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## Diseases and Conditions

# Heart attack

By Mayo Clinic Staff

A heart attack occurs when the flow of blood to the heart is blocked, most often by a build-up of fat, cholesterol and other substances, which form a plaque in the arteries that feed the heart (coronary arteries). The interrupted blood flow can damage or destroy part of the heart muscle.

A heart attack, also called a myocardial infarction, can be fatal, but treatment has improved dramatically over the years. It's crucial to call 911 or emergency medical help if you think you might be having a heart attack.

Common heart attack signs and symptoms include:

- Pressure, tightness, pain, or a squeezing or aching sensation in your chest or arms that may spread to your neck, jaw or back
- Nausea, indigestion, heartburn or abdominal pain
- Shortness of breath
- Cold sweat
- Fatigue
- Lightheadedness or sudden dizziness

## Heart attack symptoms vary

Not all people who have heart attacks have the same symptoms or have the same severity of symptoms. Some people have mild pain; others have more severe pain. Some people have no symptoms, while for others, the first sign may be sudden cardiac arrest. However, the more signs and symptoms you have, the greater the likelihood you're having a heart attack.

Some heart attacks strike suddenly, but many people have warning signs and symptoms hours, days or weeks in advance. The earliest warning may be recurrent chest pain (angina) that's triggered by exertion and relieved by rest. Angina is caused by a temporary decrease in blood flow to the heart.

A heart attack differs from a condition in which your heart suddenly stops (sudden cardiac arrest, which occurs when an electrical disturbance disrupts your heart's pumping action and causes blood to stop flowing to the rest of your body). A heart attack can cause cardiac arrest, but it's not the only cause.

## When to see a doctor

Act immediately. Some people wait too long because they don't recognize the important signs and symptoms. Take these steps:

- **Call for emergency medical help.** If you suspect you're having a heart attack, don't hesitate. Immediately call 911 or your local emergency number. If you don't have access to emergency medical services, have someone drive you to the nearest hospital.

Drive yourself only if there are no other options. Because your condition can worsen, driving yourself puts you and others at risk.

- **Take nitroglycerin, if prescribed to you by a doctor.** Take it as instructed while awaiting emergency help.
- **Take aspirin, if recommended.** Taking aspirin during a heart attack could reduce heart damage by helping to keep your blood from clotting.

Aspirin can interact with other medications, however, so don't take an aspirin unless your doctor or emergency medical personnel recommend it. Don't delay calling 911 to take an aspirin. Call for emergency help first.

## What to do if you see someone having a heart attack

If you encounter someone who is unconscious, first call for emergency medical help. Then begin CPR to keep blood flowing. Push hard and fast on the person's chest — about 100 compressions a minute. It's not necessary to check the person's airway or deliver rescue breaths unless you've been trained in CPR.

A heart attack occurs when one or more of your coronary arteries become blocked. Over time, a coronary artery can narrow from the buildup of various substances, including cholesterol (atherosclerosis). This condition, known as coronary artery disease, causes most heart attacks.

During a heart attack, one of these plaques can rupture and spill cholesterol and other substances into the bloodstream. A blood clot forms at the site of the rupture. If large enough, the clot can completely block the flow of blood through the coronary artery.

Another cause of a heart attack is a spasm of a coronary artery that shuts down blood flow to part of the heart muscle. Use of tobacco and of illicit drugs, such as cocaine, can cause a life-threatening spasm. A heart attack can also occur due to a tear in the heart artery (spontaneous coronary artery dissection).

Certain factors contribute to the unwanted buildup of fatty deposits (atherosclerosis) that narrows arteries throughout your body. You can improve or eliminate many of these risk factors to reduce your chances of having a first or subsequent heart attack.

Heart attack risk factors include:

- **Age.** Men age 45 or older and women age 55 or older are more likely to have a heart attack than are younger men and women.
- **Tobacco.** Smoking and long-term exposure to secondhand smoke increase the risk of a heart attack.
- **High blood pressure.** Over time, high blood pressure can damage arteries that feed your heart by accelerating atherosclerosis. High blood pressure that occurs with obesity, smoking, high cholesterol or diabetes increases your risk even more.
- **High blood cholesterol or triglyceride levels.** A high level of low-density lipoprotein (LDL) cholesterol (the "bad" cholesterol) is most likely to narrow arteries. A high level of triglycerides, a type of blood fat related to your diet, also ups your risk of heart attack. However, a high level of high-density lipoprotein (HDL) cholesterol (the "good" cholesterol) lowers your risk of heart attack.
- **Diabetes.** Insulin, a hormone secreted by your pancreas, allows your body to use glucose, a form of sugar. Having diabetes — not producing enough insulin or not responding to insulin properly — causes your body's blood sugar levels to rise. Diabetes, especially uncontrolled, increases your risk of a heart attack.
- **Family history of heart attack.** If your siblings, parents or grandparents have had early heart attacks (by age 55 for male relatives and by age 65 for female relatives), you may be at increased risk.
- **Lack of physical activity.** An inactive lifestyle contributes to high blood cholesterol levels and obesity. People who get regular aerobic exercise have better cardiovascular fitness, which decreases their overall risk of heart attack. Exercise is also beneficial in lowering high blood pressure.
- **Obesity.** Obesity is associated with high blood cholesterol levels, high triglyceride levels, high blood pressure and diabetes. Losing just 10 percent of your body weight can lower this risk, however.
- **Stress.** You may respond to stress in ways that can increase your risk of a heart attack.
- **Illegal drug use.** Using stimulant drugs, such as cocaine or amphetamines, can trigger a spasm of your coronary arteries that can cause a heart attack.
- **A history of preeclampsia.** This condition causes high blood pressure during pregnancy and increases the lifetime risk of heart disease.
- **A history of an autoimmune condition, such as rheumatoid arthritis or lupus.** Conditions such as rheumatoid arthritis, lupus and other autoimmune conditions can

increase your risk of having a heart attack.

Heart attack complications are often related to the damage done to your heart during a heart attack. This damage can lead to the following conditions:

- **Abnormal heart rhythms (arrhythmias).** If your heart muscle is damaged from a heart attack, electrical "short circuits" can develop, resulting in abnormal heart rhythms, some of which can be serious, even fatal.
- **Heart failure.** The amount of damaged tissue in your heart may be so great that the remaining heart muscle can't do an adequate job of pumping blood out of your heart. Heart failure may be a temporary problem that goes away after your heart, which has been stunned by a heart attack, recovers. However, it can also be a chronic condition resulting from extensive and permanent damage to your heart following your heart attack.
- **Heart rupture.** Areas of heart muscle weakened by a heart attack can rupture, leaving a hole in part of the heart. This rupture is often fatal.
- **Valve problems.** Heart valves damaged during a heart attack may develop severe, life-threatening leakage problems.

A heart attack usually is diagnosed in an emergency setting. However, if you're concerned about your risk of heart attack, see your doctor to check your risk factors and talk about prevention. If your risk is high, you may be referred to a heart specialist (cardiologist).

Here's some information to help you prepare for your appointment.

## What you can do

- **Be aware of pre-appointment restrictions.** When you make the appointment, ask if there's anything you need to do in advance, such as restrict your diet. For a cholesterol test, for example, you may need to fast beforehand.
- **Write down your symptoms,** including any that seem unrelated to coronary artery disease.
- **Write down key personal information,** including a family history of heart disease, stroke, high blood pressure or diabetes, and recent major stresses or recent life changes.
- **Make a list of medications,** vitamins and supplements you're taking.
- **Take someone along,** if possible. Someone who accompanies you may remember something you miss or forget.
- **Be prepared to discuss your diet and exercise habits.** If you don't follow a diet or exercise routine, be ready to talk to your doctor about challenges you might face in getting started.
- **Write down questions to ask** your doctor.

Preparing a list of questions can help you make the most of your time with your doctor. Some basic questions to ask your doctor about heart attack prevention include:

- What tests do I need to determine my current heart health?
- What foods should I eat or avoid?
- What's an appropriate level of physical activity?
- How often should I be screened for heart disease?
- I have other health conditions. How can I best manage these conditions together?
- Are there brochures or other printed material that I can have?
- What websites do you recommend?

Don't hesitate to ask other questions, as well.

## **What to expect from your doctor**

Your doctor is likely to ask you a number of questions, including:

- Have you had symptoms of heart disease, such as chest pain or shortness of breath? If so, when did they begin?
- Do these symptoms persist or come and go?
- How severe are your symptoms?
- What, if anything, seems to improve your symptoms? If you have chest pain, does it improve with rest?
- What, if anything, worsens your symptoms? If you have chest pain, does strenuous activity make it worse?
- Do you have a family history of heart disease or heart attacks?
- Have you been diagnosed with high blood pressure, diabetes or high cholesterol?

## **What you can do in the meantime**

It's never too early to make healthy lifestyle changes, such as quitting smoking, eating healthy foods and becoming more physically active. These are primary lines of defense against having a heart attack.

Ideally, your doctor should screen you during regular physical exams for risk factors that can lead to a heart attack.

If you're in an emergency setting for symptoms of a heart attack, you'll be asked to describe your symptoms and have your blood pressure, pulse and temperature checked. You'll be hooked up to a heart monitor and will almost immediately have tests to see if you're having a heart attack.

Tests will help check if your signs and symptoms, such as chest pain, indicate a heart attack or another condition. These tests include:

- **Electrocardiogram (ECG).** This first test done to diagnose a heart attack records the electrical activity of your heart via electrodes attached to your skin. Impulses are recorded as waves displayed on a monitor or printed on paper. Because injured heart muscle doesn't conduct electrical impulses normally, the ECG may show that a heart attack has occurred or is in progress.
- **Blood tests.** Certain heart enzymes slowly leak out into your blood if your heart has been damaged by a heart attack. Emergency room doctors will take samples of your blood to test for the presence of these enzymes.

## Additional tests

If you've had a heart attack or one is occurring, doctors will take immediate steps to treat your condition. You may also undergo these additional tests:

- **Chest X-ray.** An X-ray image of your chest allows your doctor to check the size of your heart and its blood vessels and to look for fluid in your lungs.
- **Echocardiogram.** During this test, sound waves directed at your heart from a wandlike device (transducer) held on your chest bounce off your heart and are processed electronically to provide video images of your heart. An echocardiogram can help identify whether an area of your heart has been damaged by a heart attack and isn't pumping normally or at peak capacity.
- **Coronary catheterization (angiogram).** A liquid dye is injected into the arteries of your heart through a long, thin tube (catheter) that's fed through an artery, usually in your leg or groin, to the arteries in your heart. The dye makes the arteries visible on X-ray, revealing areas of blockage.
- **Exercise stress test.** In the days or weeks after your heart attack, you may also undergo a stress test. Stress tests measure how your heart and blood vessels respond to exertion. You may walk on a treadmill or pedal a stationary bike while attached to an ECG machine. Or you may receive a drug intravenously that stimulates your heart similar to exercise.

Your doctor may also order a nuclear stress test, which is similar to an exercise stress test, but uses an injected dye and special imaging techniques to produce detailed images of your heart while you're exercising. These tests can help determine your long-term treatment.

- **Cardiac computerized tomography (CT) or magnetic resonance imaging (MRI).** These tests can be used to diagnose heart problems, including the extent of damage from heart attacks. In a cardiac CT scan, you lie on a table inside a doughnut-shaped machine. An X-ray tube inside the machine rotates around your body and collects images of your heart and chest.

In a cardiac MRI, you lie on a table inside a long tubelike machine that produces a magnetic field. The magnetic field aligns atomic particles in some of your cells. When radio waves are broadcast toward these aligned particles, they produce signals that vary according to the

type of tissue they are. The signals create images of your heart.

## Heart attack treatment at a hospital

With each passing minute after a heart attack, more heart tissue loses oxygen and deteriorates or dies. The main way to prevent heart damage is to restore blood flow quickly.

### Medications

Medications given to treat a heart attack include:

- **Aspirin.** The 911 operator may instruct you to take aspirin, or emergency medical personnel may give you aspirin immediately. Aspirin reduces blood clotting, thus helping maintain blood flow through a narrowed artery.
- **Thrombolytics.** These drugs, also called clotbusters, help dissolve a blood clot that's blocking blood flow to your heart. The earlier you receive a thrombolytic drug after a heart attack, the greater the chance you'll survive and with less heart damage.
- **Antiplatelet agents.** Emergency room doctors may give you other drugs to help prevent new clots and keep existing clots from getting larger. These include medications, such as clopidogrel (Plavix) and others, called platelet aggregation inhibitors.
- **Other blood-thinning medications.** You'll likely be given other medications, such as heparin, to make your blood less "sticky" and less likely to form clots. Heparin is given intravenously or by an injection under your skin.
- **Pain relievers.** You may receive a pain reliever, such as morphine, to ease your discomfort.
- **Nitroglycerin.** This medication, used to treat chest pain (angina), can help improve blood flow to the heart by widening (dilating) the blood vessels.
- **Beta blockers.** These medications help relax your heart muscle, slow your heartbeat and decrease blood pressure, making your heart's job easier. Beta blockers can limit the amount of heart muscle damage and prevent future heart attacks.
- **ACE inhibitors.** These drugs lower blood pressure and reduce stress on the heart.

### Surgical and other procedures

In addition to medications, you may undergo one of the following procedures to treat your heart attack:

- **Coronary angioplasty and stenting.** Doctors insert a long, thin tube (catheter) that's passed through an artery, usually in your leg or groin, to a blocked artery in your heart. If you've had a heart attack, this procedure is often done immediately after a cardiac catheterization, a procedure used to locate blockages.

This catheter is equipped with a special balloon that, once in position, is briefly inflated to

open a blocked coronary artery. A metal mesh stent may be inserted into the artery to keep it open long term, restoring blood flow to the heart. Depending on your condition, your doctor may opt to place a stent coated with a slow-releasing medication to help keep your artery open.

- **Coronary artery bypass surgery.** In some cases, doctors may perform emergency bypass surgery at the time of a heart attack. If possible, your doctor may suggest that you have bypass surgery after your heart has had time — about three to seven days — to recover from your heart attack.

Bypass surgery involves sewing veins or arteries in place beyond a blocked or narrowed coronary artery, allowing blood flow to the heart to bypass the narrowed section.

Once blood flow to your heart is restored and your condition is stable, you're likely to remain in the hospital for several days.

Your lifestyle affects your heart health. The following steps can help you not only prevent but also recover from a heart attack:

- **Avoid smoke.** The most important thing you can do to improve your heart's health is to not smoke. Also, avoid being around secondhand smoke. If you need to quit, ask your doctor for help.
- **Control your blood pressure and cholesterol levels.** If one or both of these is high, your doctor can prescribe changes to your diet and medications. Ask your doctor how often you need to have your blood pressure and cholesterol levels monitored.
- **Get regular medical checkups.** Some of the major risk factors for heart attack — high blood cholesterol, high blood pressure and diabetes — cause no symptoms early on. Your doctor can perform tests to check for these conditions and help you manage them, if necessary.
- **Exercise regularly.** Regular exercise helps improve heart muscle function after a heart attack and helps prevent a heart attack by helping you to control your weight, diabetes, cholesterol and blood pressure. Exercise needn't be vigorous. Walking 30 minutes a day, five days a week can improve your health.
- **Maintain a healthy weight.** Excess weight strains your heart and can contribute to high cholesterol, high blood pressure and diabetes.
- **Eat a heart-healthy diet.** Saturated fat, trans fats and cholesterol in your diet can narrow arteries to your heart, and too much salt can raise blood pressure. Eat a heart-healthy diet that includes lean proteins, such as fish and beans, plenty of fruits and vegetables and whole grains.
- **Manage diabetes.** High blood sugar is damaging to your heart. Regular exercise, eating well and losing weight all help to keep blood sugar levels at more-desirable levels. Many people also need medication to manage their diabetes.

- **Control stress.** Reduce stress in your day-to-day activities. Rethink workaholic habits and find healthy ways to minimize or deal with stressful events in your life.
- **If you drink alcohol, do so in moderation.** For healthy adults, that means up to one drink a day for women and men older than age 65, and up to two drinks a day for men age 65 and younger.

It's never too late to take steps to prevent a heart attack — even if you've already had one. Here are ways to prevent a heart attack.

- **Medications.** Taking medications can reduce your risk of a subsequent heart attack and help your damaged heart function better. Continue to take what your doctor prescribes, and ask your doctor how often you need to be monitored.
- **Lifestyle factors.** You know the drill: Maintain a healthy weight with a heart-healthy diet, don't smoke, exercise regularly, manage stress and control conditions that can lead to heart attack, such as high blood pressure, high cholesterol and diabetes.

Having a heart attack is scary. How will this affect your life? Will you be able to return to work or resume activities you enjoy? Will it happen again?

Here are some suggestions to help you cope:

- **Deal with your emotions.** Fear, anger, guilt and depression are all common after a heart attack. Discussing them with your doctor, a family member or a friend may help. Or consider talking to a mental health provider or joining a support group.

It's important to mention signs or symptoms of depression to your doctor. Cardiac rehabilitation programs can be effective in preventing or treating depression after a heart attack.

- **Attend cardiac rehabilitation.** Many hospitals offer programs that may start while you're in the hospital and, depending on the severity of your attack, continue for weeks to months after you return home. Cardiac rehabilitation programs generally focus on four main areas — medications, lifestyle changes, emotional issues and a gradual return to your normal activities.

## Sex after a heart attack

Some people worry about having sex after a heart attack, but most people can safely return to sexual activity after recovering from a heart attack. When you can resume sexual activity will depend on your physical comfort, psychological readiness and previous sexual activity. Ask your doctor when it's safe to resume sexual activity.

Some heart medications may affect sexual function. If you're having problems with sexual dysfunction, talk to your doctor.

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Nov. 15, 2014

Original article: <http://www.mayoclinic.org/diseases-conditions/heart-attack/basics/symptoms/con-20019520>