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Patient information: Syncope (fainting) (Beyond the Basics)

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Disclosures

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SYNCOPE OVERVIEW — Syncope, commonly known as fainting, refers to a sudden loss of consciousness, followed by a rapid and complete recovery. If you have symptoms of dizziness or lightheadedness, without loss of consciousness, this is called presyncope.

Syncope should not be confused with sudden cardiac arrest. A person with sudden cardiac arrest also loses consciousness suddenly but will die without immediate medical attention. A person with syncope recovers quickly, almost always without treatment. However, injuries can occur during a syncopal episode and recurrent episodes can be frightening. Moreover, in patients with heart problems, syncope may be a warning sign that sudden cardiac arrest is about to occur.

There are other reasons that a person may pass out, such as low blood sugar, hyperventilation, or seizures. It is important to determine the cause of syncope so that it can be prevented or treated in the future.

Frequency — Syncope is surprisingly common. About one-third of people have a syncopal episode at some point in their life. In most cases, syncope is not a sign of a life-threatening problem, although some people with syncope have a serious underlying medical condition. In non-elderly people, over 75 percent of cases of syncope are not associated with an underlying medical problem.

Risks — A person who suddenly and unexpectedly loses consciousness can be injured. Up to 35 percent of people who have syncope injure themselves; elderly people are more likely to be injured during a syncopal attack. (See ['Safety issues'](#) below.)

Because of the risk of injury and the potential for serious underlying disease, any person who has a syncopal episode should seek medical attention.

SYNCOPE CAUSES — To remain conscious, a supply of oxygen-rich blood must be pumped to the brain without interruption. If the brain is deprived of this blood supply, even for a brief period, loss of consciousness (passing out) will occur.

A number of medical conditions can cause syncope. Some of the most common are listed here.

Vasovagal syncope — One of the most common types of syncope is called vasovagal syncope or neurocardiogenic syncope. A variety of conditions can trigger vasovagal syncope, including physical or psychological stress, dehydration, bleeding, or pain. The heart rate slows dramatically and the blood vessels in the body expand, causing blood to pool in the legs, resulting in low blood pressure (hypotension). This causes a decrease in blood flow to the brain.

In some cases, vasovagal syncope is triggered by an emotional response to a stimulus, such as fear of injury, heat exposure, the sight of blood, or extreme pain. In other cases, it is caused by abnormal nervous system responses to activities such as urinating, having a bowel movement, coughing, or swallowing. In still other cases, no trigger can be identified.

In most cases of vasovagal syncope, you have some warning that you are near fainting. These signs include dizziness, nausea, pale skin, "tunnel-like" vision, and profuse sweating. After the episode, symptoms may continue because of continued low blood pressure. Some people feel extremely tired.

Heart rhythm problems — A number of disturbances in the rate and/or rhythm of the heart can cause syncope. These disturbances are called arrhythmias.

The heart includes an area of specialized cells in the upper right chamber of the heart (right atrium) called the sinus node ([figure 1](#)). These cells send a series of regular electrical impulses to the atria that regulate the heart's rhythm and pace. These impulses travel in an organized way along conduction tissues within the heart muscle and then spread along smaller fibers that go to each muscle cell of the heart. The impulses cause the heart muscle cells to contract in an organized and regular way, generating an effective pumping of blood to all areas of the body.

Syncope can occur because of problems at several places in this system. The problems may be due to primary heart rhythm problems, underlying heart disease, or use of a medication. The following are common rhythm problems that cause syncope.

Sinus bradycardia — Bradycardia means a slow heart rate. In sinus bradycardia, the heart rate is slower than normal. A dramatically slowed heart rate can decrease the blood supply to the brain.

Sometimes, sinus bradycardia occurs because of an abnormality in the sinus node itself. This is called sick sinus syndrome. In other cases, the slowed firing of the sinus node is due to medications. In still others, problems with the nerves that lead to the heart muscle and regulate the sinus node rate are to blame. For syncope to occur due to this problem, the heart usually stops for several seconds. This is known as asystole.

Heart block — Sometimes, part of the conduction system between the sinus node and the rest of the heart becomes blocked, preventing the normal flow of electrical impulses. If the electrical signal from the sinus node fails to get through the entire conduction pathway, the heartbeat can be interrupted. If the interruption is significant and the heart rate is too slow, it can impair blood flow to the brain.

Ventricular tachycardia — Tachycardia is a fast heart rate. The ventricles are the heart's main pumping chambers ([figure 2](#)). Ventricular tachycardia (VT) occurs when muscle in the ventricles send out their own rapid electrical impulses, taking over the rhythm normally controlled by the sinus node. The heartbeat that results from these abnormal impulses is also abnormal, and often fails to pump blood in an adequate way. The heart is racing but does not pump effectively, so blood flow to the brain may be decreased.

Most people with syncope due to VT have underlying heart disease, most commonly coronary heart disease. Treatment of people with syncope caused by VT usually includes an implantable cardioverter-defibrillator. (See ['Implantable cardioverter-defibrillator'](#) below.)

Supraventricular tachycardia — Rapid heartbeats can originate above the ventricles (supraventricular tachyarrhythmias, or SVT). This is not commonly associated with syncope, unless the heart rate is very rapid.

Blockage of blood flow from the heart — Any problem with the structure of the heart that interferes with the flow of blood can cause syncope. The two most common causes of outflow obstruction are hypertrophic cardiomyopathy and aortic stenosis.

- **Hypertrophic cardiomyopathy** — Hypertrophic cardiomyopathy is an inherited condition in which the areas of the left ventricular muscle walls are thickened. In some cases, the condition can interfere with blood flow out from the left ventricle and can cause syncope. More information about hypertrophic cardiomyopathy, including

treatment recommendations, is available separately. (See "[Patient information: Hypertrophic cardiomyopathy \(Beyond the Basics\)](#)".)

- **Aortic stenosis** — The left ventricle normally pumps blood through the aortic valve into the body's largest artery, the aorta, to supply blood to the body ([figure 2](#)). The aortic valve closes while the left ventricle fills with blood and opens when the ventricle contracts and pumps blood into the aorta.

When severe, aortic stenosis can reduce blood flow through the valve, and to the brain and the rest of the body. Treatment of syncope caused by aortic stenosis often includes aortic valve replacement surgery. (See "[Indications for valve replacement in aortic stenosis in adults](#)".)

Orthostatic hypotension — Hypotension means low blood pressure. Orthostatic hypotension refers to low blood pressure that occurs when a person stands or sits up. This causes an inadequate amount of blood to the brain, leading to syncope.

Causes of orthostatic hypotension include the following.

- **Blood or fluid loss** — Sometimes there is not enough blood in the body to ensure adequate flow to the brain when sitting or standing up. Low blood volume can be caused by blood loss or severe dehydration.
- **Medications** — Certain medications can interfere with the normal mechanisms that maintain blood pressure. Examples include some antidepressants, certain blood pressure or heart medicines, or medicines containing opiates, such as [morphine](#).
- **Illnesses that affect the nervous system** — A number of illnesses can affect the specialized branch of the nervous system that helps maintain blood pressure (the autonomic nervous system). Examples are Parkinson disease, diabetes mellitus, the Shy-Drager syndrome, and amyloidosis.
- **Alcohol** — Drinking alcohol can cause blood vessels to expand, causing blood pressure to fall and syncope to occur.
- **Carotid sinus hypersensitivity** — Carotid sinus hypersensitivity is a condition in which reflexes lead to a slow heart rate and/or enlargement of blood vessels. This may be triggered by pressure on the carotid arteries (the main artery in the neck), and can lead to low blood pressure and syncope.

Other causes — Less common causes of syncope include a heart attack, cardiac tumor, or blood clot in the arteries supplying the lungs.

SYNCOPE DIAGNOSIS — There are three main ways to identify the causes of syncope: the medical history, the physical examination, and cardiac testing. A medical history and physical examination are recommended for anyone who has had syncope. Some people will also require cardiac testing.

Medical history — Gathering as much information as possible about events that occurred before, during, and after a syncopal episode can be helpful in determining the possible cause of syncope.

As an example, vasovagal syncope is suspected in a person who has warning signs of nausea or sweating. In contrast, a sudden loss of consciousness with no warning is more likely to be due to a heart rhythm problem. A person who has syncope during exertion is more likely to have an obstruction to blood flow (aortic stenosis or hypertrophic cardiomyopathy) or ventricular tachycardia as a cause.

Information about current medications and preexisting medical conditions such as diabetes, heart disease, or psychiatric illness can help pinpoint the cause of syncope. If the person has abnormal body movements while unconscious and requires a long time to recover consciousness, the person may have had a seizure and not a true syncopal episode.

Physical examination — The clinician will measure your heart rate and blood pressure to help determine if a rhythm

disturbance or low blood pressure caused the syncope. You may be asked to sit or stand while the blood pressure is measured to test for orthostatic hypotension. The clinician will listen to your heart for abnormal sounds that can be present in conditions such as aortic stenosis. You may have a test for blood in the stool to evaluate for blood loss, which could result in syncopal episodes.

If the cause of the syncope is not readily apparent, the clinician may perform special maneuvers to test your response. As an example, you may be asked to bear down as if having a bowel movement; abnormal heart sounds that occur in response to this maneuver can point to hypertrophic cardiomyopathy. The clinician may firmly massage your carotid artery (located in the neck) while your heart rate is closely monitored with an electrocardiogram. The heart's response to this maneuver can give clues to a possible diagnosis.

Testing — A number of medical tests are available to help determine the cause of the syncope. However, testing is not always required.

Electrocardiogram — Most patients who have had an episode of syncope will have an electrocardiogram (ECG or EKG). An ECG can be performed in a clinician's office and takes only a few minutes. Sticky pads are placed on your chest, abdomen, arm, and leg, and are connected to a recording device with long, thin cables. This is not painful and there is no risk of electric shock with an ECG.

The ECG provides a picture of the electrical activity passing through the heart muscle. A normal ECG does not necessarily mean that syncope is not caused by a heart rhythm problem. Heart rhythm problems are often brief, come and go, and may not be present at the moment when the ECG is performed.

Rhythm monitoring — Heart rhythm monitoring may be recommended to diagnose rhythm problems that come and go and have not been detected with a routine ECG. This monitoring may be done at home or in the hospital.

- **Holter monitor** — You may be asked to wear a monitoring device, called a Holter monitor, for 24 or 48 hours while performing normal daily activities at home. The device is connected to several long thin cables that are attached to your chest with sticky pads (similar to an ECG). The cables connect to a small, portable machine that can be attached to a belt or strap that is carried over the shoulder ([figure 3](#)).

However, this type of monitoring has limited use and provides a diagnosis in only about 2 to 3 percent of people with syncope. If you do not experience a syncopal episode while wearing the Holter monitor, the test may need to be repeated, or an alternate form of long-term monitoring may be recommended.

- **Event recorder** — An event recorder may be recommended to capture rhythm problems associated with a syncopal episode. The advantages of an event recorder compared to a Holter monitor are its small size and the ability to monitor for abnormal rhythms for longer periods of time (usually one to two months).

Some devices require you to activate the recorder when you feel symptoms of a syncopal episode. However, if you lose consciousness and another person is not available to assist with the recording, the opportunity to "capture" the event on the monitor may be lost ([figure 4](#)).

- **Intermittent loop recorders** — Intermittent loop recorders were developed to capture rhythm problems that occur before the device is activated. When you activate the monitoring device after regaining consciousness, the ECG recordings from the previous few minutes are retrieved and stored for analysis at a later time.

An implantable loop recorder (ILR) provides a way to monitor rhythms over an extended period of time (eg, 18 to 24 months). The ILR is implanted under the skin on the upper left chest area. It stores events automatically according to programmed criteria, or can be activated by the patient. The ILR may be most useful if your symptoms are infrequent and an arrhythmia is suspected, but other forms of testing are negative or inconclusive.

Echocardiogram — An echocardiogram is useful for identifying underlying structural heart disease such as

hypertrophic cardiomyopathy or significant aortic stenosis. These findings alone do not conclusively establish the specific cause for syncope.

An echocardiogram uses ultrasound (sound waves) to obtain detailed pictures of your heart as it beats. A technician presses a transducer (wand) against your chest and abdomen. The transducer is attached to a recording device and monitor. You are awake during the procedure. An echocardiogram does not use radiation.

Upright tilt table test — This test is often done in healthy patients who have syncope. You lie on a flat table and are tilted at various angles while your heart rate and blood pressure are monitored closely ([figure 5](#)). Your response to the change in position can sometimes give clues about the cause of syncope.

Electrophysiology study — An electrophysiology study (EPS) may be performed if you have heart disease or if a rhythm problem is suspected.

Most people undergo EPS in a hospital setting. You will be given a sedative before the procedure but may be awake during testing. The physician uses a local anesthetic to numb a small area over blood vessel, usually in the groin, and then threads small wires through the blood vessels into the heart using x-ray (fluoroscopic) guidance. Once in the heart, precise measurements of the heart's electrical function can be obtained.

Exercise testing — In some people, especially those with a history of syncope during exertion, an exercise test is useful. Your blood pressure, heart rate, and rhythm are monitored while exercising on a treadmill or bicycle.

Electroencephalogram — EEG involves the measurement of electrical activity in the brain. It can be performed in a provider's office or in a hospital, and generally takes about one hour. Multiple electrodes (small, flat metal discs) will be attached to your head and face with a sticky paste. The electrodes are connected to a recording device with long, thin wires. You must lie still and avoid speaking during the test.

An electroencephalogram (EEG) is frequently obtained in people with syncope, but is rarely useful. It can be helpful if you have syncope and seizure-like activity.

SYNCOPE TREATMENTS — Treatment of syncope is based upon the underlying cause. The goal of treatment is to prevent recurrences or more serious problems.

Vasovagal syncope treatment — Vasovagal syncope can usually be treated by learning to take precautions to avoid potential triggers and minimize the potential risk of harm. For example, if you faint while blood is being drawn, you may be instructed to lie down during the procedure. If you have a feeling that you will pass out during any activity, you should immediately lie down and elevate your legs.

Counter-pressure maneuvers — Counter-pressure maneuvers such as tensing your arms with clenched fists, leg pumping, and leg-crossing may stop a vasovagal syncopal episode, or at least delay it long enough that you can lie down with the feet elevated. Such maneuvers include:

- Leg crossing while tensing the leg, abdominal, and buttock muscles.
- Handgripping, which involves gripping a rubber ball or similar object as hard as possible.
- Arm tensing, which involves gripping one hand with the other while simultaneously moving both arms away from the body.

Medications — People with a heart rhythm problem may be started on medication to control the rhythm.

People with orthostatic hypotension may benefit from increasing the amount of blood fluid volume. [Fludrocortisone](#) (Florinef®) is one medicine that is used to increase blood volume. [Midodrine](#) is a medication that constricts blood vessels that may be used in combination with fludrocortisone.

Pacemakers — A pacemaker is a small device that is implanted under your skin. Wires from the device are threaded to the heart where they emit impulses that help regulate the heartbeat. Pacemakers are often recommended if you

have syncope caused by sinus bradycardia, carotid sinus hypersensitivity, or heart block. (See "[Patient information: Pacemakers \(Beyond the Basics\)](#)".)

Implantable cardioverter-defibrillator — In some people with serious, life-threatening ventricular arrhythmias (such as ventricular tachycardia) that cause syncope, a device called an implantable cardioverter-defibrillator (ICD) is used. The device is surgically implanted under the skin in your chest, similar to a pacemaker. It can sense when a life-threatening ventricular arrhythmia is occurring and administer an electric shock to correct the problem and potentially prevent the person from dying. (See "[Patient information: Implantable cardioverter-defibrillators \(Beyond the Basics\)](#)".)

Orthostatic training — In people with orthostatic hypotension and certain types of vasovagal syncope, orthostatic training may be useful to prevent syncope. Techniques are designed to decrease pooling of blood in the extremities, which can allow the blood pressure to drop when you stand. Methods to decrease this problem include the following:

- Use of elastic compression stockings, which are worn on the feet and lower legs
- Contraction of the leg muscles before and while standing
- Rising to stand slowly and in stages

SAFETY ISSUES — Passing out while driving or other activities can potentially harm both the patient and those around him/her. As a result, driving restrictions are sometimes recommended for certain people with syncope. This generally includes people who have a history of syncope that occurs without warning or known cause. Driving restrictions are governed by state or local laws.

WHERE TO GET MORE INFORMATION — Your healthcare provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our web site (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for healthcare professionals, are also available. Some of the most relevant are listed below.

Patient level information — UpToDate offers two types of patient education materials.

The Basics — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

[Patient information: Syncope \(fainting\) \(The Basics\)](#)

[Patient information: Pacemakers \(The Basics\)](#)

[Patient information: Orthostatic hypotension \(The Basics\)](#)

[Patient information: Bradycardia \(The Basics\)](#)

[Patient information: Sick sinus syndrome \(The Basics\)](#)

[Patient information: Atrial flutter \(The Basics\)](#)

[Patient information: Aortic dissection \(The Basics\)](#)

[Patient information: Time to stop driving? \(The Basics\)](#)

[Patient information: Vagal maneuvers and their responses \(The Basics\)](#)

[Patient information: Long QT syndrome \(The Basics\)](#)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

[Patient information: Hypertrophic cardiomyopathy \(Beyond the Basics\)](#)

[Patient information: Pacemakers \(Beyond the Basics\)](#)

[Patient information: Implantable cardioverter-defibrillators \(Beyond the Basics\)](#)

Professional level information — Professional level articles are designed to keep doctors and other health

professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

[Approach to the adult patient with syncope in the emergency department](#)

[Carotid sinus hypersensitivity](#)

[Evaluation of syncope in adults](#)

[Management of the patient with syncope](#)

[Reflex syncope](#)

[Nonepileptic paroxysmal disorders in adolescents and adults](#)

[Pathogenesis and etiology of syncope](#)

[Upright tilt table testing in the evaluation of syncope](#)

[Indications for valve replacement in aortic stenosis in adults](#)

The following organizations also provide reliable health information.

- National Library of Medicine

(www.nlm.nih.gov/medlineplus/healthtopics.html)

- National Heart, Lung, and Blood Institute

(www.nhlbi.nih.gov/)

- American Heart Association

(www.americanheart.org)

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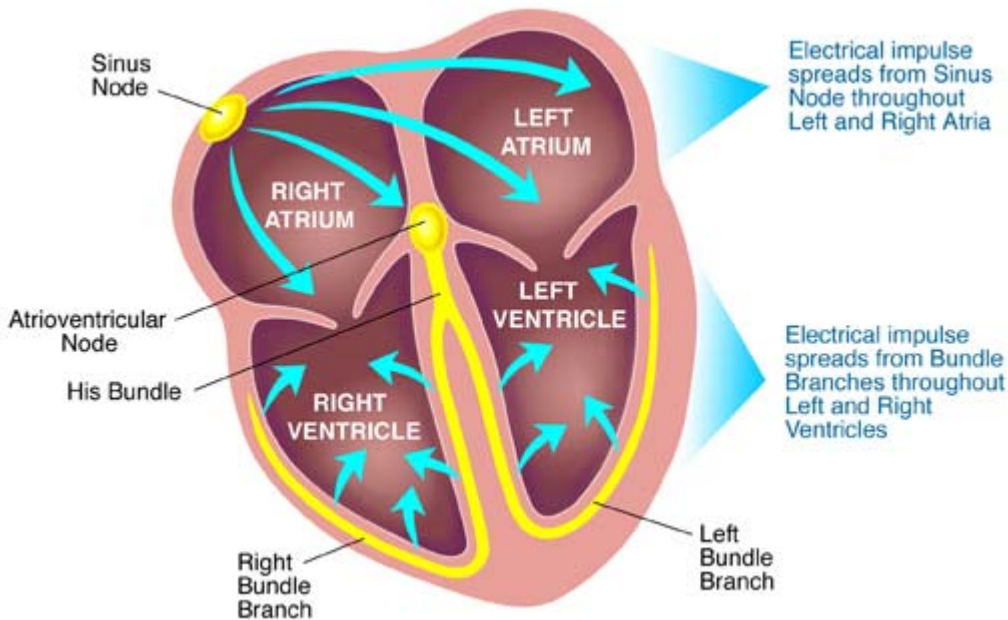
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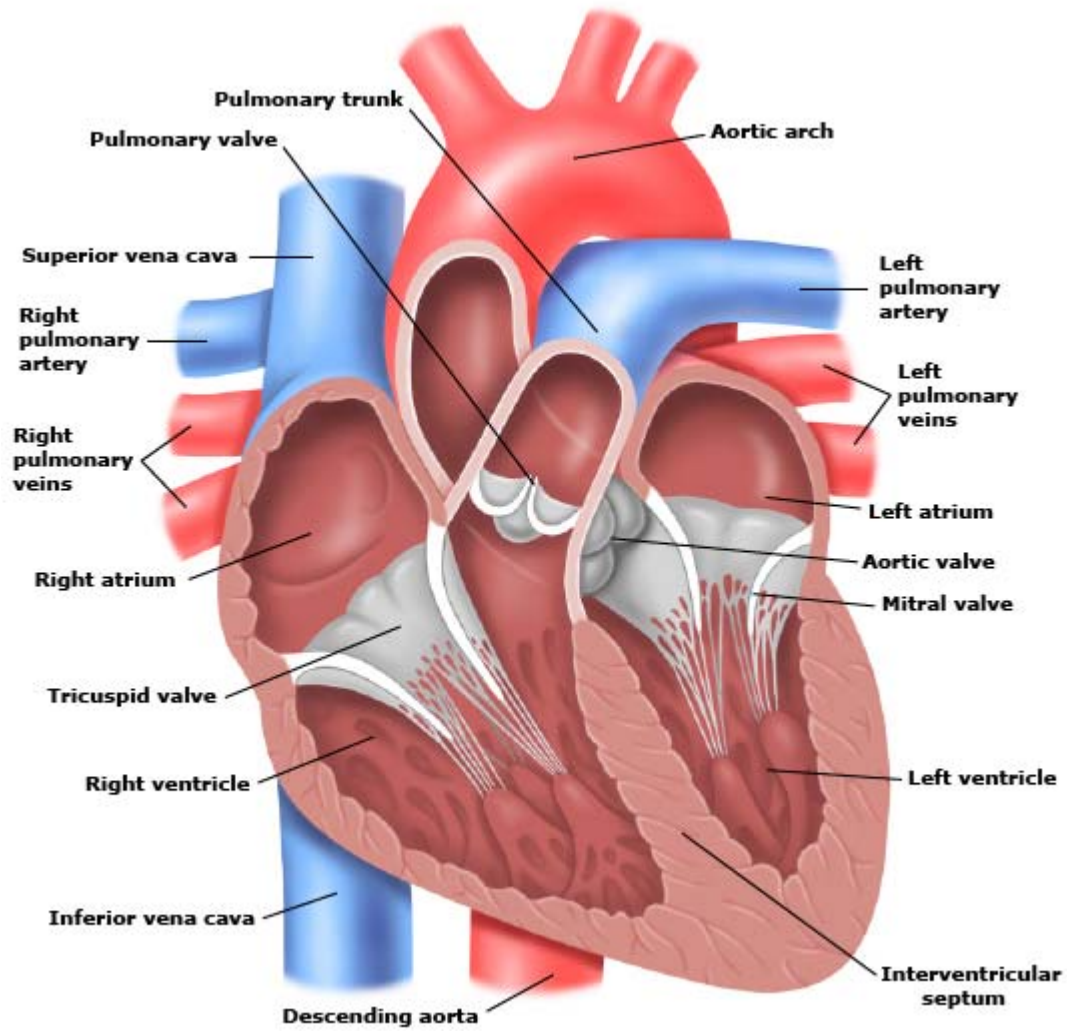
GRAPHICS

The conduction system of the heart

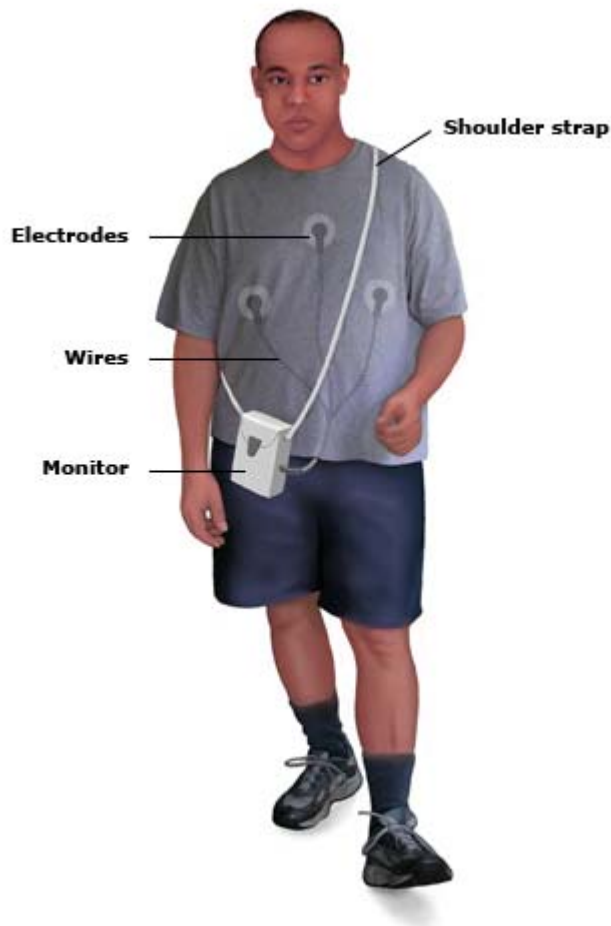


The heart has its own built-in electrical system, called the conduction system. The conduction system sends electrical signals throughout the heart that determine the timing of the heartbeat and cause the heart to beat in a coordinated, rhythmic pattern. The electrical signals, or impulses, of the heart are generated by a clump of specialized tissue called the sinus node. Each time the sinus node generates a new electrical impulse, that impulse spreads out through the heart's upper chambers, called the right atrium and the left atrium. This electrical impulse, as it spreads across the two atria, stimulates them to contract, pumping blood into the right and left ventricles. The electrical impulse then spreads to the atrioventricular (AV) node, which is another clump of specialized tissue located between the atria and the ventricles. The AV node momentarily slows down the spread of the electrical impulse, to allow the left and right atria to finish contracting. From the AV node, the impulse spreads into a system of specialized fibers called the His bundle and the right and left bundle branches. These fibers distribute the electrical impulse rapidly to all areas of the right and left ventricles, stimulating them to contract in a coordinated way. With this contraction, blood is pumped from the right ventricle to the lungs, and from the left ventricle throughout the body.

Anatomy of the interior of the heart



Holter monitor



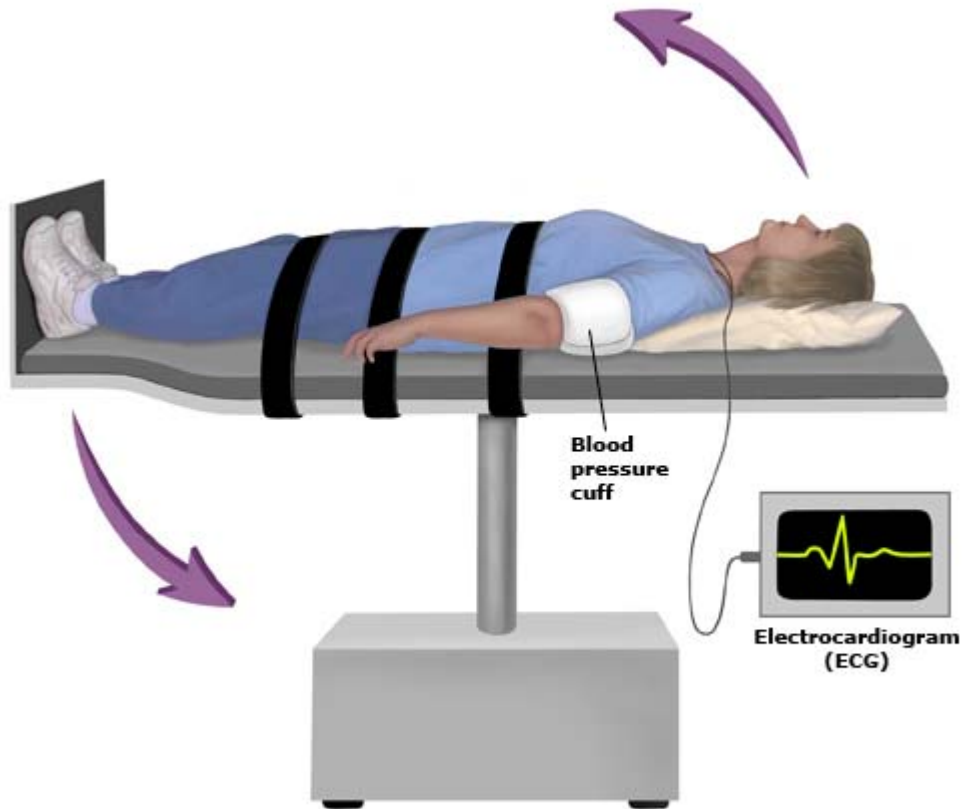
People with possible heart problems are sometimes asked to wear a device called a Holter monitor for one or two days. The device measures the electrical activity in the heart. It helps doctors pinpoint heart rhythm problems. You will have "electrodes" stuck to your chest that are connected to wires leading to the monitor. These electrodes tell the monitor how often your heart beats and if it has a normal rhythm. While you have a Holter monitor on, you should do your normal activities but keep the electrodes, wires and device dry. Some people have an abnormal heart rhythm only during certain activities or certain times of the day.

Cardiac event recorder



An event recorder is a portable device patients can use to measure their heart rhythm for a short time. The patient must activate the recorder and hold it to the chest when they feel symptoms. It is useful for patients that have intermittent symptoms that may not be captured with other forms of testing.

Tilt table test



During a tilt table test, a doctor or nurse tilts your body at different angles. At the same time, he or she monitors your blood pressure and your heart's electrical activity. Your body's response to the changes in position can help your doctor or nurse figure out what, if anything, is wrong with your heart.