

Coronary Artery Disease

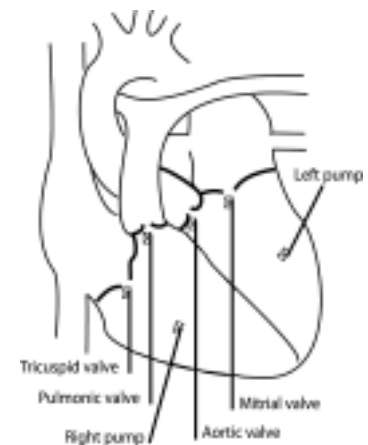
This brochure has been prepared for you by the cardiac specialists at Beth Israel Deaconess Medical Center. We believe that most patients with heart problems will benefit from learning as much as they can about their condition. While a diagnosis of heart disease might be upsetting at first, there is a lot you can do to make sure you stay as healthy and as active as possible. And there is a lot of good news. New treatments are changing the outlook for many patients with coronary artery disease, enabling them to live long, full, and active lives.

Please take the time to read this booklet. Share it with your family and with others who are close to you. Talk with your doctor about anything you don't understand.

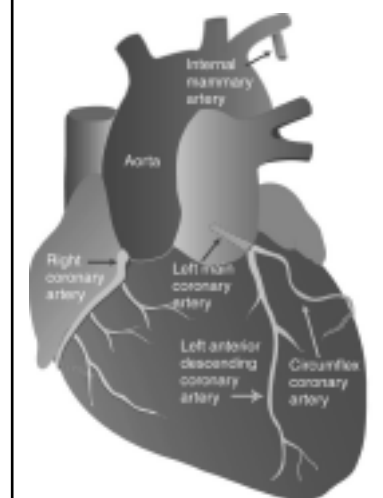
As you read this information, especially the information about risk factors, it will be important for you to think about how it all applies to you. You will find spaces in this brochure for you to record information about your own cardiovascular health. For example, you can write in your cholesterol levels or your blood pressure, and make a note of what, if any, treatments are planned to reduce a particular risk. Please, ask your doctor to provide the information about your own health that you'll need to fill in these areas. In this way, you can use this brochure as a way to learn about your health and about how to take the actions you need to be as healthy as possible.

The heart is a pump

The heart chambers work as two coordinated pumps. The **right pump** sends blood to the lungs to receive oxygen. The strong **left pump** sends the oxygen-rich blood out to the rest of the body.



Coronary arteries



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What is coronary artery disease?

Coronary artery disease, or CAD, is a narrowing of blood vessels that nourish the powerful muscles of the heart. In order to understand CAD and the problems it can cause, it's important to have a basic understanding of the normal heart and how it works.

About your heart

The heart is a hollow organ made of muscle. It is a little larger than your clenched fist. It has four chambers or compartments. The two top chambers are called atria (each one is an atrium), and the two bottom chambers are called ventricles.

The heart has one job: to pump blood to all parts of the body. Blood is pumped from the right atrium to the right ventricle, and then is sent to the lungs. Here, through a network of tiny blood vessels, carbon dioxide is removed from the blood and oxygen is taken in. The oxygen-rich blood is then sent back to the left atrium. From there, it is pumped to the left ventricle – the strongest pumping chamber in the heart. The left ventricle pumps the blood into a large blood vessel called the aorta. The aorta connects to a huge network of arteries that reach every cell in the body. All our body cells – muscles, bones, skin, nerves – need the oxygen and nutrients contained in the blood in order to function.

Remember – the heart itself is a muscle. It, too, needs a supply of oxygen-rich blood in order to work as it should. But the heart is not able to use the blood inside its chambers to feed itself. Instead, just as the blood flows through arteries to nourish the rest of the body, it also flows back over the outside of the heart muscle itself through blood vessels called the **coronary arteries**. These arteries supply the heart muscle with blood, giving it the energy it needs to keep pumping.

There are two main coronary arteries – the left main coronary artery and the right coronary artery. The left main artery divides into two large branches called the circumflex (Cx) and the left anterior descending (LAD) arteries. These arteries, along with many small branches, deliver blood to all parts of the heart muscle.

Coronary artery disease

Coronary artery disease (CAD), sometimes called coronary heart disease, is a narrowing of one or more of the arteries that feed the heart muscle. The narrowing is caused by the build-up of a substance called plaque inside the wall of a blood vessel. Plaque is made of fat, cholesterol, calcium deposits, and inflammatory white blood cells that have gotten into the blood vessel wall. The plaque causes the wall to “bulge” into the inside of the vessel where the blood normally flows. This causes the narrowing that is the hallmark of CAD.

CAD develops over a long period of time. In its early stage, the formation of plaque does not cause any symptoms. In time, though, the narrowed blood vessel may cause an interruption in the blood supply to the heart muscle. This can lead to chest pain or discomfort, also known as **angina**.

CAD plaques can grow or become unstable and rupture into the blood vessel, allowing a blood clot to form at the spot of the rupture. This can further narrow or even block the already narrow artery, causing an even greater interruption in blood flow. If the interruption is prolonged, damage to the heart muscle can occur. This is known as a **heart attack**, also called a **myocardial infarction**, or **MI**. Typically, a heart attack is the result of plaque rupture and blood clot formation at the site of a narrowed artery. The amount of damage that occurs during a heart attack depends on the severity of the blockage and on what area of the heart muscle is affected. In many cases, early treatment can help minimize the amount of damage to the heart.

Who gets CAD?

Certain conditions or medical problems are known as “risk factors” for CAD because they increase the chance that a person will develop the disease. Some of the risk factors are beyond your control, like:

- being a man over 45 years old
- being a woman over 55 years old
- having a father or brother who had a heart attack or sudden death before age 55
- having a mother or sister who had a heart attack or sudden death before age 65

But there is a longer list of risk factors that you **can** do something about. They include:

- cigarette smoking
- high blood pressure
- diabetes
- being inactive
- high levels of total cholesterol and high LDL, or “bad” cholesterol
- low levels of HDL cholesterol, or “good” cholesterol
- being overweight

The next section will explain how you can work on *your* risk factors to make sure you stay as healthy as you can.

What’s my risk?

Many adult Americans have CAD. It is the number one killer of both women and men in the United States. But many of the people who have heart attacks did not know they had CAD. So it makes sense for everyone to ask: *What’s my risk? Could I have CAD?*

Even if you’ve already been diagnosed with CAD, looking at your “risk profile” is still important. Why? Because by paying attention to

things like blood pressure, smoking, cholesterol, and weight, you can lower your risk of developing worsening disease and improve your overall health. In fact, you may actually prolong your life by taking steps now to decrease your risk of further problems related to CAD. Also, any action you take to decrease your risk for CAD will also help you avoid other, related disorders of blood vessels, including stroke.

Here is some general information about risk factors for CAD. Use the boxes provided to record information about your own risk factors and about steps you can take to reduce your risk.

Smoking

Smoking is a strong risk factor for CAD. Quitting smoking reduces your risk for CAD (and stroke) within the first year after you quit! Even if you’ve been smoking for a long time, you can still decrease your risk for CAD and other health problems by quitting. And remember: changing to a low-nicotine cigarette does **not** lower your risk for CAD. Talk with your nurse or doctor about strategies you can use to quit the habit for good.

MY RISK FACTORS

Smoking

- No, I don't smoke
- Yes, I have smoked in the last year.
My plan for quitting includes:

High blood pressure

With each beat of your heart, the flow of blood exerts pressure on the walls of your blood vessels. Your blood pressure is a measurement of this pressure. The blood pressure is recorded in two numbers: a top number and a bottom number.

The top number measures the force when the heart pumps (systolic blood pressure). The bottom number measures the force when the heart is resting (diastolic blood pressure).

High blood pressure is a condition in which the systolic blood pressure is 140 or more, and/or the diastolic blood pressure is 90 or more. In most cases, it causes no symptoms and the person is not aware that the blood pressure is high. But sustained high blood pressure can lead to CAD, stroke, and kidney damage. Keeping your blood pressure under control can reduce your risk for developing these conditions. Diet, exercise, and medications (such as diuretics, angiotensin converting enzyme [ACE] inhibitors, or angiotensin II receptor blockers [ARB]) can all be used to help keep your blood pressure under control.

What should *your* blood pressure be? Ask your doctor. This isn't the same for everyone. And remember – small variations in blood pressure are normal, so don't expect your reading to be exactly the same each time you have your blood pressure checked.



Blood pressure: What's normal?

In general:

- The top, or systolic pressure, should be less than 140.
- The bottom, or diastolic pressure, should be less than 90.

As more research on blood pressure is completed, new guidelines on what constitutes "normal" versus "high" blood pressure may be used. Your doctor can provide you with updated information. Ask your doctor about the blood pressure range that is best for you.

MY RISK FACTORS

Blood pressure

My blood pressure is (ask your nurse or doctor for a typical reading):

My doctor says I:

- Do not have high blood pressure
- Do have high blood pressure.

My treatment plan includes:

Cholesterol

Cholesterol is a waxy substance found in all parts of your body. It is used to make the walls around all your body cells, as well as certain hormones and Vitamin D. But if you have too much cholesterol, it can clog arteries and lead to CAD.

Cholesterol travels through the body attached to proteins in packages called “lipoproteins.” Low-density lipoproteins, or LDL cholesterol, are the cholesterol packages that can increase your risk for CAD. As a general rule, the higher your LDL level, the higher your risk. Doctors recommend that everyone have a level less than 130. But if you have CAD already, or if you have diabetes, your doctor may want your level to be much lower, even less than 100. Your doctor will talk with you about keeping your LDL cholesterol in the right range. Tools that may be recommended include following a low-fat diet, using cholesterol-lowering medication, and getting more exercise.

High-density lipoprotein, or HDL cholesterol, is known as “good” cholesterol. It actually helps move cholesterol away from the cells and into the liver to be processed. Your doctor will want your level to be more than 40. A level of more than 60 may actually help protect you against heart disease. Exercise may improve your HDL cholesterol level.

The facts about cholesterol

Cholesterol is a waxy substance found in all parts of your body.

LDL cholesterol - This is known as "bad" cholesterol because high levels lead to clogged arteries. The lower the number the better.

HDL cholesterol - This is known as "good" cholesterol because high levels can help prevent CAD. The higher the number, the better.

Total cholesterol - A measure of all your body cholesterol. The lower the number, the better.

Cholesterol Levels

HDL (good) cholesterol

- More than or = 60 → very good; may actually protect against heart disease
- Less than 40 → high risk for heart disease

LDL cholesterol

- Less than 100 → optimal
- 100-129 → near optimal
- 130-159 → borderline high
- 160 or more → high risk for heart disease

Total cholesterol

- Less than 200 → desirable
- 200-239 → borderline high
- 240 or more → high risk for heart disease. A person with this level has more than twice the risk of coronary heart disease as someone whose level is below 200.

MY RISK FACTORS

Cholesterol

- My LDL (bad) cholesterol is _____.
This is OK Needs to be lower
- My HDL (good) cholesterol is _____.
This is OK Needs to be higher
- My total cholesterol is _____.
This is OK Needs to be lower
- My plan for managing my cholesterol includes:
 - Following a heart-healthy diet
 - Getting regular exercise
 - Taking cholesterol-lowering medicine, if prescribed. _____
 - Losing weight, if needed

Exercise

Regular exercise (30 minutes a day, 5-7 times a week) can help decrease your risk for CAD in several ways. It helps lower your blood pressure, weight, triglycerides, and LDL cholesterol (“bad” cholesterol). It can also raise your HDL cholesterol (“good” cholesterol) and help your heart and lungs to work more efficiently. And exercise can reduce your chance of developing diabetes—another risk factor for CAD. Talk with your doctor about an exercise plan that is safe and healthy for you. Even light exercise such as a slow walk is more beneficial for your heart than no exercise at all.

MY RISK FACTORS

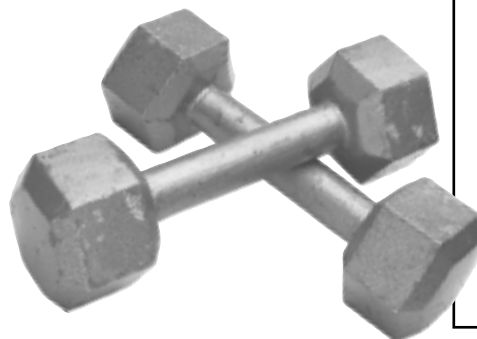
Exercise

- I get regular exercise
- I do not get regular exercise

My treatment plan includes:

Diabetes

Having a diagnosis of diabetes increases your risk for CAD. This is true no matter what kind of diabetes you have. But keeping your blood sugars in your “target range,” getting regular exercise, and eating right can help reduce this risk.



If you have diabetes, be sure you know your “Diabetes ABC’s”:

- **A = A1C.** The goal is for your A1Cs to be less than 7.
- **B = blood pressure.** In general, a goal for a healthy blood pressure is below 140/90; for many people with diabetes, the goal is below 130/80.
- **C = cholesterol.** The LDL cholesterol (“bad” cholesterol) goal for most people with diabetes is less than 100. Your doctor may suggest a lower target. Your HDL cholesterol (“good” cholesterol) should be more than 40; your doctor may recommend a higher level for you.

MY RISK FACTORS

Diabetes

- I do not have diabetes
- I do have diabetes.

My treatment plan includes:

- Medication _____

- Diet _____

- Blood sugar checks _____

- My target range is _____

- Exercise _____

Triglycerides

Triglycerides are fats found in the blood. High levels may be a risk factor for heart disease. Being overweight, or taking in a lot of fat, sugar, starch, or alcohol, can lead to a high triglyceride level. If your levels are high, your doctor may recommend you see a dietitian who will talk with you about strategies you can use to lower your level. If your triglycerides are between 150 and 199 mg/dL, treatment emphasis will be on weight reduction and increased physical activity. For levels of 200 mg/dL or more, your doctor may recommend medication management as well.

MY RISK FACTORS

Triglycerides

My triglyceride level is: _____

This is: OK Needs to be lower

If my level is high, my plan to reduce the level includes:

- Meeting with a dietitian
- Losing weight if needed
- Cutting down on fats, sugar, starch, and alcohol
- Medication _____

Being overweight

If you are overweight, losing weight can lower your risk for heart disease. Losing weight helps you improve several risk factors. It can help control high blood pressure, cholesterol levels, and blood sugar levels if you have diabetes.

Two good measures you can use to decide if you are overweight are body mass index (or BMI) and waist circumference.

Your BMI is a measure of your body size that takes height and weight into account. Use the chart at the end of this brochure to find your BMI. A BMI greater than 25 indicates excess weight. Obesity is present when the BMI is 30 or more.

Another measure you can use is waist circumference. Measure your natural waist – just above the belly button. As a general rule, your goal for waist measurement is less than 35 inches if you are a woman, and less than 40 inches if you are a man.

MY RISK FACTORS

Weight

My current weight is: _____

My BMI is: _____

My waist circumference is: _____

My doctor says I:

- Need to lose _____ pounds.
- Do not need to lose weight now.

My plan for managing my weight includes:

- Following a “heart-healthy” diet
- Losing weight if needed by:

Stress

Although the exact role of stress in the development of CAD is not clear, now is a good time to see whether a program of stress management makes sense for you. Living with a chronic condition such as CAD means having to make adjustments that can be difficult. You'll want to be prepared both emotionally and physically to enjoy life to the fullest after a diagnosis of CAD. You may be able to reduce stress by doing some mild activity, such as going for a walk. Or you might find participating in social, religious, or other activities helpful. Set realistic goals for yourself in your daily life. Break up large tasks into small ones. Set priorities and pace yourself. Spend time with other people and confide in a trusted friend or relative. Let others help you. Talk with your doctor to learn more about how to add stress management to your overall treatment plan for CAD.

Depression

Stressful events such as having an illness may contribute to depression. Some symptoms of depression may also be signs of illness such as CAD, so it is important to discuss them with your doctor. Depression can have negative effects on your recovery from illness or make it difficult to participate in your treatment. Depression can be treated with psychotherapy (counseling) and sometimes medications if symptoms are severe. Your treatment team can help you decide which treatment is best for you.

Anxiety

Like depression, anxiety may have negative effects on treatment outcomes for CAD. Having CAD may cause feelings of anxiety, such as worry about the diagnosis or the impact of impaired health on roles and relationships. Anxiety is a common reaction to stressful

events, but you should inform your doctor of prolonged or frequent episodes of anxiety. Get help right away if you have severe anxiety, or physical symptoms that you think could be related to anxiety. Your doctor can determine whether symptoms are caused by anxiety, another medical condition, CAD, or some combination. Treatment for anxiety may include psychotherapy and/or medication. Relaxation techniques, meditation, and support groups may help make treatment for anxiety more effective.

Other risk factors

Your doctor may talk with you about other factors in the blood that could affect your risk for heart disease. For example, your doctor may want to examine the levels of C-reactive protein, homocysteine, or lipoprotein(a). In some cases, treatments, such as vitamins or aspirin, may be prescribed based on the results of these tests.



Reducing your risk: cardiac rehabilitation

Many people learn to reduce their risk and live a “heart-healthy” life by enrolling in a formal cardiac rehabilitation program. Through such programs, patients with CAD learn the skills they need to manage the illness and be as healthy as possible. In many cases, supervised exercise is part of the program so that you can feel safe and confident as you learn to exercise in a way that is best for you. Diet recommendations, stress management, and smoking cessation are also usually included. There may even be services for your family to help them cope with this new factor in all of your lives. Ask your doctor or other health care provider about cardiac rehabilitation programs in your area. Most programs are covered by health insurance if you have a referral from your doctor. The number of visits that will be authorized may vary depending on your insurance.

What are the symptoms of CAD?

In its early stages, CAD has few symptoms. But over time, the lack of blood flow to an area of the heart may cause episodes of discomfort (angina) or a heart attack (myocardial infarction, or MI). This section explains the symptoms that can occur in someone who is having angina or an MI. Please talk with your doctor or nurse about anything you don’t understand.

Angina

When an area of the heart is not getting enough blood to meet its needs at a particular time, discomfort around the chest can occur.

This discomfort is known as angina. During an episode of angina, a narrowed coronary artery is having trouble delivering the amount of blood

being demanded by an area of the heart. This insufficient blood flow causes strain – also called ischemia – to that area of heart muscle. It is the ischemia that leads to the discomfort of angina. Angina may occur during exercise or after a meal when the demand for oxygen-rich blood is high (and can’t be met by the diseased artery). In other cases, angina occurs during stress or even at rest.

Angina: stable and unstable

You may hear your doctor talk about stable or unstable angina. In general, these terms can be defined as follows:

- **Stable angina** – A pattern of pain or discomfort that is regular and predictable. The pain goes away with rest or by taking nitroglycerin. It does not occur at rest.
- **Unstable angina** – Pain or discomfort that is occurring more frequently or is more uncomfortable than it has been in the past. It can occur at unexpected times, including at rest. Unstable angina may take longer to go away with nitroglycerin.

Many patients with stable angina live full, active lives. Unstable angina, or any change in angina symptoms, must be reported to the doctor right away.

How can you tell if you are having angina? Although the symptoms can vary from person to person, some typical symptoms include:

- pressure, fullness, squeezing in the chest
- discomfort in the shoulders, back, neck, jaw, arms, or anywhere in the upper body
- sweating
- dizziness
- nausea
- shortness of breath
- pain that feels like indigestion

Some people will have all of these symptoms; others will have one or two. Women may have symptoms of fatigue, weakness, and shortness of breath. In a small number of cases, patients will have episodes of ischemia and have no discomfort at all.

An episode of angina usually goes away quickly when the patient takes a nitroglycerin tablet (a medication prescribed to people who have an established diagnosis of angina). In some cases, it goes away as soon as the person stops a particular activity. Episodes of angina do not cause permanent damage to the heart.

The first time someone has symptoms like this, **it is important to get medical attention right away.** The symptoms could mean the person is having a heart attack (see next section). Even if a heart attack is not occurring, anyone with angina must be under the care of a doctor.

People who are under treatment for CAD and angina may still have occasional episodes of pain. They come to know their own pattern of pain – what will typically bring on an episode, how long it will last, and what makes the discomfort go away.

If any changes in the pattern occur, it is important to notify the doctor right away.

Heart attack

A heart attack occurs when an area of heart muscle is permanently damaged because of lack of blood flow. In most cases, heart attack is caused by the rupture of a plaque inside a coronary artery, causing the development of a blood clot. The clot blocks the flow of blood, and heart attack occurs. The symptoms of heart attack can be very similar to those of angina (see above). Often the discomfort is more severe, but not always. The discomfort typically does not go away with rest or with medication. Or, if it does go away, it quickly returns.

A person with the symptoms of a heart attack needs to call 911. Treatments are available that can reduce the damage to the heart muscle, but they must be given right away. Also, complications associated with heart attack can be sudden and life-threatening. That is why it is not safe for someone having a heart attack to travel to the hospital by car.

Signs of a heart attack

- Pressure, fullness, squeezing in the chest
- Discomfort in the shoulders, back, jaw, arms, or anywhere in the upper body
- Sweating
- Dizziness
- Nausea
- Shortness of breath
- Pain that feels like indigestion

The discomfort typically lasts longer than a few minutes and is not relieved with medication.

Don't wait to get help!

Too often, patients with symptoms of angina or heart attack wait too long before getting proper medical attention. It's natural to not want to believe that you are having a problem with the heart. It's natural to want to "wait and see" if the discomfort goes away on its own. Calling for an ambulance may seem extreme, especially if you feel able to walk and drive without any problem.

Remember, help is available in the emergency room that can decrease the severity of a heart attack. In some cases, measures can even be taken to prevent heart damage from occurring at all. Driving while a heart attack is in progress can be dangerous to you or to others. For these reasons, it is critical for someone having symptoms of a heart attack to call 911 right away.

Finding the problem: diagnosis of CAD or heart attack

“Ruling out” a heart attack

When someone comes to the emergency room or doctor’s office reporting chest discomfort, the first thing the doctor will do in most cases is to find out if the person is having a heart attack or has had one in the recent past. A number of tools are available to help:

- **History and physical exam**

The history of the patient’s symptoms and the patient’s current physical condition will give important clues as to the cause of the discomfort.

- **ECG, or electrocardiogram**

The heartbeat is controlled by a series of electrical impulses that flow over the surface of the heart. The ECG can monitor these impulses using sensors that are placed on the arms, legs, and chest. If areas of the heart are under the strain of ischemia or have been damaged by heart attack, it changes their ability to conduct electricity. This causes changes in the wave forms on the ECG, enabling your doctors and nurses to see signs of damage or ischemia.

- **Blood tests**

When heart muscle is damaged, chemicals in the damaged muscle are released into the blood. Doctors examine the blood at regular intervals to look for these “markers” of cardiac damage. You may hear your nurses or doctors refer to these markers as CKs or troponin levels.

Complications

If you have CAD or have had an MI, your doctor will watch you closely for signs of complications. By finding complications early, your doctor can take the steps needed to start effective treatments.

Heart failure – This is a term used to describe a weakening of the heart’s pumping. It does not mean the heart has “failed” or is not working. It means that, because of muscle damage or ischemia, the heart’s pumping action is not as strong as it should be. This can lead to symptoms such as shortness of breath and swelling in the legs. There are a number of medicines that are effective in treating heart failure.

Arrhythmia – The heart beats in response to electrical impulses that flow in an organized way across the heart chambers. The interruption in blood flow to the heart can sometimes cause these impulses to misfire. A variety of heart rhythm problems – or arrhythmias – can then occur, ranging from a fast or slow heart beat, to skipped heart beats, to an irregular heart rhythm. Medications can be very effective in treating many arrhythmias. Pacemakers and others treatments are also available.



Diagnosing CAD

Further tests may be needed to determine whether or not CAD is present. Some of the most common tests are described below. In some cases, patients with known CAD may have one or more of these tests so that the doctor can determine the extent of the disease, look for complications, or determine the best treatment. Not all patients need every test. Your doctor will let you know which tests you may need.

- ***Exercise test (stress test)***

Other names for this test include exercise tolerance test or treadmill test. During this test, you are asked to exercise on a treadmill or a stationary bicycle. Your heart rate, blood pressure, oxygen level, and ECG are measured as you exercise. Since exercise increases your heart muscle's demand for blood, people with CAD may have episodes of ischemia – insufficient blood flow to an area of the heart – during exercise. This may or may not cause pain. But the ischemic episode can usually be seen on the ECG, or can be detected through your blood pressure or heart rate response to activity.

- ***Nuclear stress test (cardiac perfusion scan)***

This is a special type of stress test in which cameras are used to scan the heart during and after exercise. Before the test, a small amount of radioactive substance is injected into your blood through an intravenous (IV) line. The radioactive substance makes the blood flow to the heart visible on the scan, helping your doctor to see if there is decreased blood flow during or after exercise.

For patients who are not able to exercise, a medication called Persantine is given before the scan. Persantine affects the blood flow to the heart in the same way as exercise. This enables the doctor to see how the blood flows to the heart during times of exertion, without actually having the patient exercise.

- ***Echocardiogram***

During this test, sound waves are used to make pictures of the heart. The pictures show the heart's overall shape and size, the heart valves, and the movement of blood through the heart chambers. The echocardiogram also indicates how well the heart contracts and may help in identifying the area of the heart with ischemia or damage.

- ***Cardiac catheterization***

A **cardiac catheterization** is a procedure in which a small plastic tube (catheter) is threaded into the heart from a blood vessel in the leg or arm. X-ray pictures help the doctor guide the catheter. The catheter is threaded into the coronary arteries and the chambers of the heart. **Coronary angiography** can be done as part of the catheterization. This involves injecting dye through the catheter to make the arteries show up clearly on x-ray. This helps doctors view blockages in the arteries.

During the catheterization, the doctor can also take measurements of the pressures inside the heart, giving an indication of how well the heart is functioning.

In some cases, cardiac catheterization is used to administer certain treatments for CAD or MI. These are described in more detail in the next section.

- ***Cardiac CT scans***

Two types of CT (computed tomography) scans can be used for early detection of CAD. A “calcium score” CT detects the calcium deposits that may be contributing to the formation of plaque in the arteries. A calcium “score” is calculated from multiple images done during cardiac CT. This result gives your doctor an estimate of the severity and distribution of plaque that may be lining the coronary artery. When significant, further testing is indicated. A second type of CT scan that may be used is coronary CT angiography, or CTA. During this test, intravenous (IV) contrast dye is used to

make the coronary arteries visible on the CT scan. Detailed views help doctors evaluate the coronary arteries and may aid in the diagnosis of CAD.

Treatment

In recent decades, huge advances have been made in the treatment of CAD and MI. Many different approaches to treatment are now available. We describe these approaches in three different categories: medical, interventional, and surgical. The types of treatment available in each category are described below. New treatments are being added all the time. Please talk with your doctor about treatment options that make sense for you. Be sure to ask about anything you don't understand.

Medical treatment

Risk factor reduction – Any patient with CAD will be advised to take steps to reduce the risk for further problems. This will include:

- ✓ not smoking
- ✓ getting the right exercise
- ✓ following a “heart-healthy” diet
- ✓ losing weight if needed
- ✓ taking prescribed medications (if any) for blood pressure, diabetes, cholesterol, or triglycerides
- ✓ if diabetic, keeping blood sugars under control
- ✓ learning to manage stress

Many of these so-called “lifestyle changes” are part of established cardiac rehabilitation programs. Ask your doctor about whether participation in a cardiac rehabilitation program makes sense for you.

Medications – A number of medications are available to help treat CAD. Many medicines work by decreasing the workload of the heart. A heart that isn't working as hard needs less oxygen and may be less affected by the decrease in blood supply caused by the narrowed coronary arteries. Some medicines may also widen the coronary arteries themselves, increasing the supply of blood to the heart muscle. Some medicines do both – that is, they decrease the heart's need for oxygen and increase the supply of oxygen-rich blood that is available.

Other medicines may be used to prevent blood clots from forming inside the coronary arteries. Patients with high blood pressure, high cholesterol, high triglycerides, or diabetes may receive additional medicines to treat these conditions.

Some of the common types of medicines used to treat CAD are described here. Ask your doctor, nurse, or pharmacist for more specific information about the medicine you are on, including doses and side effects.



- **Antiplatelet agents** – Many patients with CAD will be asked to take medication to help prevent blood clots from forming in the coronary arteries. These medicines work on the blood platelets – cells that clump together and form the basis of a blood clot. Medicines called antiplatelet agents help prevent the platelets from sticking together. For patients with coronary artery disease, a daily dose of aspirin is prescribed for this purpose. Additional antiplatelet medicines may be used, including clopidogrel bisulfate (Plavix) or ticlopidine hydrochloride (Ticlid).
- **Beta blockers** – Examples are: metoprolol (Lopressor, Toprol XL), atenolol (Tenormin), labetalol hydrochloride (Normodyne, Trandate), nadolol (Corgard) and propranolol hydrochloride (Inderal). Beta blockers work by slowing the heart rate and decreasing the force of the heart’s contraction, which lowers blood pressure and decreases the workload of the heart.
- **ACE inhibitors** – Examples are captopril (Capoten), enalapril maleate (Vasotec), lisinopril (Prinivil, Zestril), and ramipril (Altace). They affect the functioning of an enzyme secreted by the kidney. ACE inhibitors widen the blood vessels, decrease blood pressure, and decrease the workload of the heart. They are often used immediately after heart attack to help prevent complications. They may also be part of the treatment for high blood pressure. If you are unable to take ACE inhibitors, your doctor may prescribe a medication with a similar effect called an angiotensin II receptor blocker, or ARB. Examples are valsartan (Diovan) and losartin (Cozaar).
- **Calcium channel blockers** – Examples are diltiazem hydrochloride (Cardizem, Dilacor XR, Tiazac), amlodipine besylate

(Norvasc), nifedipine (Procardia XL), and verapamil hydrochloride. Some medicines in this class work primarily by opening up the narrowed coronary arteries. Others work by decreasing the heart’s demand for oxygen. Still others work primarily by slowing a rapid heart rate. Ask your doctor for more information about why a particular calcium channel blocker has been prescribed.

- **Nitrates** – Examples are nitroglycerin (Nitrolingual, Nitrostat, Transderm-Nitro), isosorbide dinitrate (Dilatrate-SR, Isordil, Sorbitrate), and isosorbide mononitrate (Imdur). These medicines work by widening blood vessels throughout the body, which can increase blood flow through the coronary arteries, lower blood pressure, and decrease the workload of the heart. Nitroglycerin tablets taken under the tongue are often prescribed to patients with CAD to relieve the pain of angina. Nitroglycerin tablets that go under the tongue are taken only as needed to treat or prevent pain. This type of nitroglycerin works quickly, but its effects do not last long in the body. Other types of nitrates, such as isosorbide dinitrate, are taken as daily medications. These work more slowly but last longer.
- **Lipid-lowering medicines (medicines that lower cholesterol or triglycerides)** – Examples are simvastatin (Zocor), lovastatin (Mevacor), atorvastatin calcium (Lipitor), and cholestyramine (Questran). These work by lowering the LDL, or “bad” cholesterol, which can reduce your risk of future heart attack. Other medicines include gemfibrozil (Lopid) and fenofibrate (Tricor), which lower triglycerides in the blood. Patients known to have CAD or diabetes, or patients thought to be at risk for CAD, may be given cholesterol-lowering medicine even if the cholesterol (in particular, the LDL or “bad” cholesterol) is in the ‘high normal’ or normal range. Talk with your doctor about why a particular cholesterol-lowering medicine has been prescribed for you.

Interventional treatment

A number of treatments are available that are designed to help open narrowed coronary arteries. These so-called “interventional” treatments may be offered to patients who are having angina as a way of decreasing the frequency of pain and, in some cases, reducing the risk of future MI. Interventional treatments may also be recommended as an emergency treatment for patients who are having an MI in an attempt to reduce the amount of damage to the heart muscle.

These interventional treatments are performed during cardiac catheterization – a procedure that allows the doctor to directly view the coronary arteries. During a cardiac catheterization, doctors insert one or more instruments into the coronary arteries using x-ray guidance. The instruments are threaded through large blood vessels beginning in the leg or, sometimes, the arm. A number of treatments are possible during a cardiac catheterization, including the following.

- **Angioplasty** – (Also called “balloon angioplasty” or percutaneous transluminal coronary angioplasty [PTCA]) During this procedure, a small tube with a deflated balloon at the tip is threaded into the narrowed artery. Once the balloon is positioned over the plaque that is causing the blockage, it is inflated. This pushes the plaque back toward the wall of the vessel, helping to open the artery to blood flow.
- **Coronary stent** – In this procedure, a small metal tube that conforms to the artery size and shape is placed into the diseased vessel after it has been opened

with balloon angioplasty. The device helps to keep the artery open. It stays in the artery permanently. Some stents also release medication.

- **Other** – New treatments for CAD are always under development. Much of the research on these new treatments is conducted at Beth Israel Deaconess Medical Center. Your doctor may talk with you about additional treatments. As always, ask your doctor if there is anything you do not understand about any proposed treatment.



Surgical treatment

Some patients with CAD are candidates for coronary artery bypass graft or CABG. In this procedure, the surgeon creates a detour around a blocked coronary artery. The surgeon uses a blood vessel taken from another part of the body to construct the detour, or “graft.” Usually, an artery from the chest or a vein from the leg is used. (These vessels can be taken because both the chest and the leg have many other vessels.) Depending on the patient, one or more bypasses may be done.

Traditionally, the surgeon performs this operation by placing the patient on a heart-lung machine for the duration of the surgery.

The machine takes over the function of the heart and lungs, circulating oxygenated blood throughout the patient’s body while the surgeon performs the key aspects of the surgery.

At Beth Israel Deaconess, “minimally invasive bypass surgery” – which allows the surgeon to operate on a beating heart – is also performed. This eliminates the need to stop the heart or to place the patient on a heart-lung machine. Not all patients are candidates for this type of bypass surgery.

If your doctor recommends bypass surgery, ask about what type of surgery is being considered. Your doctor can explain the benefits, risks, and side effects associated with each type of surgery.



Body mass index (BMI) chart

Find your height in the column on the left. Follow the row across to find a weight close to your own. Follow that column to the top. The number at the top of that column is your BMI.

Source: Evidence Report of Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults, 1998. NIH/National Heart, Lung, and Blood Institute (NHLBI).

BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Height	Weight in Pounds																
4'10"	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167
4'11"	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173
5'	97	102	107	112	118	123	128	133	138	143	148	153	158	163	158	174	179
5'1"	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185
5'2"	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191
5'3"	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197
5'4"	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204
5'5"	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210
5'6"	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216
5'7"	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223
5'8"	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230
5'9"	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236
5'10"	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243
5'11"	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250
6'	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258
6'1"	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265
6'2"	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272
6'3"	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279
	Healthy Weight						Overweight					Obese					

NOTES

