

Coronary Artery Disease

This information is at http://www.nlm.nih.gov/health/dci/Diseases/Cad/CAD_All.html and is provided by the NHLBI, one of the Institutes of the National Institutes of Health.

To obtain a free copy of this document, go to www.masterdocs.com.

What Is Coronary Artery Disease?

Coronary artery disease (CAD) occurs when the arteries that supply blood to the heart muscle (coronary arteries) become hardened and narrowed. The arteries harden and become narrow due to the buildup of plaque on the inner walls or lining of the arteries (atherosclerosis). Blood flow to the heart is reduced as plaque narrows the coronary arteries. This decreases the oxygen supply to the heart muscle.

CAD is the most common type of heart disease. It is the leading cause of death in the U.S. in both men and women.

When blood flow and oxygen supply to the heart are reduced or cut off, you can develop:

- **Angina.** Angina is chest pain or discomfort that occurs when your heart is not getting enough blood.
- **Heart attack.** A heart attack happens when a blood clot suddenly cuts off most or all blood supply to part of the heart. Cells in the heart muscle that do not receive enough oxygen-carrying blood begin to die. This can cause permanent damage to the heart muscle.

Over time, CAD can weaken your heart muscle and contribute to:

- **Heart failure.** In heart failure, the heart is not able to pump blood to the rest of the body effectively. Heart failure does not mean that your heart has stopped or is about to stop working. But it does mean that your heart is failing to pump blood the way that it should.
- **Arrhythmias.** Arrhythmias are changes in the normal rhythm of the heartbeats. Some can be quite serious.

Other Names for Coronary Artery Disease

Coronary artery disease is also called:

- CAD
- Coronary heart disease (CHD)
- Heart disease

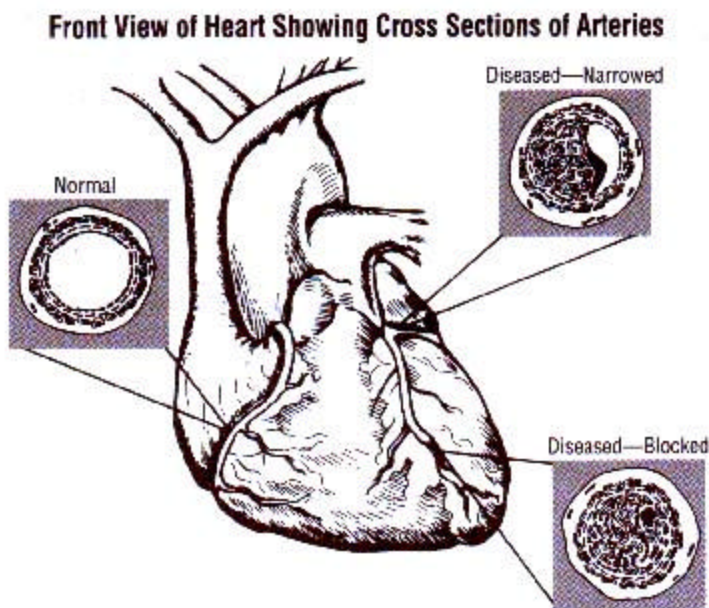
- Ischemic heart disease.

What Causes Coronary Artery Disease?

CAD is caused by atherosclerosis, the thickening and hardening of the inside walls of arteries. Some hardening of the arteries occurs normally as you grow older.

In atherosclerosis, plaque deposits build up in the arteries. Plaque is made up of fat, cholesterol, calcium, and other substances from the blood. Plaque buildup in the arteries often begins in childhood. Over time, plaque buildup in the coronary arteries can:

- Narrow the arteries so that less blood can flow to the heart muscle
- Completely block the arteries and the flow of blood
- Cause blood clots to form and block the arteries.



Plaque in the arteries can be:

- Hard and stable. Hard plaque causes the artery walls to thicken and harden. This condition is associated more with angina than with a heart attack, but heart attacks frequently occur with hard plaque.
- Soft and unstable. Soft plaque is more likely to break open or apart and cause blood clots. This can lead to a heart attack.

What Makes Coronary Artery Disease More Likely?

About **13 million people** in the U.S. have CAD. It is the number one killer of both men and women. Each year, more than half a million Americans die from CAD.

There are factors that make it more likely that you will develop CAD. These are called **risk factors**.

Risk factors that you cannot do anything about are:

- Age. As you get older, your risk for CAD increases.
 - In men, risk increases after age 45
 - In women, risk increases after age 55.
- Family history of early heart disease:
 - Heart disease diagnosed before age 55 in father or brother
 - Heart disease diagnosed before age 65 in mother or sister.

Risk factors that you can do something about include:

- [High blood cholesterol](#)
- [High blood pressure](#)
- [Cigarette smoking](#)
- [Diabetes](#)
- [Being overweight or obese](#)
- Lack of physical activity.

The more risk factors you have, the greater your chance for developing CAD.

Promising Research

Scientists continue to study the cause and the risk factors for CAD.

- Some recent studies show that having high levels of a substance called C-reactive protein (CRP) in your blood appears to be associated with an increased risk of developing CAD and having a heart attack. CRP levels in the blood rise when there is inflammation, a body process that is a response to injury. The inflammatory process appears to contribute to the growth of plaque in the artery. Inflammation can occur as a result of an infection.
- Research is under way to find out if reducing inflammation and lowering CRP levels can also reduce the risk for CAD and heart attack.

What Are the Signs and Symptoms of Coronary Artery Disease?

The most common symptoms of CAD are:

- [Chest pain or chest discomfort \(angina\)](#), or pain in one or both arms, the left shoulder, neck, jaw or back.
- Shortness of breath.

The severity of symptoms varies widely. Your symptoms may become more severe as your coronary arteries become narrower due to the buildup of plaque ([atherosclerosis](#)).

In some people, the first sign of CAD is a [heart attack](#). A heart attack occurs when plaque in a coronary artery breaks apart, causing a blood clot or clots to form and block the artery.

How is Coronary Artery Disease Diagnosed?

There is no single test to diagnose CAD. Your doctor will ask about your medical and family history, your risk factors, and do a physical exam and several tests. These procedures are used to:

- Decide if you have CAD
- Determine the extent and severity of the disease
- Rule out other possible causes of your symptoms.

Your doctor uses your exam results, your risk factors, family history, and your symptoms to decide which one or more of the following tests to order:

- [EKG or ECG \(electrocardiogram\)](#). This test is used to measure the rate and regularity of your heartbeat.
- [Echocardiogram](#). This test uses sound waves to create a picture of the heart. The picture is more detailed than an x-ray image.
- [Exercise stress test](#). This test shows how well your heart pumps at higher workloads when it needs more oxygen. EKG and blood pressure readings are taken before, during, and after exercise to see how your heart responds to exercise. The first EKG and blood pressure readings are done to get a baseline. Readings are then taken while you walk on an exercise treadmill, pedal a stationary bicycle, or receive medicine to make your heart beat faster. The test continues until you reach a heart rate set by your doctor. The exercise part is stopped if chest pain or a very sharp rise in blood pressure occurs. Monitoring continues for 10 to 15 minutes after exercise or until your heart rate returns to baseline.
- [Chest x-ray](#). A chest x-ray takes a picture of your heart and lungs.

- [Cardiac catheterization](#). A thin flexible tube is passed through an artery at the top of the leg (groin) or in the arm to reach the coronary arteries. This allows your doctor to examine inside your arteries to see if there is any blockage. Your doctor can determine pressure and blood flow in the heart's chambers, collect blood samples from the heart, and examine the arteries of the heart by x-ray.
- [Coronary angiography](#). This test is usually performed along with cardiac catheterization. A dye is injected into the coronary arteries. Your doctor can see the flow of blood through the heart on an x-ray screen.
- [Nuclear heart scan](#). This test uses radioactive tracers (technetium or thallium) to outline heart chambers and major blood vessels leading to and from the heart. A nuclear heart scan shows any damage to your heart muscle.
- **Electron beam computed tomography (EBCT)**. This test identifies and measures calcium buildup in and around the coronary arteries.

Your doctor may also order the following blood tests:

- **Fasting glucose test** to check your blood sugar level.
- [A fasting lipoprotein profile](#) to check your cholesterol levels.

How is Coronary Artery Disease Treated?

The treatments for CAD include lifestyle changes, medications, and special procedures. The goals of treatment are to:

- Relieve symptoms
- Slow or stop atherosclerosis by controlling or reducing the risk factors
- Lower the risk for blood clots forming, which can cause a heart attack
- Widen or bypass clogged arteries
- Reduce cardiac events.

Lifestyle Changes

Everyone with CAD needs to make some lifestyle changes:

- Eat a healthy diet to prevent or reduce [high blood pressure](#) and [high blood cholesterol](#), and [maintain a healthy weight](#).
- [If you smoke, quit](#).
- Exercise as directed by your doctor.
- Lose weight if you are overweight or obese
- Reduce stress.

For some people, these changes may be the only treatment needed.

Medications

Medications may be needed in addition to making lifestyle changes. Some medications decrease the workload on your heart and relieve your symptoms. Others decrease your chance of having a heart attack or sudden death, and prevent or delay the need for a special procedure (angioplasty or bypass surgery). Some common medications used to treat CAD are:

- [Cholesterol-lowering](#) medications.
- [Anticoagulants](#) (an-ty-ko-AG-u-lants) prevent clots from forming in your arteries and blocking blood flow.
- [Aspirin](#), an antiplatelet medication to prevent clots from forming in your arteries and blocking blood flow. Aspirin may not be appropriate for some people because it increases the risk of bleeding. Discuss the benefits and risk with your doctor before starting aspirin therapy.
- Other antiplatelet (an-ty-PLAYT-lit) medications stop platelets from clumping together to form clots. These medications may be given to people who have had a heart attack, have angina, or who experience angina after angioplasty.
- [ACE inhibitors](#) lower blood pressure and reduce the strain on your heart. They also may reduce the risk for a future heart attack and heart failure.
- [Beta-blockers](#) slow your heart rate and lower your blood pressure to decrease the workload on your heart. Beta-blockers are used to relieve angina and may also reduce the risk of a future heart attack.
- [Calcium channel blockers](#) relax blood vessels and lower your blood pressure. These medications can reduce your heart's workload, help coronary arteries open, and relieve and control angina.
- [Nitroglycerin](#) to prevent or relieve chest pain.
- [Long-acting nitrates](#) open up the arteries to the heart, increasing blood flow to the heart muscle and relieving chest pain. Long-acting nitrates can limit the occurrence of chest pain when used regularly over a long period.
- Glycoprotein IIb-IIIa inhibitors are very strong antiplatelet medications that are used in the hospital during and after angioplasty or to treat angina.
- [Thrombolytics](#) dissolve the clots that can occur during heart attacks. You need to get to the hospital as soon as possible if you think you are having a heart attack to get thrombolytic therapy.

Special (Invasive) Procedures

- Angioplasty. This procedure is used to open blocked or narrowed coronary arteries. It can improve blood flow to your heart, relieve chest pain, and possibly prevent a heart attack. Sometimes a stent is placed in the artery to keep it propped open after the procedure.
- Coronary artery bypass surgery. This surgery uses arteries or veins from other areas in your body to bypass your diseased coronary arteries. It can improve blood flow to your heart, relieve chest pain, and possibly prevent a heart attack.

Angioplasty or bypass surgery may be used to treat CAD if:

- Medications and lifestyle changes have not improved your symptoms
- Your symptoms are worsening.

Some people may need to have angioplasty or bypass surgery on an emergency basis during a heart attack to limit damage to the heart.

Cardiac Rehabilitation (Rehab)

Your doctor may prescribe cardiac rehab for angina or after bypass surgery, angioplasty, or a heart attack. Together with medical and surgical treatments, cardiac rehab can help you recover faster, feel better, and develop a healthier lifestyle.

Almost everyone with CAD can benefit from rehab.

Cardiac rehab often begins in the hospital after a heart attack, heart surgery, or other heart treatment. Rehab continues in an outpatient setting after you leave the hospital.

The cardiac rehab team may include:

- Doctors
 - Your family doctor
 - A heart specialist
 - A surgeon
- Nurses
- Exercise specialists
- Physical therapists and occupational therapists
- Dietitians
- Psychologists or other behavior therapists.

Rehab has two parts:

- **Exercise training** to help you learn how to exercise safely, strengthen your muscles, and improve your stamina. Your exercise plan will be based on your individual ability, needs, and interests.
- **Education, counseling, and training** to help you understand your heart condition and find ways to reduce your risk of future heart problems. The cardiac rehab team will help you learn how to cope with the stress of adjusting to a new lifestyle and to deal with your fears about the future.

["Recovering from Heart Problems Through Cardiac Rehabilitation: Patient Guide,"](#) from the U.S. Agency for Healthcare Quality and Research, provides more information on cardiac rehab.

How Can I Prevent or Delay Coronary Artery Disease?

Preventing CAD begins with knowing which risk factors you have and taking action. Remember, your chance of developing CAD increases with the number of risk factors you have.

Know your family history of health problems related to CAD. If you or someone in your family has CAD, be sure to tell your doctor. Make sure everyone in your family is getting enough exercise and maintaining a healthy body weight.

By controlling your risk factors with [lifestyle changes](#) and [medications](#), you may prevent or slow the development of CAD.

CAD can cause serious complications, but by following your doctor's advice and changing your habits, you can prevent or reduce the chance of:

- Sudden cardiac death
- A heart attack and permanent damage to your heart muscle
- Reduced oxygen to your heart causing damage
- Irregular heartbeats (arrhythmia).

If you have any other health conditions, it is important that you follow your doctor's directions to treat these conditions. By staying as healthy as possible, you can lower your risk for CAD and its complications.

Summary

- About **13 million people** in the U.S. have CAD. It is the number one killer of both men and women. Each year, more than half a million Americans die from CAD.
- CAD is caused by the thickening and hardening of the inside walls of the coronary arteries (atherosclerosis). The arteries harden and become narrow due to the buildup of plaque on the inner walls, which decreases the oxygen supply to the heart muscle.

- Plaque in the coronary arteries can be hard and stable. Hard plaque causes the artery walls to thicken and harden and may cause angina.
- In other cases, plaque in the coronary arteries is soft and unstable. Soft plaque is more likely to break open or apart and cause blood clots. This can lead to a heart attack.
- When blood flow and oxygen supply to the heart are reduced or cut off, you can develop angina or have a heart attack.
- Some risks for CAD you cannot control, but there are some risks you can control. For example, you can do something about high blood cholesterol, high blood pressure, cigarette smoking, high blood sugar, being overweight, and lack of physical activity.
- Chest pain (angina) is the most common symptom of CAD.
- There is no one single test to diagnose CAD. Your doctor will ask about your medical and family history, your risk factors, and do a physical exam and several tests. These procedures are used to decide if you have CAD, the extent and severity of the disease, and to rule out other possible causes of your symptoms.
- The goals of treatment are to:
 - Relieve symptoms
 - Slow or stop atherosclerosis by controlling or reducing the risk factors
 - Lower the risk for blood clots forming, which can cause a heart attack
 - Widen or bypass clogged arteries
 - Reduce cardiac events.
- Prevention begins with knowing which risk factors you have and taking action. Your chance of developing CAD increases with the number of risk factors you have.

This document is provided as a service to the public by TMT (Taylor MicroTechnology, Inc.). TMT does not provide medical advice to you. TMT does inform you of publicly available medical information. However, please realize that the possible diagnoses provided may not include the cause of your own pain, and that a reliable diagnosis can only be obtained by contacting your own health care provider. For details of the Content Disclaimer and Legal Disclaimers regarding materials provided by TMT, see www.masterdocs.com/disclaimer.htm.