changes to your ICD settings can be made with the wand.
- Before you go home, you will receive instructions about:
 - activity
 - lifting restrictions
 - pain medicine
 - incision care.
- Ask your doctor or the ICD clinic staff about when you can return to your normal activities, when you can drive or when you can return to work.
- It is normal for the incision and ICD pocket to be tender to the touch.

Follow-up Appointments

- See your regular health care provider in 7 to 10 days to check your incision.
- You will return to your ICD clinic in about 2 months for a follow-up visit. The health care team will tell you if you need to see your cardiologist at that time as well.
- You may be able to have your ICD checked over the phone.

It is important to keep all follow-up appointments.

When to Call Your Doctor

Call your doctor if you have:

- redness, swelling, warmth or drainage at the incision site
- a fever of 101.5 F or higher.

If You Receive a Shock from the ICD

Before you receive a shock, you may have no warning signs, or you may have symptoms such as:

- feeling dizzy
- feeling lightheaded
- having fast heartbeats
- feeling chest discomfort
- feeling faint.

If you receive a shock and **you feel OK**, call the ICD clinic, your doctor, or both. You do not need to make this call right away. You can call between 8 a.m. and 5 p.m.

Call your cardiologist or ICD clinic if you have any symptoms of an abnormal heart rhythm, such as feeling faint, dizzy, weak, or if you have a rapid pulse.

If you receive a shock and you **do not feel OK**, call 911 or have someone drive you to the nearest hospital Emergency Department.

Replacing the Battery or Leads

Your ICD contains a battery that may last 5 to 10 years. It is sealed inside the generator. Replacing the battery means that the entire generator must be replaced.

- Your doctor will re-open your surgery incision and disconnect and remove the old ICD generator.
- He or she will connect a new generator to the leads and place it back into the existing pocket.
- Your doctor may want to test the defibrillation (shocking) function of your ICD. You will be put to sleep for this part of the procedure.
- Your doctor will close the incision.

The procedure will be done at the hospital.

Sometimes, the leads may also wear out or shift and need to be replaced. To replace the leads, you will have a procedure much like when you had the ICD put in.

Cardiac Resynchronization Therapy


You may have a special type of ICD that uses one more lead to help your heart beat in a more coordinated manner.

This extra wire is placed into the large vein that wraps around the back of your heart. The wire is then attached to the ICD generator along with the other lead(s).

This extra lead lets the ICD send electrical signals to both the left and right ventricles (lower chambers) at almost the same time, triggering them to pump and squeeze (contract). This may help your heart work better.

Living With an ICD

- Please keep all follow-up appointments with the ICD clinic. A staff member will tell you when and how to schedule your follow-up visits.
- Your ICD will need to be checked on a regular basis to make sure that everything is working well.
- Over time, your ICD's settings may need to be adjusted. This can be done using a ICD programmer. This does not involve any type of procedure or surgery.
- Most machines and devices will **not** interfere with the way your ICD works.
- You may use a cell phone, but hold it to the ear on the opposite side of your device. Do not carry a cell phone in a shirt pocket directly over your ICD.
- If your line of work involves welding, electricity or large engines, you will receive specific directions about restrictions.

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- You should not have an MRI scan.
 - You will receive directions about travel and which security devices are safe for your ICD.
 - If you will be having other surgery or procedures, make sure those health care providers know you have an ICD.
 - During your routine ICD checks (interrogations), you will receive information about the ICD's battery life and overall function.
 - Having an ICD doesn't mean you can't live an active lifestyle. Talk with your doctor if you play contact sports.



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