

*Answering Your
Questions About the
Electrophysiology Study*



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Preface

Your doctor has recommended a test on your heart called an electrophysiology (EP) study.

The fact that you are having this 30-minute to four-hour test should not give you cause for concern. Because you may have already experienced symptoms of arrhythmias (irregular heartbeats) or have had arrhythmias, your physician wants to look more closely at the electrical function of your heart.

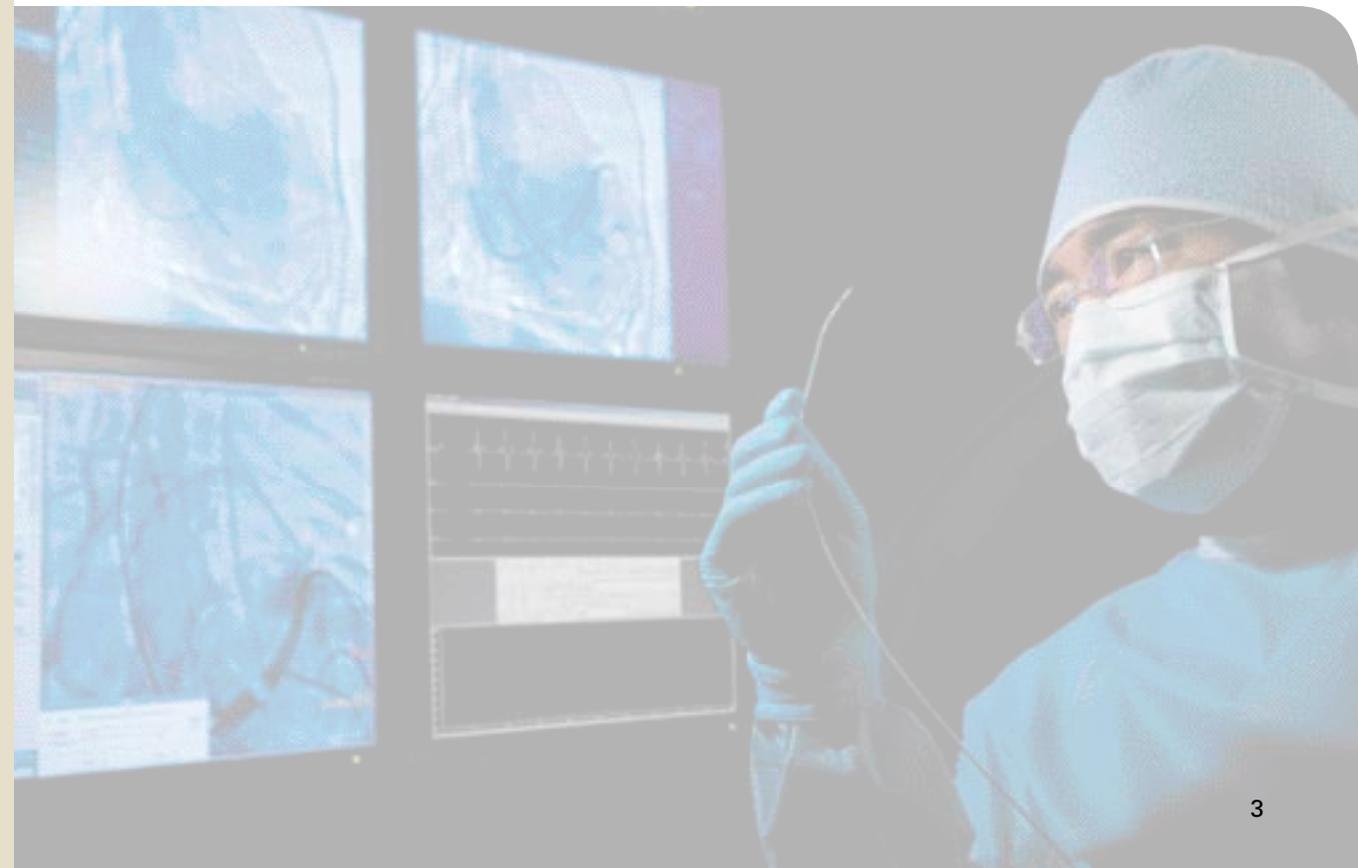
The EP study will help your physician evaluate your arrhythmias and what effect they may have on your future health. Many medical professionals believe an EP study is the most accurate and reliable method of evaluating your heart rhythms. But, most important, the EP study will help your physician determine the treatment option that is most appropriate for you.

This booklet answers many of the most frequently asked questions about an EP study, and helps you prepare for the test. If you have questions or concerns that are not answered in this booklet, be sure to ask your doctor or nurse.

What is an electrophysiologist?

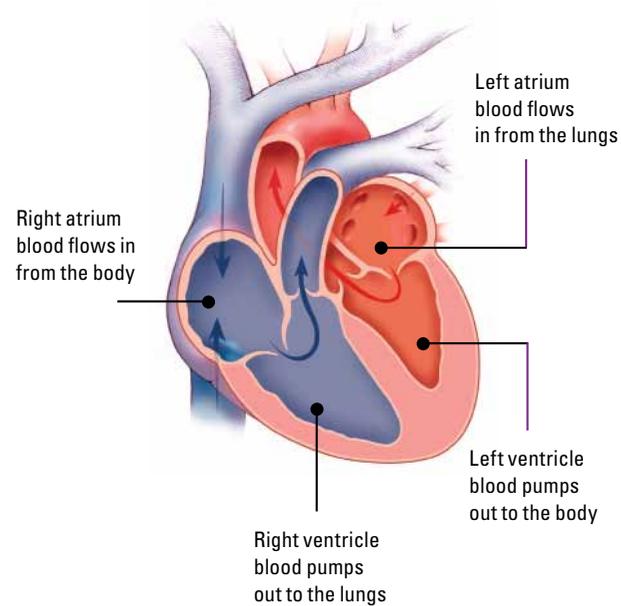
An electrophysiologist is a cardiologist who has had additional training. Specifically, an electrophysiologist specializes in the electrical function of the heart and studies arrhythmias like yours.

Your EP study will be performed in a laboratory that has specialized diagnostic equipment and heart monitoring devices. In addition to the electrophysiologist, a highly trained team of doctors, nurses and technicians will be present during the procedure. Their functions are varied but include such things as monitoring your heart and blood pressure, administering medications, and recording data pertaining to your EP study.



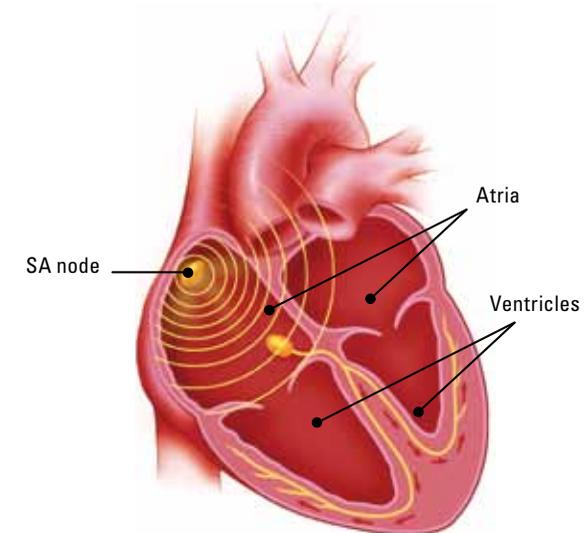
How does electricity work in my heart?

You know that the beating action of your heart pumps blood to and from the other parts of your body. This is referred to as the “mechanical” function of the heart. What you may not know is that your heart is only able to beat because the body naturally produces electricity that travels across the heart muscle and stimulates it to contract or beat.



Your heart pumps blood to and from the other parts of your body

Some people compare this to turning on a light. The light will not come on until you turn on the switch. The switch determines whether the light is on or off by allowing electricity to flow to the light bulb. In your heart, your electrical system signals the heart muscle to beat.

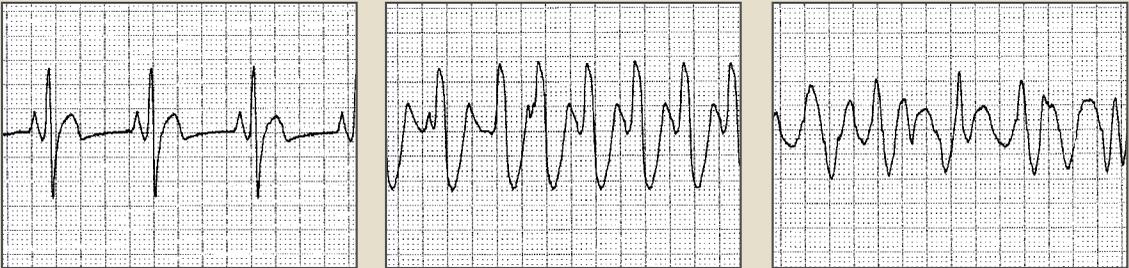


Normally, the electrical signal that tells your heart to beat comes from a small area in the upper right chamber, or right atrium, of your heart. This area is called the sinoatrial node, or SA node. When the SA node signals, a small electrical impulse runs through your heart and stimulates the heart muscle to contract in an organized manner. The contraction of the heart muscle produces a heartbeat, which forces blood out of your heart to the rest of your body. This rhythmic pumping of blood is what you feel when you take your pulse. When at rest, the hearts of most people beat 60–100 times per minute.

Who has arrhythmias and why?

Sometimes, certain conditions can cause the heart's electrical system to make the heart beat too slow, too fast, or in an uncoordinated fashion. These arrhythmias can occur in any of the four chambers of the heart: the right and left atria (top portion of the heart) that collect incoming blood, or the right and left ventricles (lower portion of the heart) that pump blood out of the heart.

And that is the reason you have been scheduled for an EP study: to determine where your arrhythmias are occurring, and then, to find the best treatment for you.



Normal heart rhythm

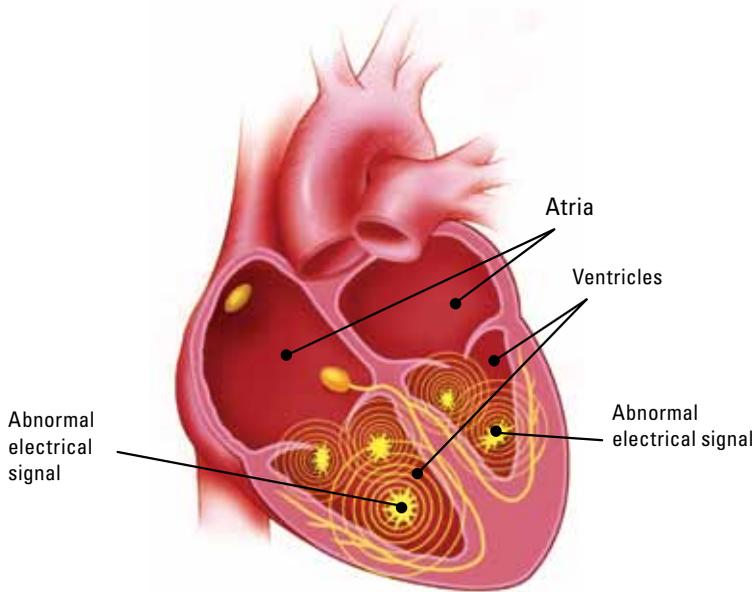
Fast heart rhythm

Uncoordinated heart rhythm

There are a number of reasons someone may experience arrhythmias.

One common cause of arrhythmias may be scarring of the heart muscle after a heart attack. The scar on the heart forms an irritable area that can potentially affect the electrical system of the heart. This irritable area may try to control the heart by sending an abnormal electrical signal that can initiate an unusual rhythm.

Other causes of arrhythmias may include enlargement of the heart, diseases of the heart valves, lung disease, or congenital (existing at birth) heart problems.



How do I prepare for the EP study?

- Some EP study procedures are done on an outpatient basis; others may require an overnight hospital stay. This varies from individual to individual as well as from physician to physician. In either case, arrange for someone to drive you to and from the hospital.
- Before the test, you may have one or more routine blood tests, x-rays, and an electrocardiogram (ECG). You may have already had a test, called an echocardiogram, that looks at the heart's structure and pumping function by bouncing ultrasound waves off your heart muscle. You may also have undergone Holter monitoring. A Holter monitor, an external device worn for 24–48 hours on an outpatient basis, records your heart's electrical activity while you go about your everyday activities. You may also have had a treadmill test to observe your heart during exertion to determine if you have coronary artery disease.
- Some of the heart medications you may normally take may be withheld for 2–3 days before the EP study. **DO NOT STOP YOUR MEDICATION** unless you are instructed to do so by your physician.
- You will not be allowed to have any food or water for approximately six hours before the procedure. You may, however, take small amounts of water with any medications, if prescribed by your physician. It is important to follow your doctor's instructions carefully.
- Before the EP study, notify your physician and nurse of any possible drug or food allergies.
- If you are a woman of childbearing age, inform your doctor if there is a chance that you may be pregnant.
- If you notice any symptoms similar to those you have experienced in the past—palpitations, dizziness, shortness of breath, or pain—notify your nurse immediately.
- Although you will wear only a hospital gown and no other clothing during the test, you may wear your eyeglasses if you need them.
- Empty your bladder as completely as possible before going to the test. In rare instances, you may have a catheter placed in your bladder during the procedure.
- Your heart rhythm may be monitored continuously during your hospitalization.

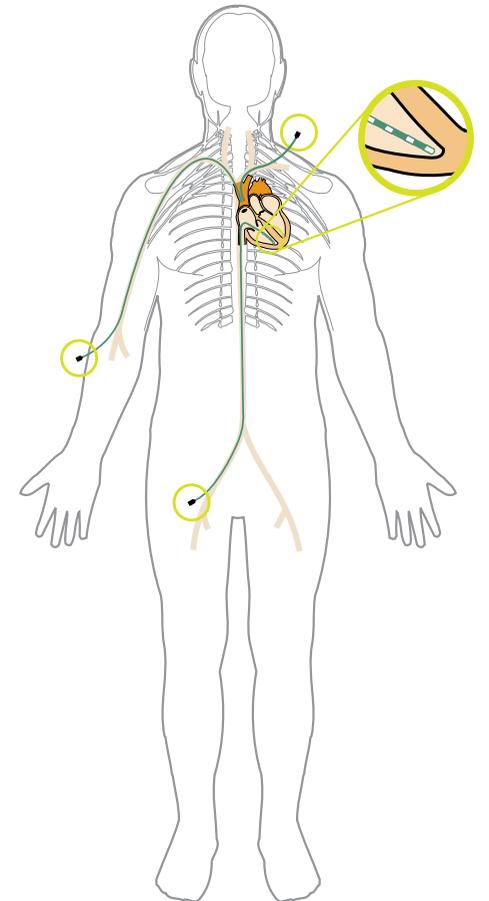
What will happen to me during the EP study? What will I feel?

You will be transported to an area in the hospital where the EP study is performed. This is known as the “EP lab” or the “cath lab.” There will be large equipment, such as heart monitors, x-ray equipment, and various data-collection instruments in the room. You will be positioned on a table similar to an x-ray table, lying on your back. A rolled towel may be placed under your knees to eliminate pressure on your lower back.

To measure exactly how the electrical impulses flow through your heart during a heartbeat, the electrophysiologist must place two or more temporary pacemaker catheters into your heart. A pacemaker catheter is a thin, insulated tube with tiny wires inside. These catheters are usually inserted through veins in the upper leg, neck, or arm areas. All of the catheters are usually removed when the EP study is completed.

Before the EP study, all areas where a pacemaker catheter will be inserted must be shaved and scrubbed with an antiseptic solution. It is important to keep these areas very clean to guard against infection.

During the test, therefore, you will be covered with sterile sheets, typically blue or green in color. Your arms and hands will have to remain completely covered under these sheets throughout the procedure.



How do the pacemaker catheters test my heart's electrical system?



An intravenous (IV) line may also be started at this time. An IV is a tiny plastic tube inserted into a vein in your arm. It will be used to give you any medications that may be necessary during the test. Once the IV is in place, you shouldn't feel any discomfort from it. To continuously monitor your condition during the test, an automatic blood pressure cuff will be placed on your arm and an oximeter clip will be placed on your finger to measure your blood's oxygen content.

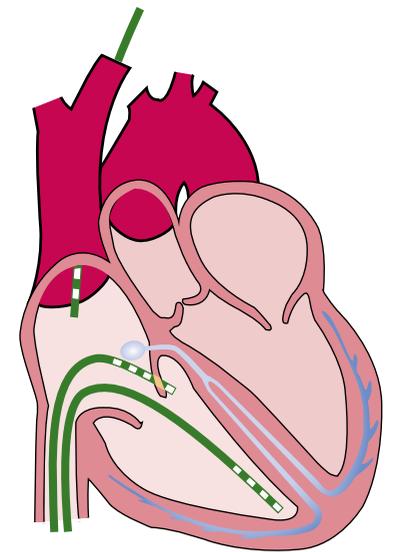
Before beginning the procedure, the electrophysiologist will inject numbing medicine wherever the pacemaker catheters are to be inserted. This medicine is similar to Novocaine, which you may have had at your dentist's office. Some people experience a burning sensation as the medicine is introduced, but once it takes effect, the area will become numb.

A pacemaker catheter is small and flexible, so you do not need to worry about it blocking your vein. The catheter's diameter, in fact, is about the same as the diameter of the lead in a normal pencil, whereas the diameter of your vein is close to the diameter of your small finger. You may not even feel the pacemaker catheter; however, you may feel pressure from your physician's hands as the catheter is positioned.

The catheters inserted into your heart serve two purposes. First, some of the catheter wires deliver tiny electrical impulses to your heart. This is called "pacing" your heart. The other wires sense your heart's normal electrical impulses and the reaction to pacing impulses. Outside of your body, these catheter wires are connected to machines that send the impulses and record your heart's electrical activity, very similar to an ECG.

During the test, the electrophysiologist will send many different types of impulses to your heart. You may, in fact, feel your heart flutter, race or skip beats occasionally. This is normal during testing and most people do not feel discomfort from it.

The purpose of this pacing is to trigger the same types of arrhythmias that are causing you problems. Because the catheter wires that sense your heart's reaction are in place, the physician can determine where in your heart the abnormal activity is occurring. This will help identify an appropriate treatment for your condition. If you feel any pain, nausea, dizziness, or palpitations during the EP study, tell the physician or nurse immediately. If the physician triggers an arrhythmia, you may feel the same symptoms you may have experienced in the past. Although you may not look forward to these sensations, you can help the medical team by describing what you feel. Remember too, that you are in an extremely controlled environment. There are trained physicians and nurses present at all times to relieve your symptoms immediately.



Is that the end of the test?

The arrhythmia may stop by itself. However, if the arrhythmia continues, the electrophysiologist may try to “pace” you out of your arrhythmia simply by changing the electrical impulses going to your heart. Occasionally, some patients need to be “shocked” out of an arrhythmia with a defibrillator. A defibrillator, a machine that produces an electrical shock to stop an abnormally fast heart rhythm, is always immediately available in the EP lab. This electrical shock is given through paddles or adhesive patches placed on the chest. Your doctor or nurse may administer a sedative to you before shock delivery.



If an arrhythmia is triggered during your EP study, the physician may want to test a prescription medicine for you while you are still in the lab. The medicine will be given to you through your IV. After waiting a few minutes for the medication to take effect, a variety of impulses will be sent to your heart to determine if the medicine is successful in preventing an arrhythmia.

What happens next?

After the EP study is completed, the pacemaker catheters will be removed. If your EP study procedure is being done on an outpatient basis, you will be in recovery for six to eight hours. Then you will be given instructions and discharged to return home.

If you have been admitted to the hospital for your EP study, you can return to your room where you should remain in bed according to your physician’s instructions. Your blood pressure, heart rate, and the areas where the pacemaker catheters were inserted will be checked frequently by the nurse. If you develop any numbness or tingling in your arm or leg, bleeding from the wire insertion areas, pain, chills, or fever, notify your nurse immediately. Your physician will let you know how long you will need to stay in the hospital.

Your physician will discuss the results of the EP study with you and your family. The electrophysiologist may wish to monitor your progress on medication, or conduct additional tests.

What are the risks?

An EP study does involve some risks; however, your physician believes these risks are small compared to the potential benefit provided by the test. Your physician will discuss the risks with you and answer any questions you may have. It might be helpful to write down your questions as you review this booklet to prepare for this discussion.

Glossary of terms

After the EP study

After the EP study is completed, the pacemaker catheters will be removed. If your EP study procedure is being done on an outpatient basis, you will be in recovery for six to eight hours. Then you will be given instructions and discharged.

In summary

This booklet is meant as an introduction to the EP study your doctor has recommended for you. Your physician and nurses will discuss the test with you in more detail. They will make every effort to help you be comfortable during your hospital stay. Do not hesitate to ask any questions you may have.



arrhythmia: any rhythm of the heart that is faster or slower than the average heart rate and regularity for most people.

atria: the upper chambers of the heart, specifically the right atrium and left atrium. The atria collect blood as it comes into the heart and from there it fills the lower chambers (ventricles) with blood.

bradycardia: a slow heartbeat, typically less than 60 beats per minute (bpm). It may be caused by the sinoatrial (SA) node not working properly or when the electrical pathways in the heart are blocked (heart block).

cardiac arrest: the heart beats very fast or stops completely so that no blood is being pumped through the body.

contraction: the rhythmic tightening of the heart muscle. This causes blood to be pumped through the heart chambers and into the body. This contraction produces a heartbeat.

defibrillation: the stopping of a fast heart rate by delivering a high-energy electrical shock therapy to restore the heart's normal rhythm.

defibrillator: an internal or external device that can deliver an electric shock. This device is used to stop extremely rapid and irregular heartbeats and return the heart to a normal rhythm.

electrocardiogram (ECG/EKG): a device that shows your heart rhythm and prints it out on paper. The test shows how electrical impulses travel through your heart. Your doctor can tell what kind of rhythm you have by looking at the printed pattern of your heartbeat.

electrogram (EGM): a picture of the electrical activity of the heart as sensed from within the heart. This is different from an ECG, which is a picture of your heart's electrical activity sensed from the surface of your skin.

electrophysiology (EP) study: a test to identify and measure the type of electrical signals in your heart. The test results can help your doctor recognize an abnormal heart rhythm. It can show how well medications work. This information helps determine the best treatment.

heart attack: this occurs when an artery that feeds the heart becomes blocked. Blood that carries oxygen to the heart muscle does not get to some parts of the heart. As a result, some of the heart tissue dies. The symptoms may include nausea, shortness of breath, and/or pain in the chest, arm, or neck. This is also called a myocardial infarction (MI).

heart rhythm: another term for a heartbeat. You may hear your doctor refer to your rhythm as being normal or irregular (meaning there is an abnormality). A normal heart rate typically ranges from 60 to 100 beats per minute at rest.

myocardial infarction: see heart attack.

pacing: small electrical pulses delivered to your heart. Pacing pulses may be delivered to the atrium or ventricle or both.

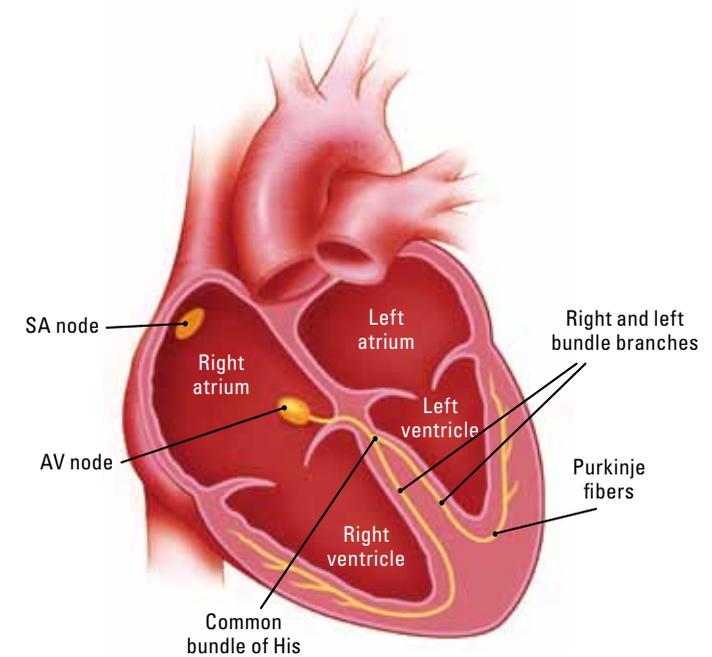
sinoatrial (SA) node: the small area in the upper right chamber of your heart that normally generates an electrical impulse. This impulse runs through the heart and causes the heart to beat.

sudden cardiac death (SCD): a death due to electrical problems in the heart. (It is different from a heart attack, which is heart muscle damage from a blockage of blood flow rather than an electrical problem.) Sudden cardiac death is usually caused by ventricular tachycardia or ventricular fibrillation.

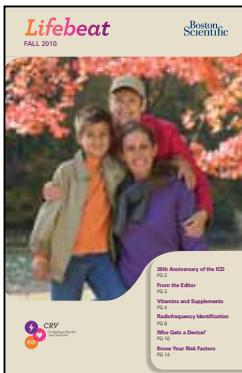
ventricle: one of the two lower chambers of the heart. The right ventricle sends blood to the lungs for oxygen. The left ventricle passes blood carrying oxygen to the rest of the body.

ventricular fibrillation (VF): a very fast, irregular heart rate caused by abnormal impulses starting from several areas of the ventricle. The heart beats so fast that it is unable to pump any blood to the body. A heart in fibrillation may beat more than 300 times a minute. A person in fibrillation passes out and needs immediate medical attention.

ventricular tachycardia (VT): a fast heartbeat caused by abnormal impulses coming from a single area of the ventricle. The rapid rate of 120–250 beats per minute may produce dizziness, weakness, blind spots, and, eventually, unconsciousness.



Notes/questions



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