



# Patient education: Heart attack (Beyond the Basics)

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## HEART ATTACK OVERVIEW

The heart, like all other organs and tissues in the body, requires a supply of blood. The blood supply to the heart is provided by blood vessels called coronary arteries. The coronary arteries lie on the outside of the heart muscle before entering the heart muscle itself ( [figure 1](#)).

Myocardial infarction, or MI (commonly known as a "heart attack"), is damage or death of part of the heart muscle. The damage is caused by lack of blood flow through the coronary arteries. Almost all cases of MI occur in someone who has an underlying condition called coronary artery disease.

More detailed information about heart attack is available by subscription. (See "[Overview of the acute management of ST-elevation myocardial infarction](#)" and "[Overview of the acute management of non-ST-elevation acute coronary syndromes](#)".)

**Coronary artery disease** — Coronary artery disease is sometimes called coronary heart disease, coronary disease, or ischemic heart disease. In coronary artery disease, the coronary arteries become narrowed by fatty deposits called plaques ( [figure 2](#)). The fatty plaques inside the coronary arteries limit blood flow to the heart muscle. This can cause pain or tightness in the chest, which is called angina pectoris, or "angina."

**Plaque rupture and clot formation** — Normally, plaques that have built up on the artery walls hold together and stay stuck there. Sometimes, however, plaques can develop cracks in their surface. If that happens, the body responds as though the blood vessel is injured and

bleeding. As part of the body's "first aid" response, tiny blood elements called platelets travel to the site and begin sticking to one another to form a clot ( [figure 3](#)).

Normally, clots like these are a good thing, because they stop you from bleeding. Unfortunately, when clots form inside the coronary arteries, they can get lodged there and partially or completely block the flow of blood. This is what happens during a heart attack.

When a blood clot forms within a coronary artery, the area of heart muscle fed by that artery no longer receives enough blood. This lack of blood supply is called "ischemia." As a result of ischemia, the heart muscle becomes damaged and may die. The death of heart muscle is termed "infarction."

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## HEART ATTACK SYMPTOMS

The "typical" symptoms of a heart attack include:

### Chest pain

- Chest pain or discomfort (pressure, tightness, or squeezing)
- Pain spreading through the chest and other areas of the body, including the upper abdomen, shoulders, arms, neck and throat, or lower jaw and teeth
- Pain coming on gradually and lasting more than a few seconds

### Other symptoms

- Shortness of breath
- Nausea, vomiting, or belching
- Sweating
- Palpitations (skipped heart beats)
- Lightheadedness
- Feeling tired
- Fainting

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## HEART ATTACK DIAGNOSIS

If you have chest pain or discomfort that is new, severe, prolonged, or causing concern, **call 911 immediately**. The emergency medical services (EMS) personnel in your community are prepared to respond rapidly, and they will take you to the nearest hospital. For a patient having a heart attack, every minute is important. Remember, the faster you get to a hospital, the sooner you can receive treatment.

Although not everyone with chest pain or discomfort is having a heart attack, you may be treated for a heart attack until testing can be done to determine the cause of your symptoms.

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## HEART ATTACK TREATMENT

You will be given oxygen through a flexible plastic tube that rests beneath the nose or by a face mask, and an electrocardiogram (ECG) will be performed as quickly as possible. The ECG gives a picture of the electrical activity that causes the heart to beat. Damaged areas usually show an abnormal pattern. The ECG may be repeated.

Blood is drawn and sent to the laboratory to look for substances in the blood that are released by damaged heart tissue (cardiac enzymes or proteins). An intravenous line (IV) is started so that medications can be given directly into the veins. **Nitroglycerin** may be given either through the IV or under the tongue to relieve chest pain. **Morphine** may also be given to help relieve chest pain and ease your anxiety. You will be given **aspirin** to chew and swallow to help stop new blood clots from forming.

There are different types of myocardial infarction (MI), based on what is seen on the ECG. The two main types are called ST-elevation MI (STEMI) and non-ST-elevation MI (NSTEMI). Your treatment will depend upon the type of MI you have.

**Treatment of non-ST-elevation heart attack** — People with non-ST-elevation heart attacks, or NSTEMI, are treated with drugs, including **aspirin** that help prevent new blood clots. A medication called a beta blocker may also be given to slow the heart and decrease the heart's demand for oxygen, and drugs such as statins are used to lower the cholesterol.

Following this, two approaches to treatment are possible: early catheterization and intensive medical therapy. Your care team will discuss with you which of these options they recommend.

**Early catheterization** — This approach is recommended in people whose heart damage continues despite initial treatment with medicines. Early catheterization is also often used in people who are in stable condition after initial treatment with medicines. With this approach, you are taken for a cardiac catheterization within the first hours or days of being in the hospital. A small plastic tube (catheter) is threaded through a blood vessel (artery), usually in the groin, to the coronary arteries. A dye is injected that allows the arteries to be seen on X-ray.

If blockages or narrowings are found, a procedure known as percutaneous coronary intervention (also known as stenting) may be done. With this procedure, a tiny catheter with a balloon at the end of it is advanced into the narrowed coronary artery. The balloon is then

inflated, which helps open up the narrowed artery. A stent (an expandable metal tube) is placed in the artery to prevent the narrowing from recurring. (See "[Patient education: Stenting for the heart \(Beyond the Basics\)](#)".)

In some cases, the X-ray reveals that the blockages cannot be opened with stenting. In these instances, coronary artery bypass graft surgery (CABG, pronounced "cabbage") may be an option. During the CABG operation, a blood vessel (vein or artery) is taken from the leg or the chest and used as a detour around the blocked coronary artery. (See "[Patient education: Coronary artery bypass graft surgery \(Beyond the Basics\)](#)".)

**Intensive medical therapy** — Intensive medical therapy is an option for people who are clinically stable after treatment with medicines. If your symptoms do not return, stress testing is performed. In this test, the heart is stressed with exercise on a treadmill or bicycle or with a drug, and the heart's response is examined with an ECG, ultrasound, or radioactive dye. The exercise test can indicate if your coronary arteries are narrowed or blocked.

Further treatment decisions are based on the results of the exercise test:

- You may be discharged on medicines that control your symptoms.
- You may need one or more procedures, including coronary artery stenting or surgery (explained below).

**Treatment of ST-elevation heart attack** — If your ECG indicates that you are having an ST-elevation heart attack, or STEMI, you will be given many of the same medications as for NSTEMI while doctors are deciding how best to quickly open the blocked coronary artery.

Opening the blocked artery is called "reperfusion therapy." The more quickly this therapy is given, the better the chance of saving areas of your heart that might otherwise be damaged. In general, the best outcome occurs when the artery is opened within four hours of your first heart attack symptoms, preferably within 90 to 120 minutes. (See "[Acute ST-elevation myocardial infarction: Selecting a reperfusion strategy](#)".)

Reperfusion therapy can occur in one of two ways. The preferred method is percutaneous coronary intervention, which is explained separately. (See "[Patient education: Stenting for the heart \(Beyond the Basics\)](#)".)

However, not every hospital is equipped to do percutaneous coronary intervention in a timely manner. In this case, an acceptable alternative treatment is to use a medicine that dissolves blood clots. The clot-busting drugs, called thrombolytic or fibrinolytic agents, should be given within 30 minutes of arrival at the hospital. However, these drugs cannot be given to certain patients, including those who have active bleeding, a high blood pressure

reading, recent trauma, or a history of stroke. They are also not recommended in the treatment of NSTEMI.

In some people with STEMI, urgent bypass surgery is needed. (See "[Patient education: Coronary artery bypass graft surgery \(Beyond the Basics\)](#)".)

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## THE DISCHARGE PLAN

If there are no complications during or after your heart attack, you can usually leave the hospital after approximately two to five days. You will be given information about what medications to take (old and new), how to change your lifestyle to reduce the risk of another heart attack (for example, stopping smoking), and when you can resume your normal activities. You will also be referred to a cardiac rehabilitation/exercise program. (See "[Patient education: Heart attack recovery \(Beyond the Basics\)](#)".)

You should take your medications exactly as directed; if you have side effects or questions about your medications, call your doctor before stopping or changing your dose.

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## 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](http://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 education: Coronary artery disease \(The Basics\)](#)

[Patient education: Heart failure \(The Basics\)](#)

[Patient education: Heart attack \(The Basics\)](#)

[Patient education: Shortness of breath \(The Basics\)](#)

[Patient education: Heart attack – Discharge instructions \(The Basics\)](#)

[Patient education: ECG and stress test \(The Basics\)](#)

[Patient education: Nuclear heart testing \(The Basics\)](#)

[Patient education: Coronary artery bypass graft surgery – Discharge instructions \(The Basics\)](#)

[Patient education: What can go wrong after a heart attack? \(The Basics\)](#)  
[Patient education: Cardiac catheterization \(The Basics\)](#)  
[Patient education: High blood pressure emergencies \(The Basics\)](#)  
[Patient education: Sudden cardiac arrest \(The Basics\)](#)  
[Patient education: Atherosclerosis \(The Basics\)](#)  
[Patient education: Ventricular fibrillation \(The Basics\)](#)  
[Patient education: Aortic dissection \(The Basics\)](#)  
[Patient education: Coronary artery disease in women \(The Basics\)](#)  
[Patient education: Heart failure with preserved ejection fraction \(The Basics\)](#)  
[Patient education: Heart failure with reduced ejection fraction \(The Basics\)](#)  
[Patient education: Stress cardiomyopathy \(The Basics\)](#)  
[Patient education: Coronary artery bypass graft surgery \(The Basics\)](#)  
[Patient education: Lowering your risk of heart disease \(The Basics\)](#)  
[Patient education: Troponin test \(The Basics\)](#)  
[Patient education: Angina \(The Basics\)](#)  
[Patient education: Ambulatory heart monitoring \(The Basics\)](#)  
[Patient education: Clot-dissolving medicines for heart attack or stroke \(The Basics\)](#)  
[Patient education: Living with coronary artery disease \(The Basics\)](#)  
[Patient education: How to protect the chest after heart surgery \(The Basics\)](#)

**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 education: Stenting for the heart \(Beyond the Basics\)](#)  
[Patient education: Coronary artery bypass graft surgery \(Beyond the Basics\)](#)  
[Patient education: Heart attack recovery \(Beyond the Basics\)](#)

**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.

[Ventricular arrhythmias during acute myocardial infarction: Incidence, mechanisms, and clinical features](#)  
[Overview of the acute management of ST-elevation myocardial infarction](#)  
[Overview of the acute management of non-ST-elevation acute coronary syndromes](#)  
[Overview of the nonacute management of ST-elevation myocardial infarction](#)  
[Overview of the nonacute management of unstable angina and non-ST-elevation myocardial infarction](#)

[Risk stratification after acute ST-elevation myocardial infarction](#)

[Prevention of cardiovascular disease events in those with established disease \(secondary prevention\) or at very high risk](#)

[Overview of secondary prevention of ischemic stroke](#)

[Acute myocardial infarction: Patients with diabetes mellitus](#)

[Acute ST-elevation myocardial infarction: Selecting a reperfusion strategy](#)

The following organizations also provide reliable health information.

- National Library of Medicine  
( [medlineplus.gov/heartattack.html](https://medlineplus.gov/heartattack.html))
- National Heart, Lung, and Blood Institute  
( [www.heart.org/en/health-topics/heart-attack](https://www.heart.org/en/health-topics/heart-attack))
- American Heart Association  
( [www.heart.org/](https://www.heart.org/))

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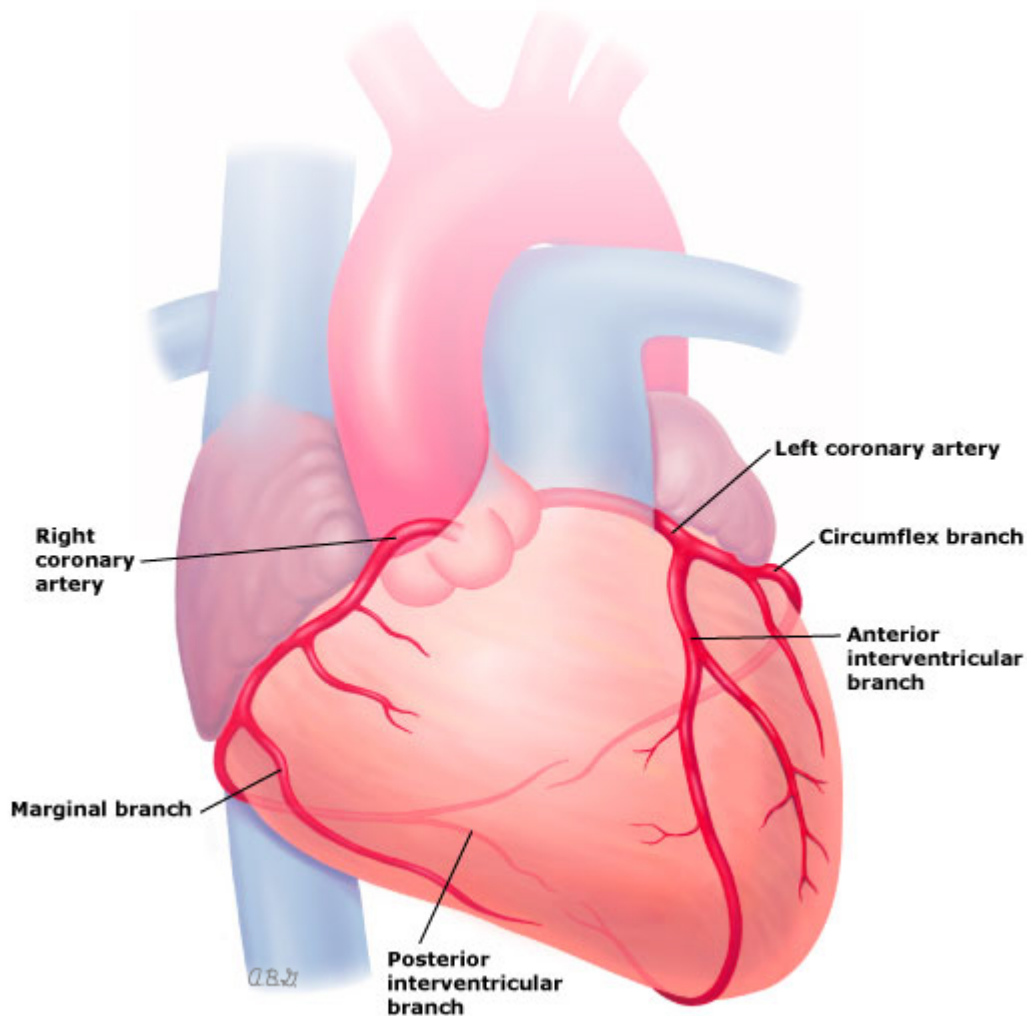
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Topic 3447 Version 32.0

## GRAPHICS

### Location of heart attacks



The heart pumps oxygen-rich blood through the huge network of arteries that extend throughout the body, including the vessels that supply oxygen to the heart muscle itself. These vessels, called coronary arteries, lie on the surface of the heart muscle before entering the heart muscle itself. Depending upon which coronary arteries are obstructed, different areas of the heart can suffer damage during an MI.

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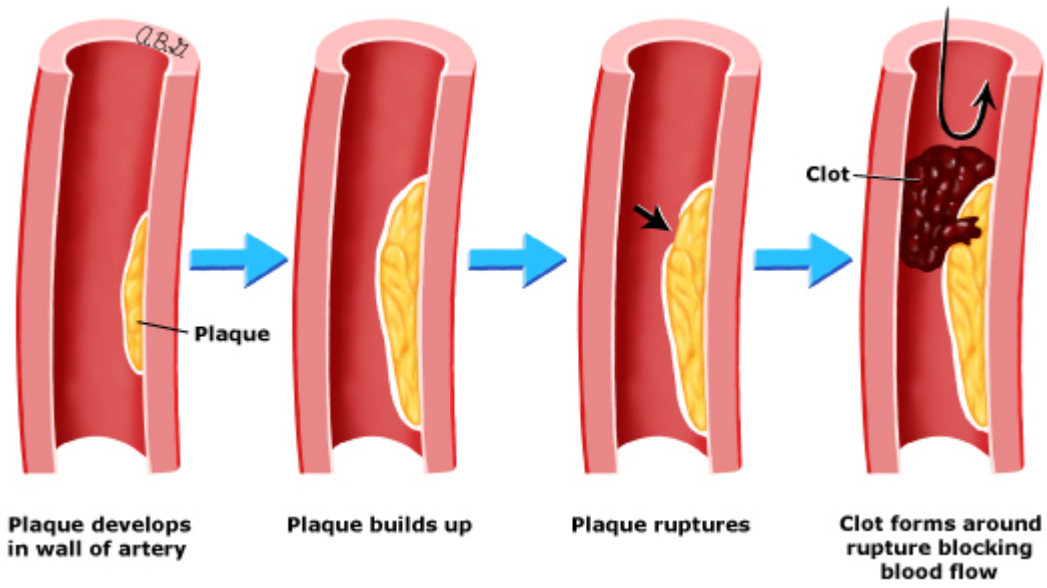
MI: myocardial infarction.

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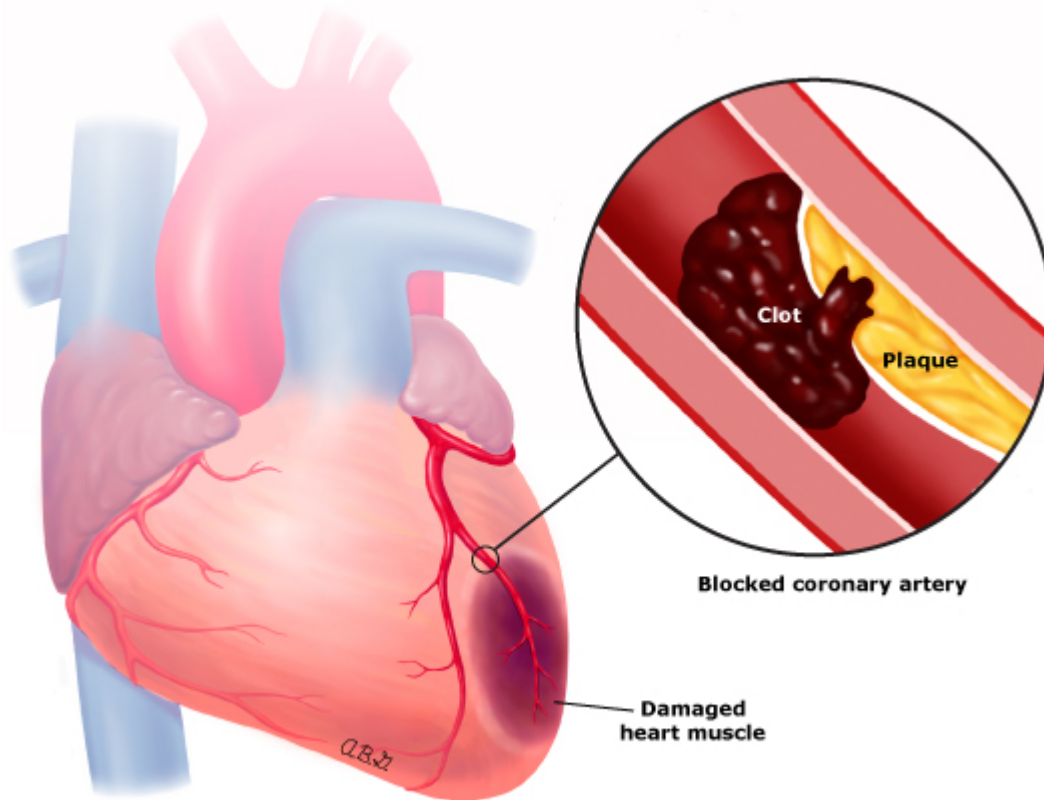


## Plaque formation



Graphic 78702 Version 3.0

## Heart attack



Plaques inside the coronary arteries sometimes break open or "rupture." This is what causes most heart attacks. When a plaque breaks open, it causes a blood clot to form inside the artery. As the clot grows, it can completely block off the flow of blood through the artery. That means that the tissue on the other end of the clogged artery does not get the blood and oxygen it needs, so it gets damaged or dies.

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Graphic 60394 Version 9.0

