Angina

Angina (sometimes called angina pectoris) occurs when your heart doesn't get as much blood and oxygen as it needs because of a blockage of one or more of the heart's arteries (coronary arteries). This blockage causes pain in the chest. People who have angina describe the pain as a squeezing, suffocating or burning feeling.

What is angina?
Angina is not a heart attack. It is a warning signal that you are at increased risk of a heart attack, cardiac arrest or sudden cardiac death. Usually, the pain will go away with rest or medication, but it is your heart telling you that your body is working too hard and needs to slow down. Angina is a warning to you to stop what you are doing and rest. If you experience this kind of chest pain, see your doctor to determine the cause and get treatment if necessary.

What causes angina?
Angina is the pain you feel when one or more of your coronary arteries becomes damaged, blocked or narrowed and isn't able to bring enough oxygen-rich blood to your heart. The pain may occur during physical activity, exercise, stress, periods of extreme cold or hot temperatures, after heavy meals or while drinking alcohol or smoking. Angina is most often caused by:

- **Coronary artery disease** as a result of atherosclerosis, a buildup of fatty deposits that block the flow of blood through the coronary arteries.
- **Coronary artery spasm**, when one of the blood vessels supplying the heart muscle vigorously contracts, causing blood flow to the part of the heart supplied by the artery to decrease or even stop, resulting in a heart attack.

In some cases angina can be caused by uncontrolled high blood pressure, or other heart conditions such as narrowing of one of the valves in the heart (aortic stenosis) or an enlarged heart (hypertrophic cardiomyopathy). Sometimes, people can have chest pain that is the result of other health conditions such as lung problems, muscle problems or bone problems.

What are the symptoms of angina?

- Angina is usually a symptom of coronary artery disease and puts you at risk of having a heart attack. Symptoms of angina are often experienced after exertion or emotional stress and are relieved with rest or medication. Symptoms of angina include: Pain that starts in the centre of your chest, but spreads to your left arm, neck, back, throat or jaw.
- Tightness, pressure, squeezing and/or aching feeling in your chest or arm(s).
- Feeling of moderate to severe indigestion that is persistent.
- Sharp, burning or cramping pain.
- An ache starting in, or spreading to, your neck, jaw, throat, shoulder, back or arm(s).
- Discomfort in your neck or upper back, particularly between the shoulder blades.
- Numbness or a loss of feeling in your arms, shoulders or wrists.
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If you experience one or more of these symptoms, see your doctor right away. If your pattern of angina changes, call your doctor as soon as possible.

What should I do?
Get immediate medical attention.
Usually angina only lasts a few minutes, but if the pain lasts longer, it may mean that you have a sudden, total blockage of a coronary artery or that you may be having a heart attack and you need to get help immediately. If you are experiencing chest pain or pressure that is not relieved with rest or nitroglycerin after 15 minutes, you may be having a heart attack. Don't delay. Call 9-1-1 or your local emergency response number immediately.

What are the types of angina?
- **Stable angina** usually follows a predictable pattern. The pain generally happens at about the same point when you are exercising or under emotional stress. The pain is usually relieved with rest or medication. If you have stable angina, try to track how long it lasts and what helps ease the pain. This will help you notice any change in the pattern, which could mean you have developed unstable angina.
- **Unstable angina** causes chest pain that is unexpected and may happen when you are at rest or without stimulating activity. If you have chest pain that is new, worsening or constant, you are greater risk of having a heart attack, an irregular heartbeat (arrhythmia), and even sudden death. See your doctor as soon as possible.
- **Variant angina**, also called Prinzmetal's angina, usually happens spontaneously, and unlike stable angina, it nearly always happens while you are at rest. It doesn't follow physical exertion or emotional stress. Attacks may be very painful and usually happen between midnight and 8 a.m. It is caused by coronary artery spasm. About two-thirds of people with variant angina have severe atherosclerosis in at least one major coronary artery and the spasm usually happens very close to the blockage.
- **Microvascular angina** causes chest pain but without any apparent blockage in a coronary artery. The pain is caused by an improper functioning of the tiny blood vessels that feed your heart. (This condition may also be referred to as Cardiac Syndrome X, not to be confused with metabolic syndrome, which is also known as Syndrome X.)
- **Atypical angina** is where you may not experience typical symptoms of angina and instead may feel a vague chest discomfort, shortness of breath, fatigue, nausea, back or neck pain or burning indigestion. Women are more likely to experience atypical symptoms such as vague chest discomfort.

How is angina diagnosed?
Your doctor will probably review your medical history and give you a complete physical exam. Then, he or she may want to run a few tests before recommending treatment. These tests may include:
Diagnostic Tests (See Appendix A)
- **Angiography**
- **Electrocardiogram (ECG/ EKG)**
- **Echocardiogram**
Angina

- Exercise electrocardiogram (Stress test)
- Thallium or cardiolite scan
- Transesophageal echocardiogram (TEE)

**How is angina treated?**
Lifestyle changes and medications are the most common ways to treat and control angina. Sometimes, surgery may be necessary.

**Lifestyle changes**
Although exercise may bring on angina, you'll still need to stay physically active, as long as your doctor approves. You could live more comfortably and with fewer angina attacks by controlling your risk factors such as blood pressure, diabetes and high blood cholesterol, and by eating a healthy diet, being smoke-free, limiting alcohol use and reducing stress.

**Medications** Appendix B
Certain medications may help prevent or relieve the symptoms of angina.
- Anti-platelets
- Beta-blockers
- Calcium channel blockers
- Nitroglycerin

**Surgical and other procedures**
Angina can also be treated by widening or bypassing the narrowed artery to increase the blood flow to your heart. Procedures to treat angina might include:
- Percutaneous coronary intervention (PCI or angioplasty with stent)
- Coronary artery bypass surgery
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Appendix A

Angiography
An angiogram is a test that takes X-ray pictures of the coronary arteries and the vessels that supply blood to the heart. During an angiogram, a special dye is released into the coronary arteries from a catheter (special tube) inserted in a blood vessel. This dye makes the blood vessels visible when an X-ray is taken. Angiography allows doctors to clearly see how blood flows into the heart. This allows them to pinpoint problems with the coronary arteries. Angiography may be recommended for patients with angina (chest pain) or those with suspected coronary artery disease (CAD). The test gives doctors valuable information on the condition of the coronary arteries, such as atherosclerosis, regurgitation (blood flowing backwards through the heart valves) or pooling of blood in a chamber because of a valve malfunction.

What to expect
Angiography is performed in a hospital or clinic. You will be asked to lie on a table, and the site where the catheter is to be inserted (the groin or arm) will be cleaned. You will be given a local anesthetic to numb the skin so you feel no pain. Then, a catheter is carefully guided through a vein or artery to a position near the heart. When the catheter is in place, it releases a special dye into the bloodstream. While the dye is being released, you might feel a brief sensation of heat, which usually passes quickly. An angiogram can take about one to two hours. However, it is best to check with the centre where you are having the procedure to find out how long it will take.

Angiography is a very common procedure and is generally considered safe. In some patients, the contrast dye may cause nausea, the need to urinate or even allergic reactions, although these side effects are rare.

How to prepare
Generally, you should not eat or drink for 6 to 8 hours before having a coronary angiography. Speak to your doctor about how to prepare for the test, specifically about food, drink and medications. If you have questions, it is best to check with the centre where you are having your test for specific information about how to prepare.

Electrocardiogram (ECG/EKG)
An electrocardiogram (ECG or EKG) is a test that checks how your heart is functioning by measuring the electrical activity of the heart. With each heart beat, an electrical impulse (or wave) travels through your heart. This wave causes the muscle to squeeze and pump blood from the heart. An ECG measures and records the electrical activity that passes through the heart. A doctor can determine if this electrical activity is normal or irregular. An ECG may be recommended if you are experiencing arrhythmia, chest pain, or palpitations and an abnormal ECG result can be a signal of a number of different heart conditions.
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An ECG is used to:
- Detect abnormal heart rhythms that may have caused blood clots to form.
- Detect heart problems, including a recent or ongoing heart attack, abnormal heart rhythms (arrhythmias), coronary artery blockage, areas of damaged heart muscle (from a prior heart attack), enlargement of the heart, and inflammation of the sac surrounding the heart (pericarditis).
- Detect non-heart conditions such as electrolyte imbalances and lung diseases.
- Monitor recovery from a heart attack, progression of heart disease, or the effectiveness of certain heart medications or a pacemaker.
- Rule out hidden heart disease in patients about to undergo surgery.

What to expect
An ECG is a non-invasive procedure, which means that nothing is injected into the body. It is painless. A number of electrodes – usually a total of 12 to 15 – are attached to various locations on your body including your arm, leg and chest. The electrodes are attached by small suction cups or adhesive patches. Sensors in the pads detect the electrical activity of your heart. The test is usually performed while you lie still. Results are most often recorded on graph paper and interpreted or read by your doctor or a technologist. The test usually takes 5 to 10 minutes. If you require more detailed information, check with the facility where you are having your exam.

How to prepare
You do not have to restrict what you eat or drink before your ECG, although it is recommended that you not smoke just before the test. You will be asked to remove your jewelry and wear a hospital gown.

Echocardiogram
An echocardiogram (ECHO) uses sound waves (ultrasound) to create a picture of your heart. The recorded waves show the shape, texture and movement of your heart valves, as well as the size of your heart chambers and how well they are working. An ECHO may be done to determine whether a stroke was caused by a heart condition and can also help determine if there is a risk of blood clots forming in your heart. It may also be recommended if you are experiencing abnormal heart sounds, shortness of breath, palpitations, angina (chest pain) or have a history of stroke. It is very useful in diagnosing heart valve problems.

What to expect
A gel is placed on your chest to help transmit the sound waves and a transducer (a unit that directs sound waves) is moved over your chest. This test involves no pain or discomfort. A typical test takes about 15 to 45 minutes. If you have questions, it is best to check with the centre where you are having your test for specific information about how to prepare.
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How to prepare
For a regular echocardiogram, no special preparation is needed.

Exercise electrocardiogram (Stress test)
An exercise electrocardiogram (ECG) records your heart’s response to the stress of exercise. An exercise ECG measures your heart's electrical activity, blood pressure and heart rate while you exercise, usually by walking on a treadmill.

It is usually done to pinpoint the cause of unexplained chest pain, especially if coronary artery disease (heart disease) is suspected. If you have been diagnosed with coronary artery disease, you may be given an exercise ECG to determine how far the disease has progressed and how much exercise you can do safely. If you have had a heart attack or heart surgery, it can help determine how much work or exercise you can do safely. It may also be recommended if you are experiencing irregular heartbeats (arrhythmia), very fast or slow heartbeats (tachycardia or bradycardia), palpitations (unusual throbbing or fluttering sensations in the heart), dizziness or excessive fatigue.

What to expect
An exercise ECG is usually done in a clinic or hospital. You will be asked to walk on a treadmill (or sometimes pedal a stationary bicycle). Small metal electrodes are attached to your chest, then you will either begin by walking slowly or pedalling. As you walk, a technician will monitor your heart’s activity and rate, your breathing and blood pressure. Gradually the speed of the treadmill is increased so you have to walk more quickly. This will help your doctor see how your heart handles progressively greater challenges. The test continues until your heart is beating as fast as it safely can (you reach your peak exercise capacity, given your age and condition), or until you experience chest pain. It is generally a safe procedure, although it may trigger chest pain or irregular heart rhythms. Be sure to let someone know if you are feeling any discomfort or other symptoms. The length of time for the test is usually between 15 and 30 minutes.

How to prepare
Wear clothing and shoes that are comfortable for exercising. You'll probably be told not to eat for at least two hours before the test. If you're a smoker, you'll also need not to smoke for at least two hours before the test. Talk to your doctor about any medications you are taking. If you have questions, it is best to check with the centre where you are having your test for specific information about how to prepare.

Transesophageal echocardiogram (TEE)
A transesophageal echocardiogram (TEE) is a special type of echocardiogram. It is usually done when your doctor wants to look more closely at your heart to see if it could be producing blood clots. Like an echocardiogram, the TEE uses high-frequency sound waves (ultrasound) to examine the structures of the heart. A transducer (a unit that directs the sound waves) is placed in the esophagus (the pipe that connects the mouth to the stomach). The esophagus is close to the heart, so images from a TEE can give very clear pictures of the heart and its structures.
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What to expect
You may be given a mild sedative to help you relax. You may also be given oxygen during the procedure. Your throat will be numbed with an anesthetic, then a flexible tube about the size of your index finger is inserted into your mouth and down your esophagus. During the procedure, you may feel the probe moving, but it won't be painful or interfere with your breathing. The transducer at the tip of the tube releases sound waves that bounce off your heart and are converted into pictures on a video screen. The doctor can move the tube up, down and sideways to look at different parts of your heart from different angles. The test usually takes about 20 to 40 minutes.

If you require more detailed information, check with the facility where you are having your exam.

How to prepare
You will be asked not eat or drink for 4 to 6 hours before your exam and to take any prescribed medications with only a sip of water. You should also arrange to have someone drive you home after the exam in case you are feeling drowsy.
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Appendix B
Anti-platelets (acetylsalicylic acid (ASA), clopidogrel, dipyridamole)
Anti-platelets help prevent dangerous blood clots from forming. They may be used to reduce the risk of clot-induced heart attack or stroke, which is called preventive or prophylactic treatment. One of the most common anti-platelets is ASA (acetylsalicylic acid or Aspirin®).

What are the main types?
ASA is a common over-the-counter pain reliever that also has anti-platelet properties. ASA can irritate your stomach and in some cases can cause bleeding. ASA should never be given to children because it has been linked to Reye's Syndrome, a rare brain and liver disorder. Clopidogrel (clopidogrel bisulfate, Plavix®) is an anti-platelet drug that is effective in preventing strokes and heart attacks and is often prescribed to patients who receive a coronary stent. Dipyridamole is usually given with other anti-platelet or anticoagulant medications, such as ASA. It can also be given by injection during tests on the heart.

How does it work?
Anti-platelets help prevent tiny cells in the blood (platelets) from clumping together and forming blood clots. Anti-platelets, such as ASA, act on platelets in your blood, making it less sticky so that the platelets are less likely to produce clots that block arteries and may cause heart attacks or strokes.

How should I take it?
Do not take over-the-counter anti-platelets such as Aspirin to prevent a heart attack unless your doctor has advised you to do so. Aspirin can prevent blood clots, but it can also increase the chances of serious bleeding in some people. If your doctor has advised you to take Aspirin, take it with or without food and swallow it whole with water. Do not cut, crush or chew the tablet as there is often a special coating to reduce stomach upset. Always talk to your doctor or pharmacist about how and when to take your medication.

What should I avoid while taking this medicine?
Avoid smoking and limit your use of alcohol. Also, try to avoid cutting yourself. Use an electric shaver and soft-bristled toothbrush. You'll also want to floss gently and wear gloves while gardening. If you need surgery (even a simple surgical procedure) or dental extraction, inform your surgeon or dentist that you are taking an anti-platelet. Talk to your dentist or doctor about whether you should consider delaying non-essential dental work until your treatment is finished.

What if I am taking other medicines?
Anti-platelet medications can enhance the effects of other blood thinning medications such as Warfarin. Some common side effects associated with Aspirin include upset stomach (taking your medication with food can help) and heartburn. Because anti-platelets interact with many
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other common drugs, always talk to your doctor or pharmacist before taking any other medication including prescription, non-prescription, over-the-counter or natural health products (vitamins and minerals, herbal remedies, homeopathic medicines, traditional medicines such as traditional Chinese medicines, probiotics and other products such as amino acids and essential fatty acids). Clopidogrel should not be used with omeprazole, esomeprazole, fluconazole, ketocontazole, fluoxetine or flouvoxamine.

What else should I tell my doctor?
If you require surgery (even a simple surgical procedure) or dental extraction, inform your surgeon or dentist that you are taking an anti-platelet. The blood thinning effects of these medications can last for up to 10 days after you stop taking them.

What are some common side effects?
Because anti-platelets interfere with the clotting action of the blood, they can increase the risk of uncontrolled bleeding. Anti-platelets should not be taken by individuals who have an ulcer or history of bleeding problems. Abnormal bruising may be a symptom of a bleeding problem. Anti-platelet medications can irritate the stomach, promote the development of ulcers, and increase water and salt retention.

Lifestyle changes
Eating a healthy diet that is lower in fat, especially saturated and trans fats, being smoke free, limiting alcohol use, being physically active and reducing stress are also important in lowering the risk of heart disease. Talk to your health-care practitioner about how you can achieve these lifestyle changes.

For more information
Health Canada provides health and medical information to help Canadians maintain and improve their health. Learn more about Safe Use of Medicines, Safety and Effectiveness of Generic Drugs and Buying Drugs over the Internet. Drug Product Database provides information about drugs approved for use in Canada. MedEffect Canada provides safety alerts, public health advisories, warnings and recalls. Your ministry of health also provides useful health resources in your province or territory. For example, Ontario has a MedsCheck program providing free pharmacist consultations on safety use of drugs. British Columbia has a Senior Healthcare webpage providing information about important health programs.

Beta-blockers
What does this medication do?
Beta-blockers are used to treat high blood pressure, heart failure, abnormal heart rhythms (arrhythmia) and chest pain (angina). They may also be used to prevent future heart attacks in patients, and to treat anxiety, migraines and tremors caused by an overactive thyroid.
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**How does it work?**
Beta-blocker is short for Beta-Adrenergic blocking drugs. Beta-blockers block the responses from your beta nerve receptors. This slows your heart rate and lowers your blood pressure to reduce the workload on your heart.

**How should I take it?**
Beta-blockers are available as tablets or capsules. Some are taken once daily; others are taken several times a day. Your doctor may prescribe them to lower your blood pressure or they may be given along with a diuretic (water pill) or other antihypertensive drug. Talk to your doctor or pharmacist about how and when to take your medication. Take your medications as prescribed. Do not stop taking your medicine unless your doctor tells you to. If you stop taking your beta blockers abruptly, it may increase your heart rate suddenly.

**What if I am taking other medicines?**
Some medications can interact with beta-blockers, so always tell your doctor or pharmacist about any other medication including prescription, non-prescription, over-the-counter or natural health products (vitamins and minerals, herbal remedies, homeopathic medicines, traditional medicines such as traditional Chinese medicines, probiotics and other products such as amino acids and essential fatty acids). Some potential interactions with beta-blockers include medications to treat high blood pressure, diabetes, asthma, bronchitis and emphysema, as well as some anti-depressants and allergy shots.

**What else should I tell my doctor?**
If you have asthma, make sure your doctor is aware of it because beta-blockers may make your asthma worse. Tell your doctor if you have or have had any problems with your circulation or have diabetes. Never stop taking beta-blockers suddenly without first checking with your doctor.

**What are some common side effects?**
Beta-blockers can cause some side effects. The more common include drowsiness or fatigue, cold hands and feet, weakness or dizziness, dry mouth, eyes and skin. Tell your doctor if you experience these or any other side effects.

**Combination treatments**
Most people with high blood pressure need two or more medications, together with lifestyle changes, to lower their blood pressure. In some cases, two medications can be taken as a single tablet.

**Lifestyle changes**
Eating a healthy diet that is lower in fat, especially saturated and trans fats, being smoke free, limiting alcohol use, being physically active and reducing stress are also important in lowering the risk of heart disease. Talk to your healthcare practitioner about how you can achieve these lifestyle changes.
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Calcium channel blockers
What does this medication do?
Calcium channel blockers, sometimes called calcium channel antagonists, are used to control high blood pressure (hypertension), chest pain (angina) caused by coronary artery disease and irregular heartbeats (arrhythmia). Calcium channel blockers are often taken in combination with beta-blockers or diuretics to help reduce blood pressure.

How does it work?
Calcium channel blockers are vasodilators, which means they widen (dilate) your blood vessels, letting blood flow through more easily. By relaxing your blood vessels, your blood pressure drops and your heart doesn't have to work as hard. Some calcium channel blockers also slow the heart.

How should I take it?
There are many different kinds of calcium channel blockers, so how much you need depends on what type you are taking. Talk to your doctor or pharmacist about how and when to take this medicine. If you are taking an "extended-release" calcium channel blocker, do not chew, cut or crush the pills.

What should I avoid while taking this medicine?
Check with your doctor or pharmacist about consuming grapefruit or grapefruit juice (fresh or frozen) because they may increase the effect of a certain class of calcium channel blocker and may cause your blood pressure to drop too much. A component in grapefruit juice appears to interfere with your body's ability to eliminate this medication. You should also avoid smoking while you are taking calcium channel blockers because it may cause a rapid heartbeat (tachycardia). Speak to your doctor or pharmacist about any other information you may need to know about your medications.

Visit Health Canada to learn more about The Effects of Grapefruit and its Juice on Certain Drugs.

What if I am taking other medicines?
Calcium channel blockers can interact with other medications, so be sure to tell your doctor about any other medication including prescription, non-prescription, over-the-counter or
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natural health products (vitamins and minerals, herbal remedies, homeopathic medicines, traditional medicines such as traditional Chinese medicines, probiotics and other products such as amino acids and essential fatty acids). Some medications that can cause an interaction with calcium channel blockers include ACE inhibitors, antiarrhythmics, digitalis, corticosteroids, large doses of calcium or vitamin D supplements.

What else should I tell my doctor?
Always check with your doctor or pharmacist before taking other medications on a regular basis. It is not safe to stop taking a calcium channel blocker without consulting your doctor.

What are some common side effects?
Calcium channel blockers have relatively few side effects, and these are rarely serious although they may be irritating. Among the most common are fatigue, dizziness/lightheadedness, heartburn and swelling of the ankles or feet. Tell your doctor if you have any of these side effects. Do not stop taking your medications without speaking to your doctor first.

Combination treatments
Most people with high blood pressure need two or more medications to lower their blood pressure. In many cases, two medications can be taken as a single tablet.

Lifestyle changes
Eating a healthy diet that is lower in fat, especially saturated and trans fats, being smoke free, limiting alcohol use, being physically active and reducing stress are also important to lowering the risk of heart disease. Talk to your health-care practitioner about how you can achieve these lifestyle changes.

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Nitrates (Nitroglycerin)
What does this medication do?
Nitrates can be used to prevent chest pain (angina), limit the number of angina attacks that you have, relieve the pain of a current attack, or treat the symptoms of heart failure. Nitroglycerin is a type of nitrate.

How does it work?
Nitrates are vasodilators, which means they help widen (dilate) your blood vessels, making it
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easier for blood to flow through and let more oxygen-rich blood reach your heart. Better blood flow means your heart doesn't have to work as hard. Nitrates also relax the veins so less blood is returned to the heart, which can reduce the workload on your heart.

How should I take it?
There are several different forms of nitrates:
- Pills: sublinguals (held under your tongue).
- Topical ointment or transdermal patches deliver nitrates through your skin.
- Sublingual spray is sprayed on or under your tongue.
Always talk to your doctor or pharmacist about how and when to take your specific medication.

What should I avoid while taking this medicine?
You should avoid smoking while you are taking nitrates since it may make them less effective. You should also avoid alcohol, because it may increase the effect of the medicine.

What if I am taking other medicines?
Nitrates can interact with other medications, so be sure to tell your doctor about any other medications you may be taking including prescription, non-prescription, over-the-counter or natural health products (vitamins and minerals, herbal remedies, homeopathic medicines, traditional medicines such as traditional Chinese medicines, probiotics and other products such as amino acids and essential fatty acids).

Some medications that may cause an interaction include:
- Viagra® (sildenafil). Viagra should not be taken within 24 hours of taking nitrates. When combined with nitrates, Viagra may cause lowered blood pressure, dizziness, lightheadedness, fainting or more serious effects. Check with your doctor or pharmacist about similar drugs or herbal remedies that treat erectile dysfunction.
- Medicines to treat high blood pressure.
- Certain heart medicines.
- Over-the-counter cough, cold, and flu medicines.
- Over-the-counter herbal cough, cold, and flu medicines.
Speak to your doctor or pharmacist about any other information you may need to know about your medications.

What else should I tell my doctor?
Always give your doctor your complete medical history, especially if you are over 60 years of age, have recently had a stroke or heart attack or have severe headaches, low iron (anemia) or glaucoma. You may also want to talk to your doctor about how effective nitrates are for managing your angina. Your doctor can adjust the amount of medicine or suggest other ways of managing your condition.

What are some common side effects?
Some common side effects of nitrates include headaches, flushing, dizziness, fainting, low blood
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pressure (hypotension) and irregular heart rhythms (arrhythmia). Report any and all side effects to your doctor.

Lifestyle changes
Eating a healthy diet that is lower in fat, especially saturated and trans fats, being smoke free, limiting alcohol use, being physically active and reducing stress are also important to lowering the risk of heart disease. Talk to your healthcare practitioner about how you can achieve these lifestyle changes.

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Percutaneous coronary intervention (PCI or angioplasty with stent)
What is it?
Percutaneous Coronary Intervention (PCI, formerly known as angioplasty with stent) is a non-surgical procedure that uses a catheter (a thin flexible tube) to place a small structure called a stent to open up blood vessels in the heart that have been narrowed by plaque buildup, a condition known as atherosclerosis.

Why is it performed?
PCI improves blood flow, thus decreasing heart-related chest pain (angina), making you feel better and increasing your ability to be active. PCI is usually scheduled ahead of time.

What is done?
A catheter is inserted into the blood vessels either in the groin or in the arm. Using a special type of X-ray called fluoroscopy, the catheter is threaded through the blood vessels into the heart where the coronary artery is narrowed. When the tip is in place, a balloon tip covered with a stent is inflated. The balloon tip compresses the plaque and expands the stent. Once the plaque is compressed and the stent is in place, the balloon is deflated and withdrawn. The stent stays in the artery, holding it open.

What can you expect?
Your doctor will explain the risks and benefits of the procedure. Before the procedure starts, inform your doctor if you:

- Have ever had a reaction to any contrast dye, iodine, or any serious allergic reaction (for example, from a bee sting or from eating shellfish).
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- Have asthma.
- Are allergic to any medication.
- Have any bleeding problems or are taking blood-thinning medication.
- Have a history of kidney problems or diabetes.
- Have body piercings on your chest or abdomen.
- Have had any recent change in your health.
- Are, or may be, pregnant.

Shortly before your procedure, you may receive a sedative to help you relax. Hair in the groin area around where the catheter will be inserted may be clipped. An intravenous (IV) line is inserted so, if necessary, you can be given medications quickly. Electrodes will be placed on your body to monitor your heart, and a small device called a pulse oximeter may be clipped on a finger or ear to track the oxygen level in your blood.

Most PCIs are conducted with the patient sedated but not asleep. You will lie on your back on a procedure table. A local anesthetic will be injected into the skin at the site where the catheter will be inserted. Once it has taken effect, the catheter will be inserted into the blood vessels. You may feel a brief sting or pinch as the needle goes through the skin and some pressure within the artery as the catheter is moved. If you are uncomfortable, tell your doctor and if necessary additional pain medication may be given.

When the catheter reaches the heart, the contrast dye will be released so the area where the blood vessel is narrowed can be identified. When the dye is released, you may feel a brief flushing sensation or feeling of warmth. Some people experience a salty or metallic taste in the mouth, or a brief headache. A few people may feel nauseated or even vomit, but this is rare. These effects are harmless usually last for only a few minutes.

When the narrowing is located, the catheter will be advanced so the special tip can be activated. It is possible to experience some chest pain or discomfort at this point, but your doctor will monitor you carefully and the discomfort should go away quickly.

When finished, the catheter will be withdrawn and pressure put on the insertion site to stop the bleeding. Once the bleeding has stopped, a tight bandage will be applied. You will need to remain lying flat during this time. If the catheter was inserted in the groin, you will have to keep your leg straight for several hours. If it was inserted in the arm, your arm will be kept elevated on pillows and kept straight with an arm board.

After the procedure, you will probably go to a recovery room for several hours of observation. You will be asked to remain in bed for 2 to 6 hours, depending upon your specific condition. Pain medication may be given if you experience any discomfort. You will be encouraged to drink water and other fluids to help flush the contrast dye from your body. Most people spend the night in hospital after a PCI. When you return home, keep an eye on the insertion site. A small bruise is normal, but contact your doctor if you experience increased pain, redness, swelling, bleeding or other draining from the insertion site, fever, or chills.
Angina

**Coronary artery bypass surgery**

**What is it?**
Coronary artery bypass surgery improves the blood flow to the heart muscle. It is commonly referred to as bypass surgery or Coronary Artery Bypass Graft (CABG, pronounced like cabbage) surgery.

**Why is it performed?**
Bypass surgery is performed to improve blood flow problems to the heart muscle caused by the buildup of plaque (atherosclerosis) in the coronary arteries. The surgery involves using a piece of blood vessel (artery, vein) taken from elsewhere in the body to create a detour or bypass around the blocked portion of the coronary artery.

One alternative to bypass surgery is Percutaneous Cardiac Intervention (also known as angioplasty), a non-surgical technique that uses catheters and small structures called stents to keep the arteries open. If there are many blockages or if the blockages are positioned in places that are difficult for a catheter to reach (for example, at a bend in a blood vessel), your doctor may recommend bypass surgery as your best alternative.

By improving blood flow, bypass surgery may decrease heart-related chest pain (angina), make you feel better and increase your ability to be active. Bypass surgery doesn’t cure the underlying heart disease. Lifestyle changes and medications as prescribed by your healthcare providers are critical to reduce atherosclerosis and blood clot formation to prevent another blockage.

**What is done?**
A piece of a healthy blood vessel from the patient’s leg, arm, or chest will be “harvested” to be used as the bypass. Unless you are undergoing one of the newer procedures (minimally-invasive bypass or off-pump or beating-heart surgery), the heart is stopped so the surgeons can work on it. (A machine called the heart-lung machine will take over the work of your heart and lungs while the surgeon is operating on the heart.) The section of healthy blood vessel is attached above and below the blocked artery. When the heart is restarted, blood flow is diverted through the bypass around the narrowed portion of the diseased artery. Depending upon the number of blockages, several bypasses may be created.

**Off-Pump or Beating-Heart Surgery**
This procedure is similar to bypass surgery, except the heart is not stopped and the patient is not put on a heart-lung machine. Using special equipment to stabilize or quiet the area of the heart, the surgeons work on the heart as it continues to beat.

**What can you expect?**
Usually, the surgery is scheduled ahead of time. A week or so before your operation, you will probably be asked to visit your hospital’s preadmission unit. Blood and urine tests, an electrocardiogram, and an X-ray may be performed. Your doctor will explain the risks and
Angina

benefits of the procedure and you will be asked to sign a consent form. You may be asked whether you (or inform your doctor if you):

- Have ever had a reaction to any contrast dye, iodine, or any serious allergic reaction (for example, from a bee sting or from eating shellfish).
- Have asthma.
- Are allergic to any medication.
- Have any bleeding problems or are taking blood-thinning medication.
- Have a history of kidney problems or diabetes.
- Have body piercings on your chest or abdomen.
- Have had any recent change in your health.
- Are, or may be, pregnant.

Bypass surgery may be performed the same day or you may be admitted the night before. The hair on your chest may be clipped and you will be asked to bathe using special antibacterial soap sponges to disinfect your skin. To reduce the risk of vomiting, you will be asked not to eat or drink after midnight the night before surgery.

A bypass is done under a general anesthetic so you will be asleep throughout the procedure and for some time afterwards. If you smoke, you should stop at least two weeks before your surgery, as smoking can contribute to blood clotting and breathing problems. Smoking is a major risk factor for the development of atherosclerosis and should be stopped altogether. You will be very sleepy when you arrive in the operating room. The anesthesiologist will insert intravenous tubes and give you additional medication to put you to sleep. After you are completely asleep, all the equipment needed to help support you during the surgery and in your early recovery are put in place.

Unless you are undergoing off-pump or minimally-invasive surgery, the heart must be stopped so the surgeons can work on it. To ensure your body continues to receive a flow of oxygen-rich blood, you will be hooked up to a heart-lung machine. This machine takes over the pumping action of the heart and the work of the lungs.

The surgery can take anywhere from 3 to 6 hours, depending upon the number of bypasses that are created. When you wake up, you will be in the recovery room or an intensive care unit (ICU). You can expect to stay in the hospital 5 to 7 days. How quickly you recover from surgery will depend in large part upon how healthy you were before the surgery and how well you tolerated the operation. If you have minimally invasive surgery, your hospital stay may be shorter and your recovery faster. When you return home, contact your doctor if you experience increased pain, redness, swelling, bleeding or discharge from an incision, fever or chills, breathing problems, swelling in the leg and abnormal heart beats or for any other unusual physical problems.

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