IMPLANTABLE CARDIOVERTER DEFIBRILLATOR (ICD)

What is an ICD?

- An ICD is a small device that is placed under the skin of the chest. Wires (called “leads”) connect the ICD to the heart.
- An ICD is designed to prevent an at-risk person from dying suddenly from a dangerous heart rhythm.

What does an ICD do?

- When it senses a dangerous heart rhythm, an ICD gives the heart an electrical shock. It does this in order to get the heart to beat normally.
- An ICD is different than a pacemaker. A pacemaker helps the heartbeat but does not give a shock like an ICD. However, defibrillators also work as a pacemaker.
- Additionally, some ICDs have multiple pacing leads to deliver cardiac resynchronization therapy (CRT) to treat heart failure.

Treat ventricular arrhythmias

- The primary purpose of an ICD is to treat potentially fatal ventricular arrhythmias (VT and VF).
- Ventricular tachycardia (VT) is a fast but regular rhythm. It can lead to ventricular fibrillation, which is fast and irregular.
- With ventricular fibrillation (VF), the heartbeats are so fast and irregular that the heart stops pumping blood. Ventricular fibrillation is a leading cause of sudden cardiac death. Pulseless VT.
- The ICD is highly effective in the treatment of these arrhythmias, and studies have demonstrated that people who have or who are at risk for these arrhythmias survive longer with an ICD.
- The ICD does not prevent arrhythmias from occurring, but the ICD can stop an arrhythmia that develops, often saving the patient's life.

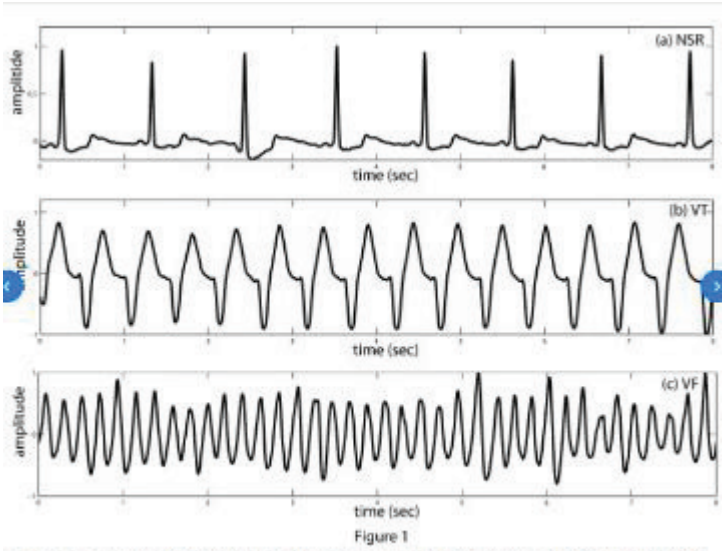


Figure 1

Characteristics of NSR, VT, VF signals. Characteristics of different variety of ECG signals (a) NSR episode, (b) VT episode, and (c) VF episode.

The ICD treats an arrhythmia in one of three ways:

Cardioversion and Defibrillation

- Cardioversion and defibrillation are both forms of high-energy shocks that stop dangerous arrhythmias and restore a normal heart rhythm. If the patient is conscious (awake) at the time of the shock, it is painful and usually described as feeling like a kick in the chest.
- Most of the time, however, a shock for a dangerous arrhythmia is delivered after the patient has lost consciousness and is therefore unable to feel the shock.

Anti-tachycardia pacing

- Anti-tachycardia pacing is an alternative method of stopping ventricular arrhythmias and is available in most ICDs.
- It involves delivering a short series (eg, 5 to 10) of paced beats. This is not painful and may be unnoticed by the patient, although some patients may feel a brief burst of palpitations.
- Anti-tachycardia pacing can be very effective for some slower ventricular arrhythmias (eg, 150 to 200 beats per minute), and is often programmed as the initial therapy for these arrhythmias.
- High-energy shocks are often programmed as the initial therapy for very fast rhythms (eg, more than 200 to 220 beats per minute), or as a rescue therapy if anti-tachycardia pacing fails.

What else can my ICD do?

Record the heart's activity

- A record of the heart's activity is kept by the ICD.
- The record can be retrieved during an office visit, or when the information is delivered during a remote home monitoring transmission, enabling the health care provider to monitor any underlying conditions causing abnormal heart rhythms.
- This allows the provider to properly treat the patient's heart rhythm disorders.

Pacemaker

- In addition to treating dangerous rapid arrhythmias, most modern ICDs also can function as a standard cardiac pacemaker and treat slow heart rhythms, also called bradycardias.
- However, standard pacemakers do not perform the functions of an ICD.

WHO SHOULD CONSIDER AN ICD?

- Patients who have experienced one or more episodes of spontaneous, sustained VT or VF (if it is not due to a transient or reversible cause).
- Certain patients who have not had prior episodes of VT or VF but are at high risk for one of these arrhythmias.
- The estimated risk for these arrhythmias is based upon a combination of several risk factors (for example, prior heart attacks, severely reduced heart function, cardiomyopathy, congenital heart disease, and/or advanced heart failure).

Will an ICD make me feel better?

ICDs do not make you feel better.

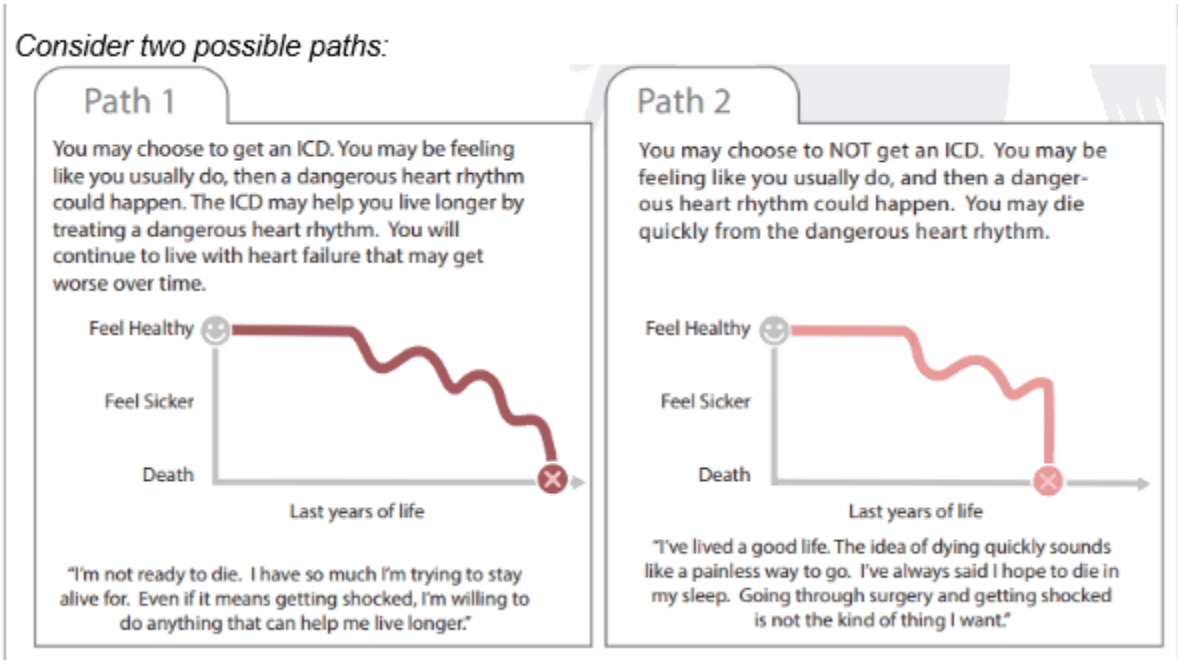
- Some patients might get devices with other features that can make them feel better (Biventricular or resynchronizing devices result in less heart failure symptoms).

Is an ICD right for me?

This is a big decision.

- Understanding what to expect after getting an ICD might help you to feel better about your decision.
- The ICD may not be right for some people. Although this may be hard to think about, other patients like you have wanted to know this information.
- While the future is always unpredictable, there is an important trade-off to consider when deciding whether to get an ICD.

Consider two possible paths:



Values

There are no right or wrong answers.

- This information will help you decide whether an ICD is right for you.
- Before making your decision, think about what is most important to you – and how you would like to live the rest of your life.

Survival

Would I survive a dangerous heart rhythm without an ICD?

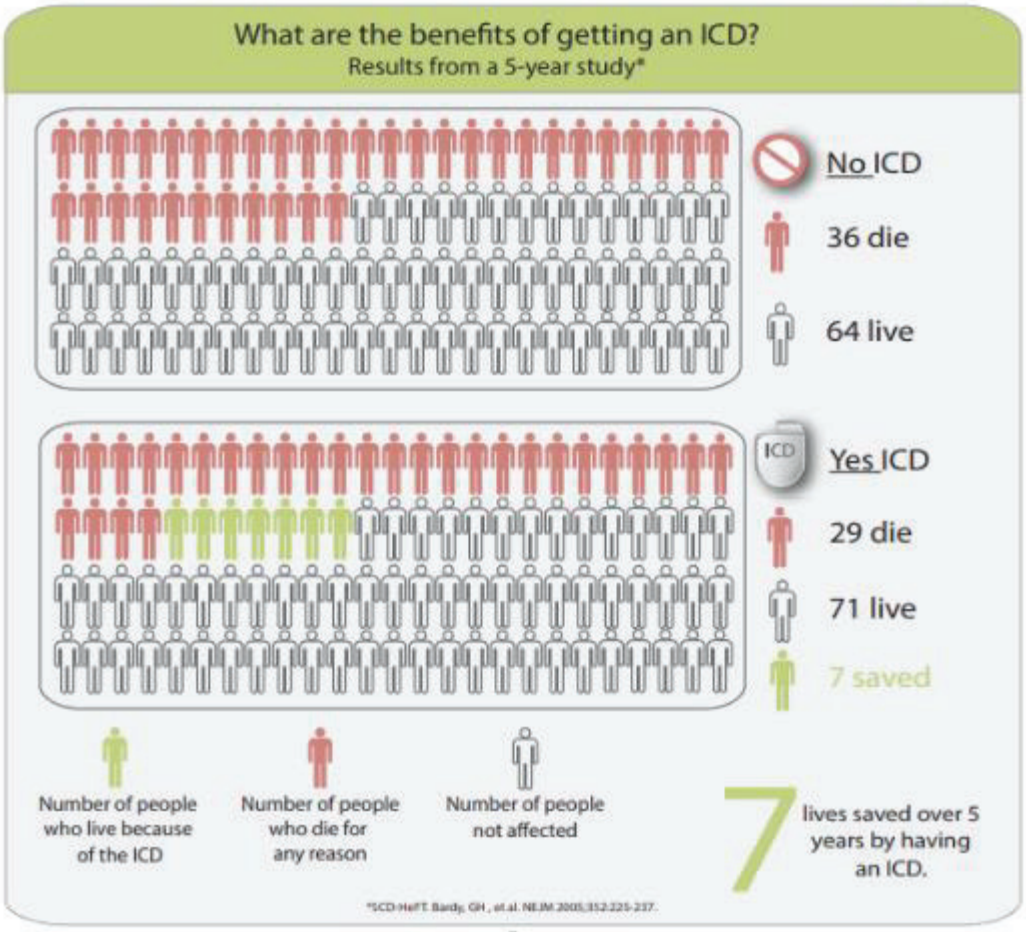
You may survive a dangerous heart rhythm only if you are treated within a few minutes with an external shock. However, many patients die before emergency help can reach them.

Will I live longer with an ICD?*

Without an ICD: Patients without an ICD are more likely to die suddenly from a dangerous heart rhythm. Without an ICD, over 5 years, 36 out of every 100 patients with heart failure will die over a 5-year period.

With an ICD: Patients with an ICD are less likely to die suddenly of a dangerous heart rhythm. With an ICD, 29 out of every 100 patients with heart failure will die over a 5-year period. This means 7 more patients would live with an ICD over a 5-year period.

The numbers below are from recent medical studies. However, no one can know what will happen to any one person.



Consider your values and wishes

Can the ICD be taken out?

It is best not to remove the ICD unless you have an infection or are having the ICD replaced.

ICDs have to be replaced every 5 to 10 years when the battery wears down. This requires another surgery. Replacing ICD wires is rare but is sometimes required.

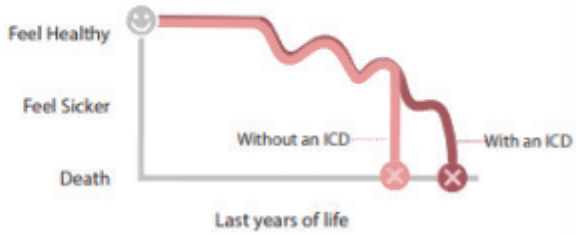
Can the ICD be turned off?

Yes. It is possible to turn off the ICD without surgery. This is even recommended when a person is close to dying of another cause. It is possible to keep the pacemaker turned on. Talk about this with your doctor.

Why would I want to turn off the ICD?

In the future, people may reach a point where living as long as possible is not what they want anymore. This could be because of worsening heart failure or another illness. When this happens, the ICD can be turned off to avoid shocks.

The ICD does not stop an advancing illness like heart failure. The only purpose of the ICD is to try to get a dangerous heart rhythm to beat normally.



PARTS OF AN ICD

An ICD is approximately the size of a pager. The main parts include:

The ICD

- The ICD is powered by a battery and generates an electrical shock. It is also called the battery, device, or pulse generator.
- It is a single unit that is usually inserted into a "pocket" created under the skin (or muscle) in the chest below the collarbone (in the pectoral region).
- The longevity of the ICD is defined by the length of life of the battery (usually 6 to 12 years).

The leads

- Flexible, insulated wires, or leads, monitor the electrical impulses and report the heart's electrical activity back to the ICD.
- These leads deliver electrical charges from the generator to the heart muscle when needed. During implantation, the ICD leads are passed through a vein into the heart.
- The leads are connected to the ICD.
- When the ICD reaches the end of battery life and is replaced, the original leads are usually left in place and connected to the new device.
- The leads usually last for several years.

In Summary

FAQ	Implant an ICD	Do not implant an ICD
What does an ICD do?	An ICD may stop a dangerous heart rhythm that could cause sudden death by giving an electrical shock to the heart.	Without an ICD, you will have a higher risk of dying suddenly if a dangerous heart rhythm happens.
What is involved?	An ICD is put under the skin on your chest and wires ("leads") go into your heart. You will probably stay one night in the hospital. In about 5-10 years, when the battery runs out, the ICD will need to be replaced	You can continue to use medicine to treat your heart problem.
Will I live longer with an ICD?	Patients with an ICD are less likely to die suddenly of a dangerous heart rhythm. With an ICD, 29 out of 100 patients with heart failure will die over a 5-year period. This is 7 fewer deaths than if they did not have an ICD.	Patients without an ICD are more likely to die suddenly from a dangerous heart rhythm. Without an ICD, 36 out of 100 patients with heart failure will die over a 5-year period.
Will I get shocked by the ICD? What will that feel like?	Over 5 years, 20 out of every 100 patients who have an ICD will get a shock. 80 out of 100 patients will not get shocked.	You will not get a shock from an ICD.
What are the risks of getting an ICD?	4 out of every 100 patients will have some bleeding. 2 out of every 100 patients will have a serious problem, such as damage to the lung, a heart attack, or a stroke. 1 out of every 100 patients will get an infection, which may require removing the ICD.	You will not have the risks of placing an ICD.
Will an ICD improve my symptoms?	Having an ICD will not improve your symptoms or cure your heart problem.	Your symptoms will be influenced by your heart failure.
Are there things I cannot do?	This depends on your heart problem. Talk to your doctor about driving limitations and other activities.	Even without an ICD, talk with your doctor about driving limitations and other activities.
Can the ICD be taken out?	It is best not to remove the ICD unless it gets infected or it is time to have it replaced when the battery runs out.	Does not apply.
Can the ICD be turned off?	Yes, the ICD can be turned off without surgery. This is recommended if a person is likely to die from another illness.	Does not apply.

Risks

Complications from having surgery to implant your ICD are uncommon, but could include:

- Infection where the ICD was implanted
- Allergic reaction to the dye or anesthesia used during your procedure
- Swelling, bruising or bleeding at the generator site, especially if you are taking blood thinners
- Damage to your blood vessels or nerves near the ICD

- Collapsed lung
- Life-threatening complications of ICD implantation are rare.

How is the ICD placed under my skin?

Pre-Procedure

- One of our nurses will take you to a procedure room and myself or one of my nurse practitioner's will discuss the procedure with you and review your medical history.
- If you are a woman of childbearing age, a urine pregnancy test will be performed.
- You will be asked to sign a consent form.
- After you change into a hospital gown, an intravenous line (IV) will be placed in your forearm. A blood pressure monitor will be placed on your arm, and ECG stickers will be placed on your chest to monitor your heart rhythm. Large sticky patches will be placed on your chest and back.

During the Procedure

- You will be positioned in a comfortable upward position on the procedure bed.
- The nurses will clean the site where your device is with sterile soap and a sterile drape will be positioned from your chin to your toes.
- You will be given sedating medication through your IV. Local anesthesia will be injected under the skin where the Pacemaker will be placed.
- After you receive medication to numb your skin, I will make a 1.5-2-inch incision, usually on the left side of your chest.
- The lead(s) is inserted through the incision and into a vein, then guided to the heart with the aid of the fluoroscopy machine. The lead tip attaches to the heart muscle, while the other end of the lead (attached to the pulse generator) is placed in a pocket created under the skin in the upper chest.
- After the leads are in place, they are tested to make sure they function properly and can increase your heart rate. This lead function test is called “pacing.” Small amounts of energy are delivered through the leads into the heart muscle. This energy causes the heart to contract. Once the leads have been tested, I will connect them to the ICD.
- After the ICD implant procedure, I use an external device (programmer) to program final ICD settings.
- The procedure usually takes 1 to 2 hours, and most patients go same day or the next AM depending on your recovery.
- Once the procedure is complete, you will be taken to your hospital room or the recovery room.

What will I feel?

- You will feel an initial burning or pinching sensation when I inject the local numbing medication. Soon the area will become numb.
- You may feel a pulling sensation as I make a pocket in the tissue under your skin for the pacemaker.
- When the leads are being tested, you may feel your heart rate increase or your heart beat faster.
- You should not feel pain after the local anesthetic takes effect.

After the Procedure

- You may eat as soon as you are awake following the procedure.
- A nurse educator will discuss your discharge and follow-up instructions.

- You will receive a temporary identification card for your new device. This card has vital information and you should always carry it .
- The device company will mail you a permanent card within a few weeks of your surgery to replace your old card.

What should I expect?

- In your hospital room, a special monitor, called a telemetry monitor, will continually monitor your heart rhythm.
- The telemetry monitor consists of a small box connected by wires to your chest with sticky electrode patches.
- The box displays your heart rhythm on several monitors in the nursing unit. The nurses will be able to observe your heart rate and rhythm.

What tests will be done after the procedure?

- A chest X-ray will be done after the pacemaker implant to check your lungs as well as the position of the pacemaker and lead(s).

Will I have to stay in the hospital?

- Most likely you will be eligible to discharge same day, about 4 hours after the procedure.
- If you do not meet the criteria for same day discharge, then you will be monitored overnight.

What will happen at my follow up appointment in the device clinic?

- A nurse will place a small device, known as a programmer, directly over the ICD.
- The programmer allows the nurse to change the ICD settings and to check the ICD and lead function.
- You may feel your heart beat faster or slower. Although this is normal, please tell the nurse what symptoms you are experiencing.
- The results of the device check are reported to me, who then determines the appropriate settings for the ICD.
- Home going instructions including incision care, activity guidelines and follow-up schedule also are reviewed.

Remote Surveillance

You will require periodic surveillance of the implanted device.

- The status of the ICD will be regularly checked or "interrogated" (often done remotely using a telephone or a secure web-based system) to provide information regarding the type of heart rhythm, the functioning of the ICD leads, the frequency of utilization of the ICD, the battery life, and the presence of any abnormal heart rhythms.
- Remote transmissions are made at scheduled intervals or at unscheduled times if your ICD sends an alert, or you can send a transmission if you have a concern.
- Remote technology means fewer trips to the doctor's office, but you'll still need to be seen by me in person for at a minimum once a year for scheduled checkups.

How long will my device last?

The ICD runs on a battery.

- Depending on the type of ICD you have, the battery lasts 5 to 15 years.

- When the batteries start to wear out, they do so in a very slow and predictable fashion, allowing enough time to be detected and pulse-generator replacement planned.
- Replacing the pulse generator usually requires a simple procedure in which a skin incision is made over the old incision, the old generator is removed, and a new generator is implanted and joined with the existing leads, assuming the existing leads are functioning normally.

Special precautions
It's unlikely that your ICD would stop working properly because of electrical interference. Still, you'll need to take a few precautions:

- Cell phones. It's safe to talk on a cell phone but avoid placing your cell phone directly over your ICD implantation site when the phone is turned on. Try to keep your phone 6 inches away. Although unlikely, your ICD could misinterpret the cell phone signal as a heartbeat and withhold pacing, producing symptoms, such as sudden fatigue.
- Security systems. Passing through an airport metal detector won't interfere with your ICD, although the metal in it may sound the alarm. But avoid lingering near or leaning against a metal-detection system. If security personnel insist on using a hand-held metal detector, ask them not to hold the device near your ICD any longer than necessary or ask for an alternative form of personal search. To avoid potential problems, carry an ID card stating that you have a ICD.
- Medical equipment. If a doctor is considering any medical procedure that involves intensive exposure to electromagnetic energy, tell him or her that you have an ICD. Such procedures include magnetic resonance imaging, therapeutic radiation for cancer treatment and shock wave lithotripsy, which uses shock waves to break up large kidney stones or gallstones. If you're having surgery, a procedure to control bleeding (electrocautery) also can interfere with ICD function.
- Power-generating equipment. Stand at least 2 feet (60 centimeters) from welding equipment, high-voltage transformers or motor-generator systems. If you work around such equipment, your doctor can arrange a test in your workplace to determine whether it affects your ICD.

Devices that are unlikely to interfere with your ICD include microwave ovens, televisions and remote controls, radios, toasters, electric blankets, electric shavers, and electric drills.

Patient Post-Device Instructions:
Activity:

- Activity as tolerated. No lifting greater than 10 pounds (a gallon of milk is about 10 lbs.) with the affected arm (on the side of the device) for 4 weeks.
- Avoid lifting/reaching above your head with this arm for 4 weeks. This allows the newly implanted leads in your heart to firmly secure to the heart.
- You may not drive for 24 hours after the procedure

Wound/Site Care:

- Keep incision site clean and dry. Remove the outer bandage 2 days after the procedure.
- Leave the steri-strips in place. Allow the steri-strips to fall off, do not pull them off. They will be removed at your clinic visit in 1-2 weeks.
- You may have Dermabond (liquid skin adhesive) over your incision. Do not scratch, rub or pick at the incision.

- If the dressing becomes saturated, please remove the original dressing and apply a clean thin dressing/gauze bandage over the incision. Please allow the incision to get as much exposure to air as possible to promote healing.
- You may shower 2 days after your device was implanted. Mild soap (optional) may be applied, although be sure this is thoroughly rinsed off, and then gently pat the area dry with a clean towel. Do not allow the stream of water to beat directly on the incision. Keep your incision clean and dry.
- No baths, swimming or submerging in water until cleared by your provider at your clinic visit in 1-2 weeks.
- Do not apply powders, lotions or home remedies to your incision.
- Women should consider putting a flannel sleeve or padding around their bra strap to prevent irritation of the incision until it is fully healed.
- Look at incision daily for any signs or symptoms of infection. Call immediately if there is any drainage containing pus, significant redness, foul smell or warmth at site.

Pain: Tylenol as needed for pain, follow manufacturers guidelines for recommended daily allowances. A prescription has been provided to you for stronger pain relief if needed. Only fill this if necessary.

Hours: If you have any questions or concerns during the work week please call our office at 435-215-0400 and ask the staff to send a message to Dr. Cooley's staff pool to get a return to your call. We are allowed 24 hours for a return call. If your concern is emergent, please inform the scheduler of your symptoms/issues. If you have questions that are on the weekends or past 5 PM during the weekdays, please call the on-call physician for Electrophysiology at 435-215-0400.

Arm Immobilizer: We've provided you with an arm immobilizer. Generally, you should wear this when you sleep. This simply is a reminder not to lift your arm above your head. If you are a calm sleeper and generally sleep in one position through the night this may not be necessary. Please use your discretion. If you don't think you will use this, please let our staff know.

Miscellaneous:
If you're having concerns through the night or the next day please call the office at 435-215-0400. If it is after hours the on-call electrophysiology physician can be contacted at 435-215-0400 and should call you back. Please do not hesitate to go to the emergency room if you feel it is necessary.