The Christ Hospital™ Health Network

Heart Disease

what you should know

Vital information about:

- your heart
- cardiac risk factors
- lifestyle modification
- treatment options

Dean J. Kereiakes, MD, FACC, and Ian J. Sarembock, MD, FACC, FAHA, FSCAI

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The Christ Hospital™ Health Network

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Treatment Disclaimer

This book is for education purposes, not for use in the treatment of medical conditions. It is based on skilled medical opinion as of the date of publication.
However, medical science advances and changes rapidly. Furthermore, diagnosis and treatment are often complex and involve more than one disease process or medical issue to determine proper care. If you believe you may have a medical condition described in the book, consult your doctor.

Table of Contents

Introduction

Heart disease, especially coronary heart disease, is an everyday part of our culture. It is also the most common cause of death. What can be done to reverse this trend? A large percentage of cardiovascular disease is genetic or inherited. However, there are things you can do to reduce your chance of having a heart attack. You can start by understanding what cardiovascular disease is and making the necessary changes in your lifestyle. If you have had a cardiac event, or if you think you may be at risk of cardiovascular disease, **now** is the time to take command of your life.

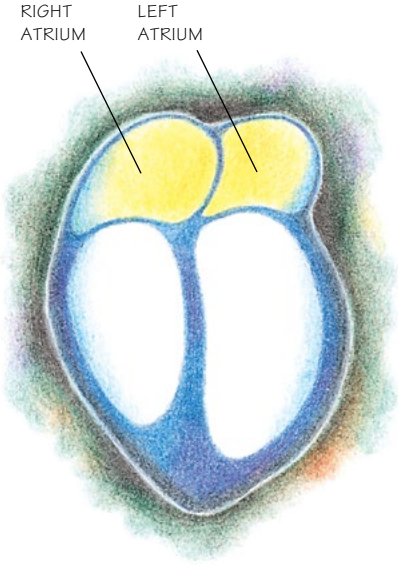
— Dean and Ian

Heart Anatomy

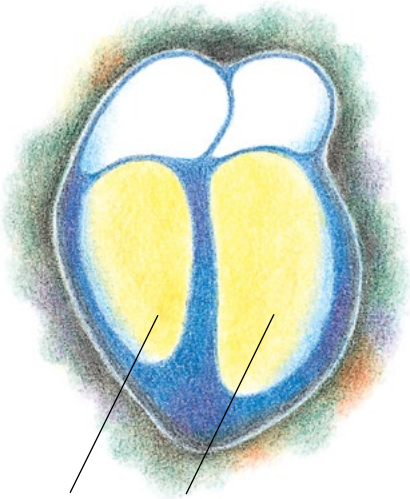
The heart

The heart is a muscle. It pumps blood to the head and the body.

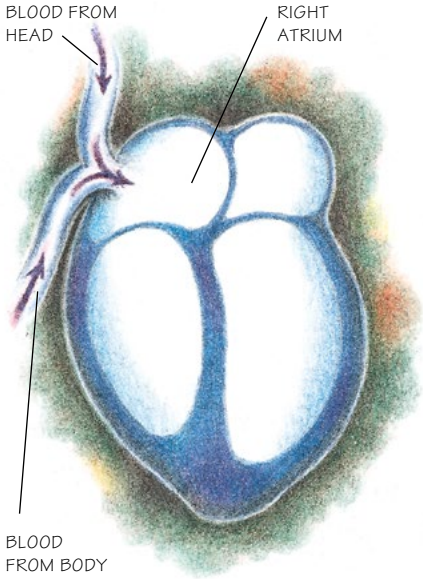
It is about the size of your fist and sits just to the left of the middle of your chest.



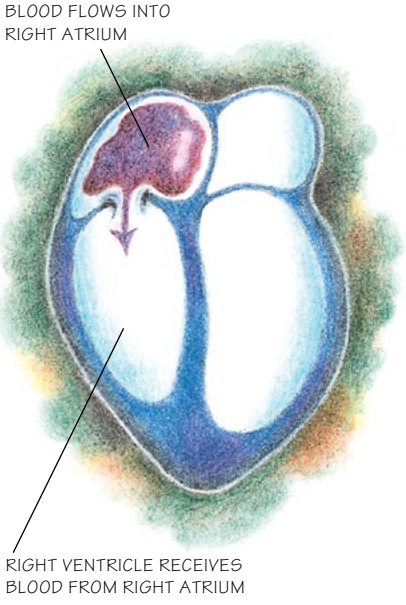
The heart is made up of 4 chambers. The top 2 chambers are called the **atria**. The atria collect blood returning to the heart from the body and lungs. The atria then dump the blood into the ventricles.



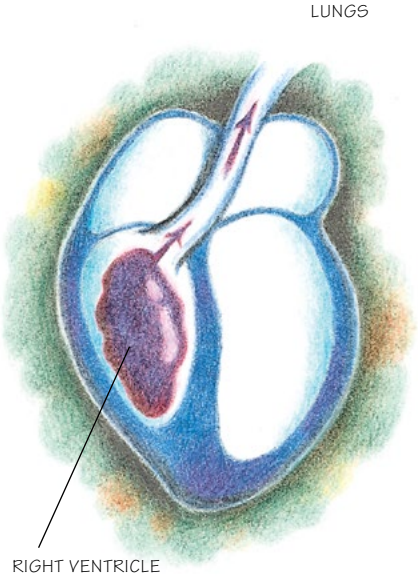
The bottom 2 chambers are called the **ventricles**. The ventricles are larger than the atria, and the left one is more muscular. When the ventricles contract, they propel blood out of the heart to different parts of the body.



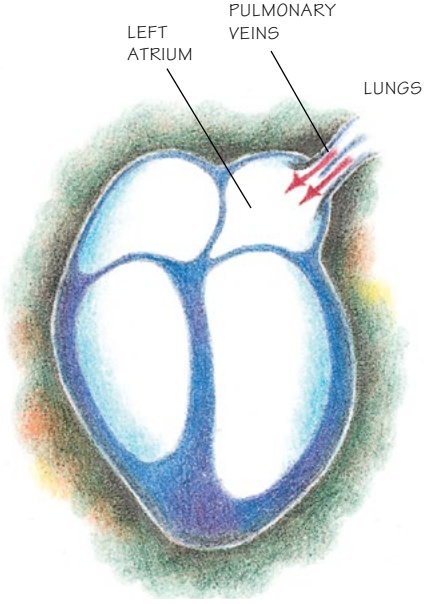
The body uses nutrients and oxygen carried by the blood. The blood returning to the heart from the body has had oxygen removed. This "deoxygenated" blood collects in the **right atrium**.



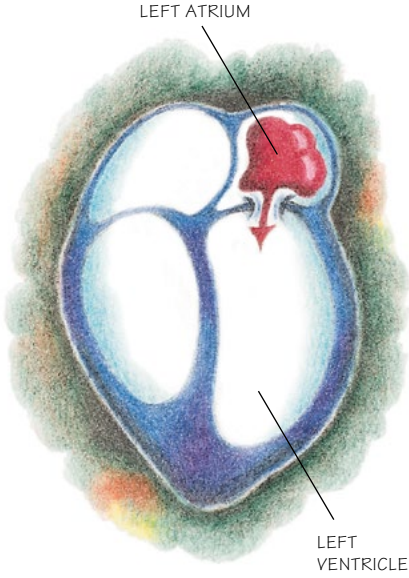
The blood in the **right atrium** goes into the **right ventricle**.



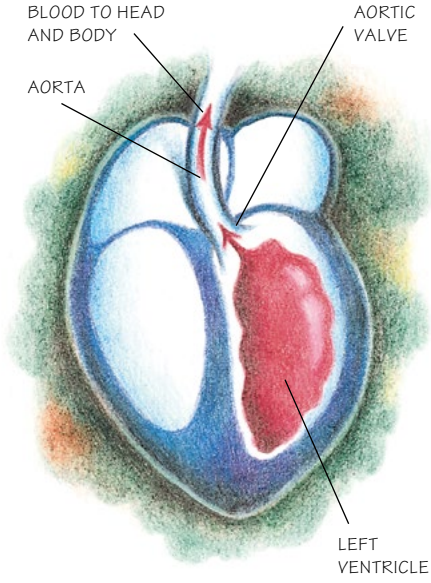
The **right ventricle** pumps blood to the **lungs** where the blood picks up oxygen.



The "oxygenated" blood returns to the heart through the **pulmonary veins** and collects inside the **left atrium**. The oxygen-rich blood is ready to be used by the body again.



The **left atrium** contracts and sends the blood to the **left ventricle**.

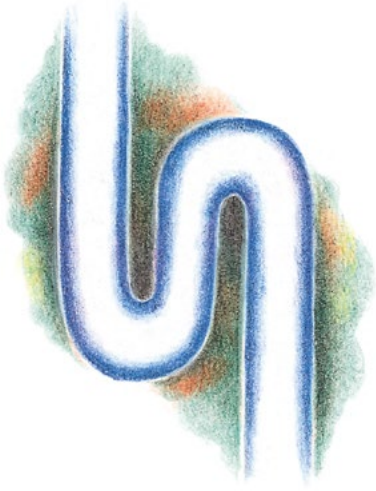


The **left ventricle** contracts and pumps oxygenated blood through the **aortic valve** into the **aorta**. The blood then travels through the **aorta**, providing life-sustaining oxygen and nutrients to the body.

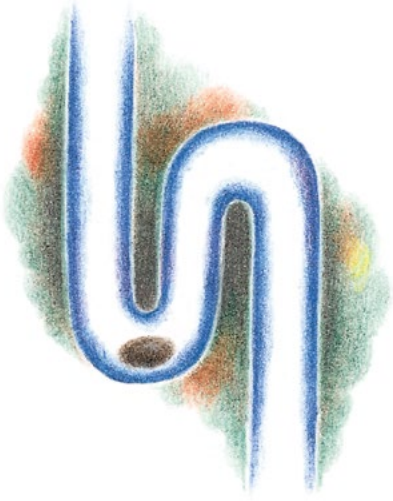
So:

1) Blood with lower oxygen content collects in the right atrium.
2) The right ventricle pumps blood to the lungs where it picks up oxygen.
3) Oxygen-rich blood collects in the left atrium.
4) The left ventricle pumps oxygen-rich blood to the head and the rest of the body.

Arteries and Coronary Arteries



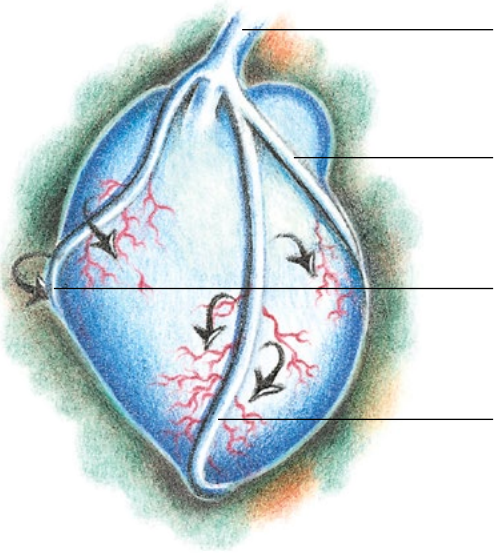
Arteries carry blood much the same way a plumbing system carries water throughout a house.



Over time, debris traveling through the pipes may collect in a bend. Debris that collects and restricts water flow is known as a clog or a blockage.

Arteries and veins wind throughout the body carrying blood. Arteries carry blood away from the heart. Veins carry blood back to the heart.

The heart has its own arteries to provide blood to the heart muscle.



The **aorta** supplies blood to the arteries of the heart as well as to the rest of the body.

The **circumflex artery** supplies blood to the lateral or side aspect of the heart.

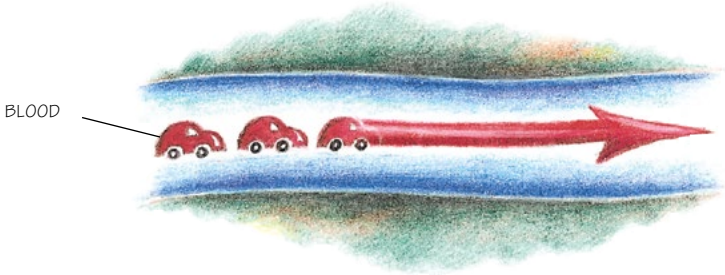
The **right coronary artery** provides blood to the back or underside of the heart.

The **left anterior descending artery** supplies blood to the front of the heart.

To give you some idea of their size, the **coronary arteries** are only about the size of a strand of spaghetti.

(APPROXIMATE SIZE OF SPAGHETTI)

At birth, the inside of the arteries, including the coronary arteries, is slippery — similar to a nonstick pan. The blood cells (represented by the small cars) flow smoothly through the arteries.

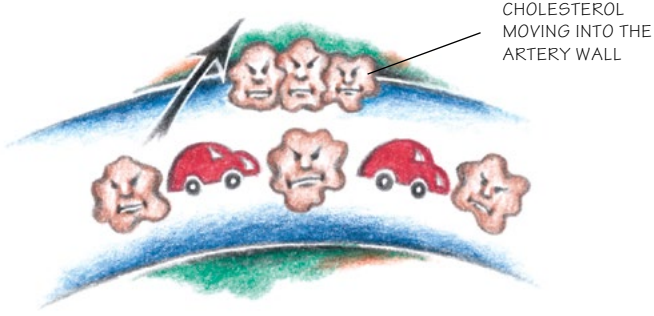


What happens to an artery during a person's lifetime?

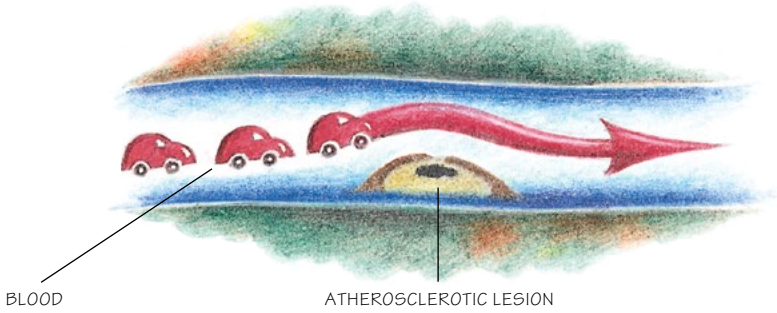
Donna Arnett, PhD, past president of the American Heart Association, describes the damage that occurs to the inside of the artery this way:

"Think about a splinter in your finger or an abscess on a tooth. Our body launches an attack with our white blood cells and chemicals that results in redness and swelling to kill the bacteria or rid the body of the intruder."

Over time, the inside of the artery may become damaged due to high blood pressure, smoking, and LDL or bad cholesterol. Fatty streaks begin to develop along the insides of the damaged areas as cholesterol (lipids) moves into the artery walls.



When people smoke or they have risk factors such as diabetes, high blood pressure, obesity, high cholesterol, and physical inactivity, these fatty streaks may become more advanced **atherosclerotic lesions**.

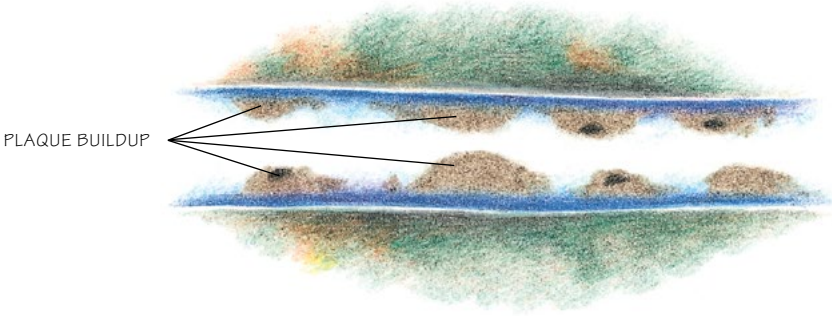


The body views these fatty streaks as "infection." It tries to fight the "infection" by producing inflammation. Fatty streaks may eventually progress to **plaque** (atheromas or fibroatheromas).

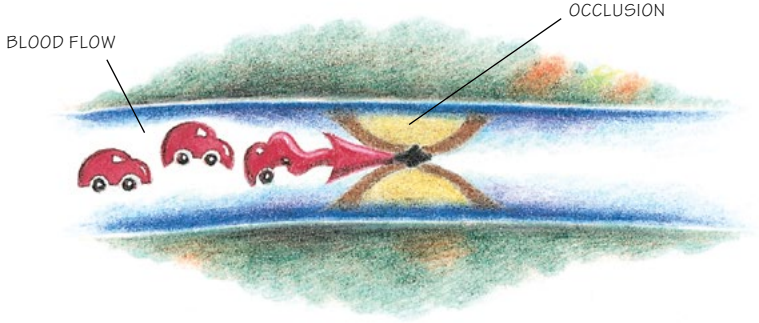
Simply, the progression of cholesterol inside the artery wall is:

Damaged artery→Fatty Streaks →Inflammation→Plaque

Buildups of plaque may occur at multiple points along the length of the artery, often starting where the artery divides into branch points or forks in the road. Plaque buildups are not limited to the arteries of the heart. They can occur and restrict blood flow in arteries throughout your entire body, including the brain (**stroke**) and legs (**claudication**).

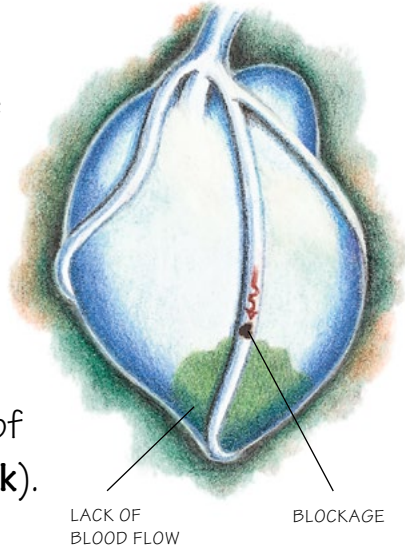


The total blockage of the artery may occur due to: (a) the **buildup** of plaque, (b) the formation of a blood clot on the plaque, or (c) the plaque **rupturing** and causing a larger blood clot to form. The complete blockage of the artery is called an ***occlusion***.



What happens if an artery becomes completely blocked?

An artery that is completely blocked has no blood flowing through it. If the heart muscle does not receive blood, then it does not receive nutrients and oxygen. It experiences **ischemia**. This may may result in heart pain (**angina**). Ischemia, if prolonged and severe enough, may cause a portion of the heart muscle to die (**heart attack**).



What are some symptoms of a possible heart attack?

- **Angina**, or heart pain, usually felt as a pressure, ache, tightness, squeezing, or **burning sensation** behind the breastbone and left chest and often extending to the neck, jaw, shoulders, or down the arm (usually the left arm)
- **Nausea**
- **Shortness** of breath and/or **sweating**

NOTE: People who have diabetes may not "feel" angina in the same way, often have atypical symptoms like shortness of breath, and consequently have a greater risk of experiencing a "silent" or unrecognized heart attack.

Quite often, people who are having a heart attack say they feel like "an elephant is standing on my chest."

Preventing coronary artery disease

What can you do to reduce your chance of developing heart disease? Fortunately, it can take a long time for plaque to build up in your arteries. You can focus on prevention by addressing certain habits or "risk factors" now.

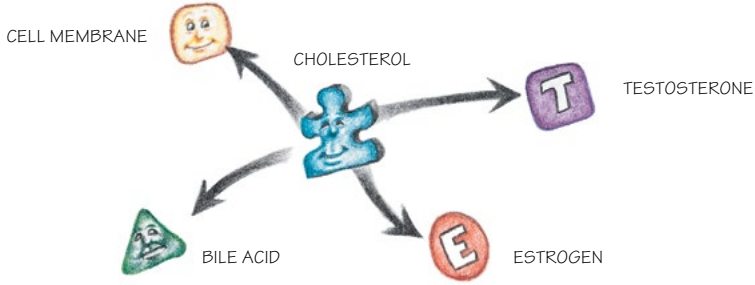
Risk Factors

The primary risk factors for cardiovascular disease include:

1) High cholesterol
2) Tobacco abuse
3) Diabetes
4) Metabolic syndrome (pre-diabetes)
5) Hypertension or high blood pressure
6) Overweight or obesity
7) Age
8) Genetics and family history
9) Vascular injury and inflammation
10) Physical inactivity

1. High cholesterol

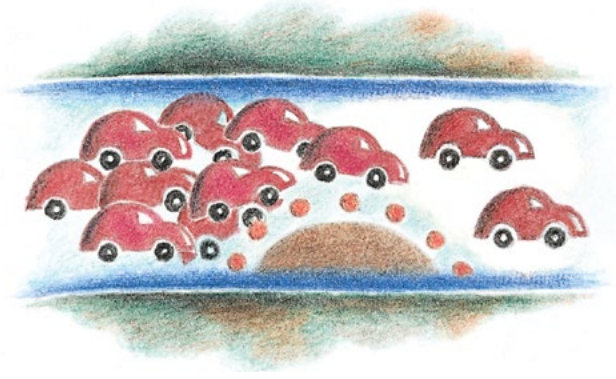
Cholesterol is a waxlike substance that serves as a building block within the normal **cell membrane**. Cholesterol is also used to make **hormones**, especially **estrogen** and **testosterone**. It is also used to make **bile acids** that help break down fat in our intestines.



Why is cholesterol so harmful?

Fatty streaks in the arteries start to develop in the first decade of life as a result of **lipids** moving into the cell wall. As described on pages 26 - 28, these fatty streaks may become more advanced **atherosclerotic lesions** and may then progress to **plaque**.

The natural response of the artery is to expand to accommodate the plaque. However, at a certain point, the plaque starts to narrow the artery, potentially reducing blood flow.



How is high cholesterol treated?

The American Heart Association (AHA) and the American College of Cardiology (ACC) create the guidelines for managing blood cholesterol. High cholesterol has a long-term, cumulative effect on damaging a person's entire cardiovascular system, so the guidelines stress the importance of lifestyle modifications such as:

(1) adhering to a heart-healthy diet, (2) exercising regularly based on your doctor's recommendations, and (3) avoiding tobacco products.

For individuals who cannot lower their cholesterol with diet and exercise alone, the AHA/ACC guidelines provide recommendations on when to start cholesterol-lowering medications. Your doctor may use a "risk calculator" or other screening tests to determine the best treatment option.

The first-line medication to lower cholesterol is a statin. Statins have the most scientific evidence supporting their role in reducing the risk of heart disease, heart attacks and strokes.

Two other medications your doctor may consider are ezetimibe and PCSK9 inhibitors. Ezetimibe may be

prescribed along with a statin for some individuals with high cholesterol. For a small portion of the population that does not respond well to statin therapy or cannot tolerate statins, a doctor may prescribe a PCSK9 inhibitor. PCSK9 medications are very effective but are also fairly expensive. Talk to your doctor about whether a statin (with or without ezetimibe) or PCSK9 inhibitor provides the most benefit based on your medical history and your health care coverage.

High triglycerides can contribute to cardiovascular disease, so your doctor may also prescribe a medication to help lower your triglycerides.

The guidelines also place a special emphasis on the detection of a family history of high cholesterol.

The guidelines recommend that children with a family history of high cholesterol should be tested for high cholesterol between the ages of 9 and 11 and again between the ages of 18 and 21.

2. Tobacco abuse

What about smoking? Don't do it. Smoking is bad for the entire cardiovascular system because it:

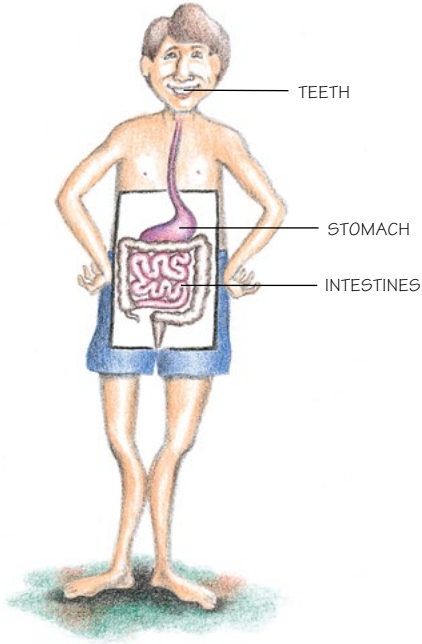
- Introduces carbon monoxide into the body
- Directly harms the blood vessels
- Increases blood pressure and heart rate
- Increases the risk of a heart attack

Smoking has harmful effects, especially for anyone who has already had a heart attack or bypass surgery. More importantly, there is an increased risk of a second heart attack or need for stent placement or another bypass surgery if you continue to smoke after an initial cardiac incident.

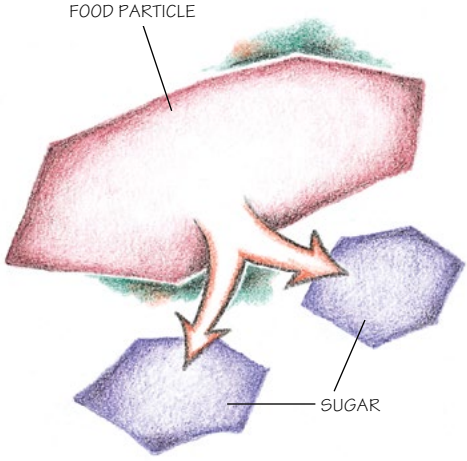
Smoking is also a risk factor for **peripheral vascular disease** (blockages of the arteries to the brain, kidneys, and legs).

3. Diabetes

What exactly is diabetes? The working cells need sugar for energy. Sugar is absorbed through the digestive system after a meal or snack. **Insulin** is released by the **pancreas** to allow the body to use sugar as a source of nutrition and energy. That may be hard to visualize. This may help …

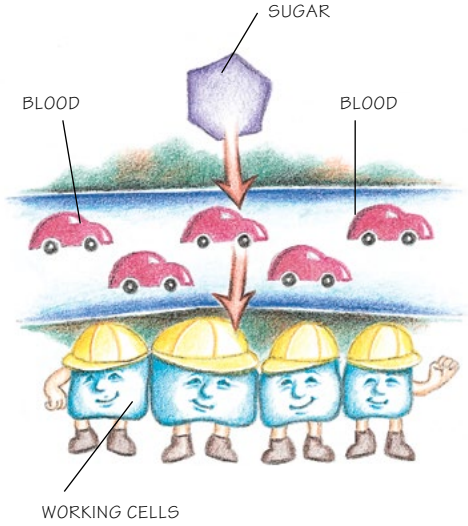


While you eat, the digestive system (teeth, stomach, and intestines) breaks your food down into smaller particles that are used by your body.



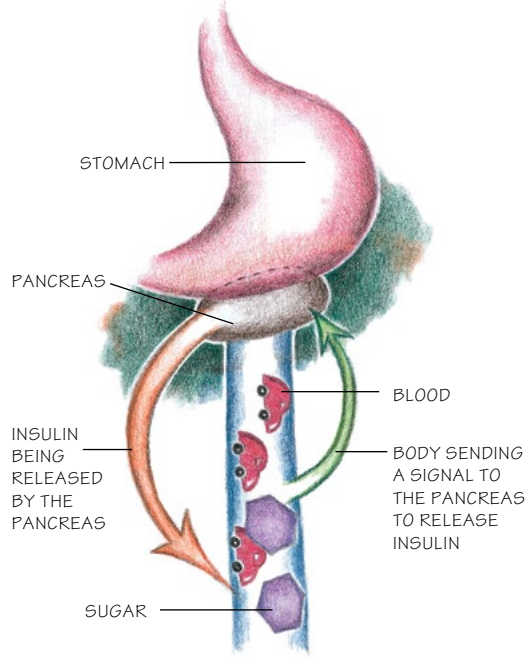
Some food is broken down into particles of **sugar.** Sometimes this sugar is referred to as **carbohydrates** or **glucose.**

Sugar moves from the digestive system to the blood and travels throughout the body to feed the working cells. The sugar is the energy packet the cells need to do work like running and breathing.

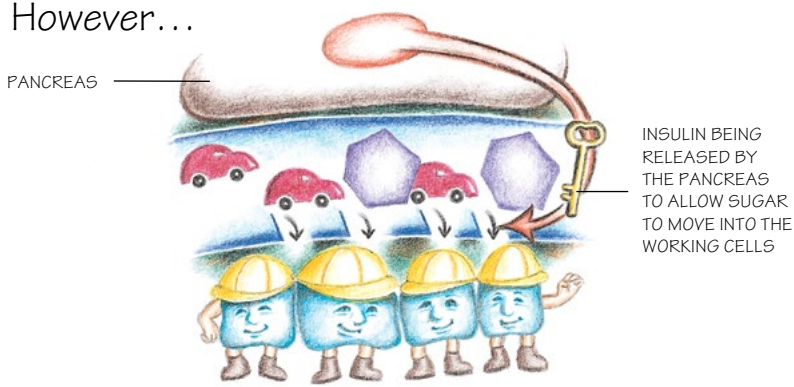


At the same time the sugar moves into the blood, the body sends a signal to the **pancreas** telling it to release **insulin** into the bloodstream.

Insulin is released from the "beta" cells of the pancreas.



Insulin acts like a **key** that unlocks the doors of the cells to let sugar move in. The working cells can then use the sugar for energy to do their jobs. This is how your body uses sugar. However…



…without the key (insulin), the sugar cannot get out of the bloodstream and into the working cells.

The sugar builds up in the blood, and the working cells get hungry. This is what happens in diabetes: the body cannot move sugar from the blood into the cells.

Diabetes is a major risk factor for cardiovascular disease. It is estimated that half of all type 2 diabetes patients have some form of coronary heart disease prior to being diagnosed with diabetes.

4. Metabolic syndrome (pre-diabetes)

Metabolic syndrome affects 1 of every 3 Americans (1 of every 2 people over age 60). Individuals who have at least 3 of these criteria are considered to have this condition:

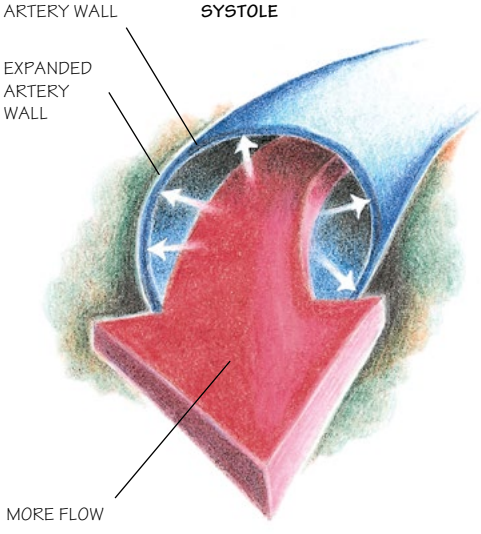
- Large waistline
- Elevated triglyceride levels
- Low HDL-cholesterol
- High blood pressure
- Elevated fasting blood glucose levels

Those with metabolic syndrome are at increased risk for heart attack, stroke, or even death.

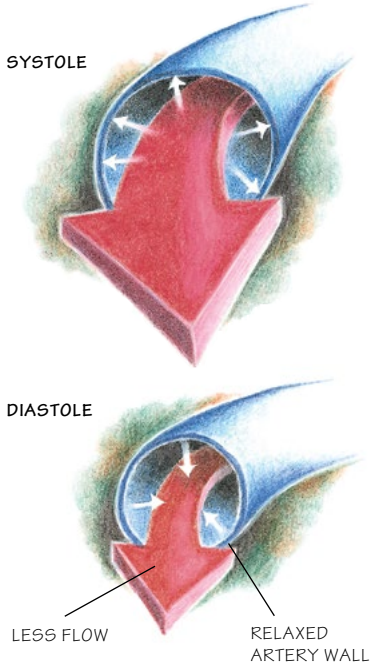
5. Hypertension or high blood pressure

Hypertension is commonly referred to as high blood pressure. It is important to know what blood pressure is… and then understand some of the lifestyle modifications you can take to manage your blood pressure. For some people, lifestyle changes are not enough to lower blood pressure and your doctor may need to add medication(s) to manage your condition.

Here's a simple explanation of blood pressure.



Blood comes out of the heart (**left ventricle**) in 1 big thrust. The artery expands to handle the blood. The amount of pressure put on the expanded artery wall is called **systolic pressure**.

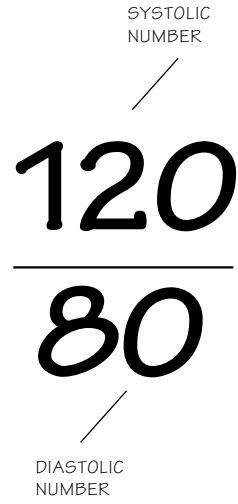


After the artery expands during systole, it relaxes back to its normal size.

It is similar to a rubber band that goes back to its normal shape after being stretched. Normal pressure on the artery wall during relaxation is called **diastolic pressure**.

Managing high blood pressure

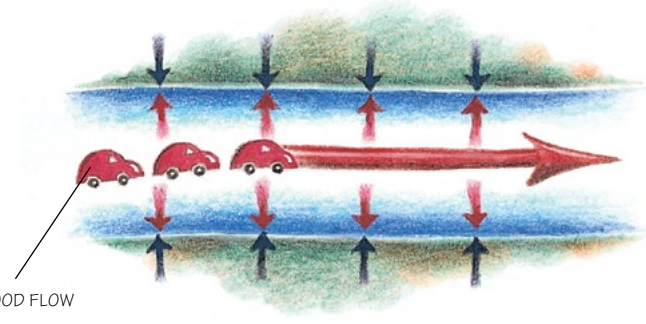
Talk to your doctor about your blood pressure goals. Generally, doctors want their patients to have blood pressure less than 120/80 mmHg. Because blood pressure can vary depending on what your are doing, your doctor may ask you to have your blood pressure retested, or he or she may ask you to buy an automatic blood pressure cuff and monitor your blood pressure at home weekly, monthly, or more frequently with changes in blood pressure medication.



How does hypertension relate to cardiovascular disease?

Blood pressure is a result of the blood flowing through the artery (cardiac output) and the resistance of the artery wall (vascular resistance). If that sounds too technical, here… this may help:

Blood pressure = Cardiac output x vascular resistance



If a lot of resistance is created by either the blood or the artery wall, then there is more pressure as the blood travels through the artery. If it takes more energy to get the blood through the arteries, then your heart has to work harder with each beat. Most people with high blood pressure do not realize they have it. No wonder hypertension is called the "silent killer."

What contributes to hypertension?

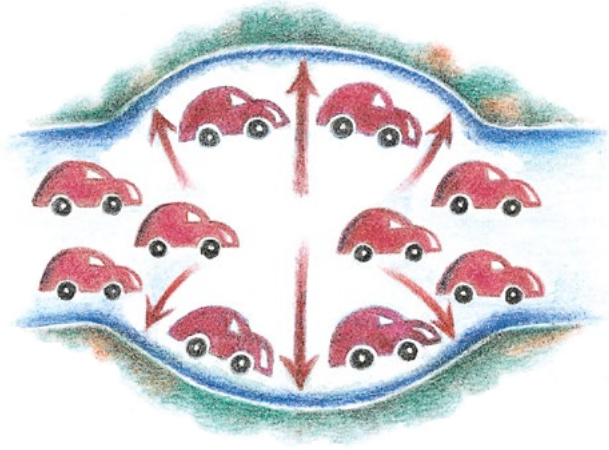
Several factors contribute to hypertension and cardiovascular disease. These include:

- Excess dietary salt
- Excess alcohol intake
- Obesity, particularly morbid obesity
- Stress
- Age
- Genetics and family history
- Physical inactivity
- High saturated fat diet

Excess dietary salt

Salt helps conserve water in your body. The American Heart Association Step 2 diet recommends that the average person consume no more than 2,400 mg of salt per day, especially those individuals who are salt sensitive. Excess dietary salt may contribute to both hypertension and to your body retaining too much water.

If you are retaining too much water, then you are increasing your blood volume (cars) without adding space. This increase will result in more pressure in the arteries.



Excess alcohol intake

A common concern for individuals with cardiovascular disease is alcohol consumption — mainly because there seems to be conflicting evidence about the benefits versus the risks of drinking. Experts agree that excess alcohol consumption over time can lead to many harmful effects, including high blood pressure, cirrhosis of the liver, and damage to the heart. The issue is the balance between **moderate** and **excessive** alcohol consumption.

While evidence shows that there is a protective effect for **moderate** alcohol consumption, this benefit disappears with excessive intake. Men should consume no more than 2 drinks* daily, and women, because of their smaller body size, should not consume more than 1 drink* each day. The 7 to 14 allowable drinks in a week should not be consumed in a few days or during a weekend of binge drinking. Drinking alcohol for cardio-protection is not a good idea.

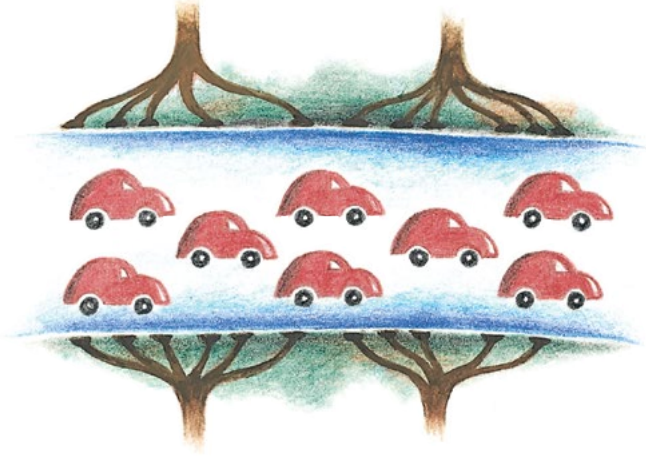
***A guide**: One drink is defined as 5 ounces of wine, 12 ounces of beer, or 1-1/2 ounces of 80-proof liquor.

People who should not drink alcohol include individuals with high levels of triglycerides in their blood (over 300 mg/dL), women who are pregnant, individuals who are under age, people with a genetic predisposition for alcoholism or who are recovering from alcoholism, and those taking certain medications. Because alcohol affects blood pressure, people who have high blood pressure should not have more than 1 drink per day. Also, a cardiologist may ask individuals who have been diagnosed with atrial fibrillation or cardiomyopathy not to consume any alcohol.

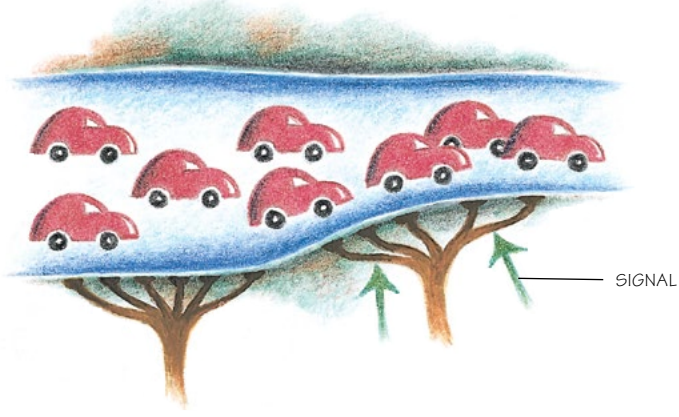
What about stress?

When you are under stress, your brain releases signals to the body through the nerves and hormones. These signals allow your body to respond to various situations. Whether chronic stress or reactions to stress raise blood pressure is hard to define and even harder to treat because stressors are usually related to the environment and lifestyle.

Arteries have nerves attached to them. The nerves can either cause the arteries to relax or can put more tension on the walls of the arteries. If you are under a lot of stress, the nerves send signals to tighten or narrow the arteries.



Narrowing the artery is like taking away a lane of traffic. The same number of cars (blood) need to move through a smaller space (artery). This increases the pressure inside the artery.



So,

something you can do to improve your blood pressure is reduce stress. You can accomplish this by practicing meditation, doing deep breathing exercises, or doing exercise such as going for a walk, riding a bike, or taking a swim.

6. Overweight or obesity

The American Heart Association describes obesity as a major risk factor for cardiovascular disease. What exactly is obesity?

Metropolitan Life's height/weight tables are often used to determine a recommended weight for an individual based on age and gender. Generally, those who are 20% over the recommended weight for their height are considered to be overweight — but not necessarily obese. Obesity refers to fatness rather than weight. Men who have greater than 25% of their body weight as fat and women who have more

than 35% are considered to be obese. Obesity and being overweight carry significant health risks, are directly related to cardiovascular risk factors, and may:

- raise triglycerides (the "bad" blood fat)
- lower HDL-cholesterol (the "good" cholesterol)
- raise LDL-cholesterol (the "bad" cholesterol)
- raise blood pressure
- increase the risk of developing diabetes, and
- increase the risk of metabolic syndrome and insulin resistance

Obesity may be related to both genetics (nature) and lifestyle (nurture). Generally speaking, obesity occurs when the calories we consume exceed the calories we burn through activities of daily living and exercise. We store the excess calories as fat reserves, thus contributing to obesity and ultimately increasing the risk of coronary disease. Obesity has increased in men and women in every decade over the past 50 years.

There is a misconception that Americans are overeating and eating too much fat. In fact, as a nation we are eating less fat, fewer calories, and still gaining weight — primarily due to the lower levels of physical activity in our

youth and adult lives. A sedentary lifestyle could be the real culprit.

Recently, a dramatic increase in obesity has been observed in children and adolescents. According to the Centers for Disease Control, obesity rates in adolescents ages 2–19 is about 17% or 12.7 million children in the United States alone. Obesity in children may lead to high blood pressure and pre-diabetes, and it may also lead to chronic conditions such as heart disease, type 2 diabetes, stroke, several types of cancer, and osteoarthritis.

7. Age

Aging has an effect on the risk of cardiovascular disease because aging causes changes in the heart and blood vessels. As people age, they become less active, gain more weight, and the effects of a sedentary lifestyle, smoking, and poor diet continue to damage the heart and circulation by increasing blood pressure and cholesterol levels. Blood pressure increases with aging, in part because arteries gradually lose some of their elasticity and, over time, may not be as resilient.

8. Genetics and family history

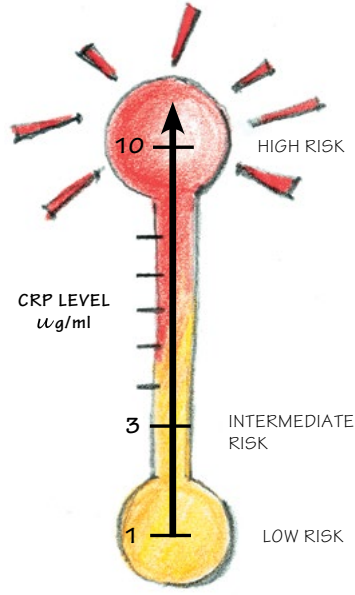
A **family history** of cardiovascular disease is a risk factor for men younger than 40 and women younger than 50. It could reflect genetics and/or an unhealthy family lifestyle. If most of your family members smoke, are sedentary, and have a poor diet — then these are harmful habits that increase the risk of heart disease in your family. However, unlike your genes, these behaviors can be changed.

On the other hand, if your family has a healthy lifestyle but there is still a high incidence of cardiovascular disease, then it is likely that genetics is playing a role. In either case, by practicing a healthy lifestyle, you can help reduce your risk rather than giving up and thinking you have no control over your destiny.

9. Vascular injury and inflammation

Vascular inflammation is another risk factor for cardiovascular disease. Smoking, high cholesterol, high blood pressure, and diabetes can all result in inflammation, which then causes plaque to grow in the artery walls. If the plaque ruptures, blood clots can form, leading to increased risk for chest pain or heart attack.

Your doctor may order a simple blood test to check your **C-reactive protein** (CRP) levels, which reflect the degree of vascular inflammation. A lower CRP score is preferred. You can reduce your CRP levels by losing weight, closely controlling diabetes, exercising regularly, and quitting smoking. Certain medications — such as aspirin, statins, and ACE inhibitors — are also effective in lowering CRP levels.



10. Physical inactivity

Lack of exercise is a major contributor to obesity, diabetes, and hypertension. Beginning an exercise program may help you feel better, have more energy, lose weight, lower your cholesterol, lower your blood pressure, and improve your muscle tone. Also, starting an exercise routine can increase your HDL-cholesterol or "good cholesterol" — especially if exercise is associated with weight loss. Exercise can also reduce vascular inflammation such as C-reactive protein levels.

Exercise

Currently, only about 30% of adults in the United States regularly exercise during their leisure time. What are some important considerations when starting an exercise program?

1) Type of exercise
2) Amount and regularity of exercise
3) Intensity of exercise

1. Type of exercise

Aerobic exercise

To meet your general fitness goals, the best type of exercise is **aerobic** exercise.

Aerobic exercise does not necessarily require special equipment or a health club membership.

Aerobic exercises are those that require a lot of oxygen. These exercises include walking, jogging, cycling, swimming, cross-country skiing, or rowing.

30 minutes a day, 5 days a week

2. Amount and regularity of exercise

The U.S. Surgeon General recommends that healthy adults exercise 30 minutes, 5 days a week.

There are nearly 50 half hours in a 24-hour day. Exercising for 30 minutes daily requires ***only about 2%*** of your total day. Try to find 1, or 2, or 3 exercises you like to do. You'll enjoy the variety.

3. Intensity of exercise

Warm up

By walking or cycling slowly, you move the blood out to the working muscles.

A warm-up should start slowly and last 5 to10 minutes.

Getting started

If you have a history of cardiovascular disease, or if you are just starting a program, **check with your doctor before starting an exercise routine**. Your doctor is aware of the many factors that may need to be considered in modifying your exercise intensity. Please be sure to ask your doctor for a recommended target heart rate range.

To begin your exercise program, it may be best for you to exercise only 15 to 20 minutes daily for the first few weeks. This may help you more easily establish a consistent exercise routine. Check with your doctor for input on your exercise program.

How hard and how often should I exercise?

When you are just starting out, try to exercise very comfortably. Here are 4 quick tips.

1) Try to exercise so that you are breathing noticeably but are not out of breath. Remember this simple rule: you should be able to carry on a conversation while you are exercising.
2) Sweating is a good thing. This means that your body is working hard enough and receiving the necessary stimulus for the muscles and the heart.

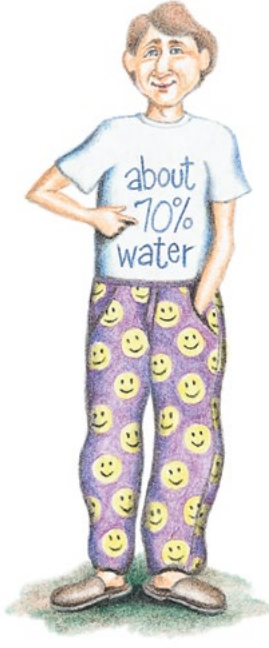
3) If you are not fatigued and are completely recovered from exercising on the previous day, then you should exercise daily.

4) Give yourself a warm-up before exercise (several minutes of easy walking) and a cooldown at the end of exercise (again, several minutes of easy walking). Ask an exercise specialist for some recommendations for stretching after your workout, and discuss the intensity of the exercise with your doctor. **If you feel any chest discomfort, lightheadedness, or other concerning symptom, stop your exercise.**

VERY, VERY important

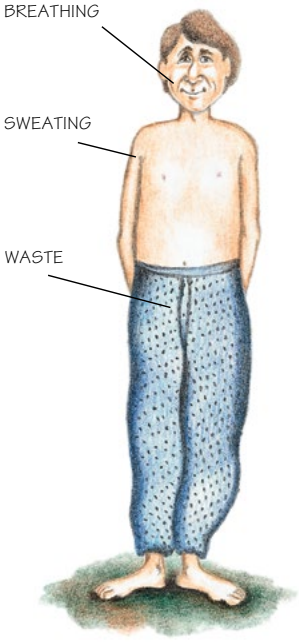
Cool down. As important as the warm-up and the aerobic exercise are to improving your fitness, you must also include a cooldown as part of your exercise routine.

Your cooldown should be just like your warm-up. At the end of your exercise routine, give yourself 5 to 10 minutes of nice, easy walking. You also may want to include some mild stretching.



Another consideration — water

Water is needed for virtually every function of the body. The body is approximately 70% water.



During the course of the day, you lose water through sweating, breathing, and waste. Replacement of water (rehydration) is important — especially when participating in an exercise program.

You should drink 6 to 10 (8-ounce) glasses of water per day. Sorry, caffeinated drinks and alcohol do not count. They are "diuretics," meaning that they actually may cause you to lose even more water.

Nutrition

Proper nutrition is an important aspect of our lives — especially for individuals who have heart disease. For example, it is possible to lower your cholesterol by changing what you eat. Things that you can do to reduce your cholesterol vary by food group. Start by making changes in one area at a time.

Here's a brief review of the different food groups and a few simple recommendations for healthier eating.

Fats

Not all fats are bad. **Monounsaturated** fats are "good" fats. Examples include olive and canola oils, peanut butter, and nuts.

MONOUNSATURATED FAT

POLYUNSATURATED FAT

Polyunsaturated fats are "acceptable" fats. Examples include margarine made with corn or safflower oils and some nuts. The fats found in marine fish oils like salmon are protective against coronary disease and actually lower triglycerides.

SATURATED FAT

Saturated fats are the "bad" fats, particularly the "**trans**" **fats**. Saturated fats are usually solid at room temperature. Examples of saturated fats include lard, butter, and cream cheese. Examples of "trans" fats include partially hydrogenated vegetable oils found in many snack foods.

It is difficult to eat a diet without saturated fat unless you are on a strict vegetarian diet. While we need fats in our diet, we also need to choose our foods wisely, especially meats, eggs, and dairy products.

People who have had a cardiac event, or people who have high cholesterol and are at risk for cardiovascular disease, should contact a dietitian about reducing their saturated fat intake and limiting their intake of alcohol, caffeine, and salt. The dietitian will also be able to review the amount of sugar you are eating — especially sugars found in "no fat" snack foods.

Meats and Fish

Limit the amount of fatty meats, particularly those that are very high in saturated fat (bacon, sausage, and prime rib), to 1 or 2 servings per week. Cook meat using little or no fat, such as baking, broiling, grilling, stewing, or stir-frying without adding fat. Always trim off the obvious fat **before** cooking red meat, and remove the skin before cooking chicken. It is a good idea to eat at least 1 helping of ocean fish per week. Shrimp, previously banned from low-cholesterol diets, is now considered okay to eat.

TRIM FAT OFF RED MEAT

REMOVE SKIN FROM CHICKEN

Eggs

If you have elevated cholesterol or a history of heart disease, you should limit egg yolks to no more than 3 or 4 per week. Egg whites or "egg substitutes" have no cholesterol and do not need to be limited.

EGGS

Dairy products

Switch from whole milk to 2% and then to 1% or even skim milk. Use low-fat cheeses, yogurt, and sour cream. For a healthier dessert, look for low-fat ice cream or sherbet.

DAIRY PRODUCTS

Whole grains, fruits, and vegetables

Another thing you can do to help improve your overall diet is to eat a variety of healthier foods. The American Heart Association recommends that you try to increase the number of servings of foods that are high in whole grains, such as breads and cereals, and try to have at least **5 servings** of fruits and vegetables every day.

WHOLE GRAINS

FRUITS

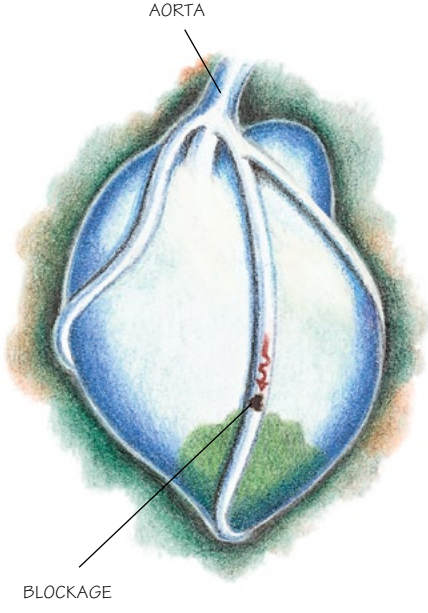
VEGETABLES

What if changing your risk factors, starting an exercise program, and modifying your diet do not help?

What's next?

Your doctor may refer you to a heart specialist called a **cardiologist**. The cardiologist may have to consider several options including medications or surgical intervention such as **angioplasty** or **bypass surgery**.

Angioplasty, Bypass Surgery, and Medications



Let's suppose there is a blockage in the left anterior descending artery.

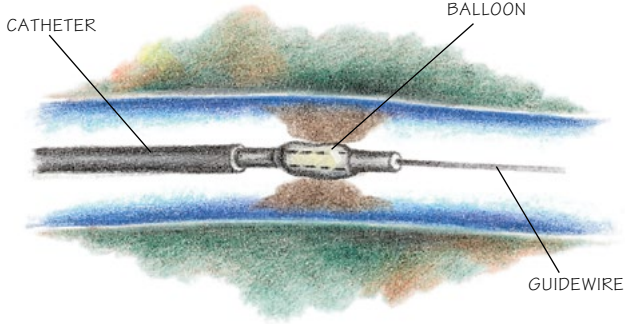
The shaded area below the blockage in the drawing is not receiving blood. If this portion of the heart goes too long without enough oxygen, then the muscle may die.

Thrombolytics

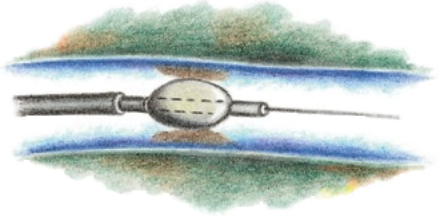
Most often, a heart attack is caused by a **blood clot** (thrombus) at a site of **atherosclerotic plaque disruption** within the coronary artery. Blood clots can completely block blood flow in the artery and cause a heart attack. If a person gets to a hospital emergency room, usually within 30 minutes of the onset of chest pain, either coronary angioplasty or clot-dissolving medications called thrombolytics may be used to open the blocked artery and restore coronary blood flow. The restoration of blood flow can save heart muscle.

Angioplasty

Coronary angioplasty is currently the preferred treatment for a heart attack. Angioplasty is a procedure by which the cardiologist inserts a balloon catheter over a thin wire across a blockage of a coronary artery.



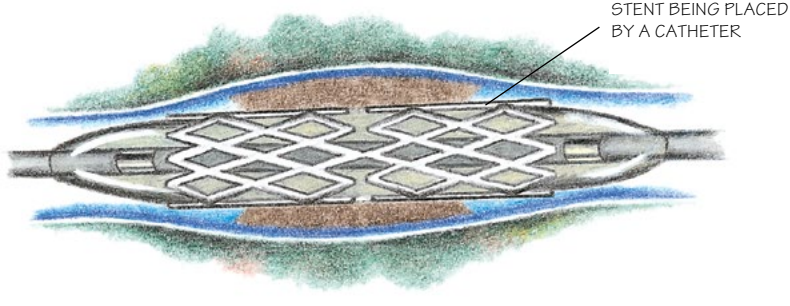
The balloon is inflated to compress the plaque. This is repeated as necessary to restore blood flow.



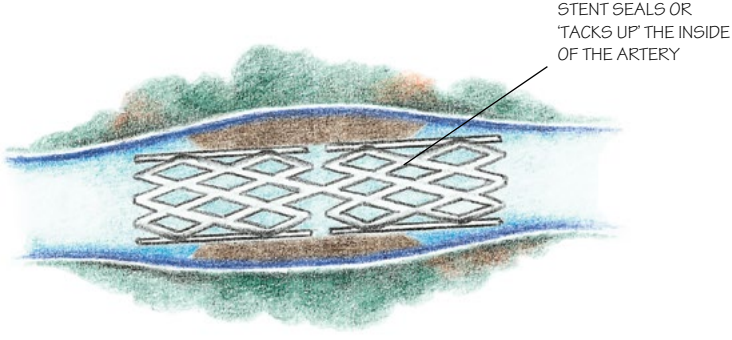
Inflating the balloon catheter compresses and disrupts the plaque, allowing blood flow to the starved heart muscle.

Stents

The cardiologist may decide to insert a stent inside the coronary artery. Usually made of stainless steel or other metal alloys, the stent functions as a scaffold to hold open the inside of the coronary artery.



Stents can seal and "tack up" tissue flaps within the artery that are created when a balloon catheter injures the artery.



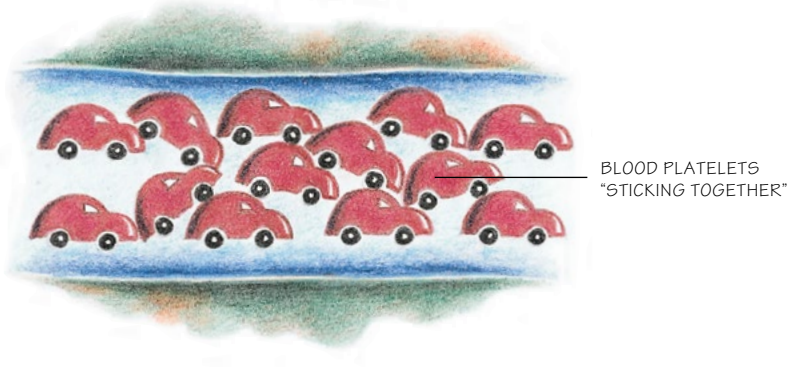
Today's stents are treated with medicines that reduce inflammation and minimize scar tissue, which could narrow the stent. These devices significantly reduce the risk of repeated blockages and the need to have another angioplasty or coronary bypass procedure.

Unfortunately, stents do not eliminate clot formation or the risk of heart attack following the procedure.

What else can be done to reduce blood clot formation and reduce the risk of reocclusion?

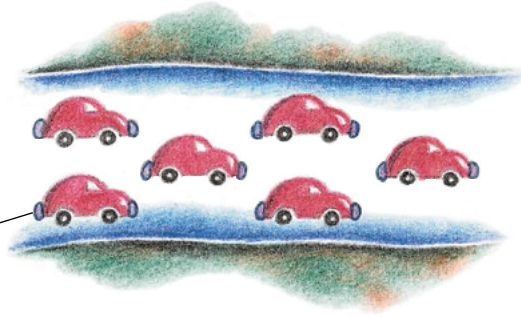
Antiplatelet therapy

During and after angioplasty, the blood platelets may be susceptible to "sticking together" and forming clots.



Improved outcomes

To reduce the likelihood of blood platelets sticking together, cardiologists prescribe a class of medicines called platelet IIb/IIIa receptor blockers. Administered intravenously (by vein), these blockers act like "bumpers" attached to the blood platelets and prevent platelets from sticking together and forming blood clots.



"BUMPERS" ATTACHED TO THE BLOOD PLATELETS

Platelet IIb/IIIa blockers can reduce the likelihood of stent clotting (**thrombosis**) immediately following stent treatment, particularly when the stent was used to treat a heart attack.

Dual antiplatelet therapy

After angioplasty, unless you have complications, your doctor will most likely prescribe 2 medications: (1) aspirin *plus* (2) a medication that works with aspirin to reduce the risk of another heart attack. The use of both medications at the same time is called **dual antiplatelet therapy**.

In dual antiplatelet therapy, the 2 medications work together to prevent clot formation in the stent and reduce the risk of heart attack. Patients should receive both medications for at least 1 year following a heart attack and for at least 6 months after a stent is placed in someone not having a heart attack.

VERY IMPORTANT. Contact your doctor before discontinuing any medication!

Genetic testing and genetic counseling

What is genetic testing and why is it potentially important to someone with heart disease?

To understand genetic testing, it is first important to understand what a gene is and how genes impact the body's development.

Think of it this way. When building a house, a builder uses an architectural blueprint to lay out the exact position of the foundation, walls, roof, wiring, plumbing, etc. The architect's blueprint provides the dimensions and location for each item so the house fits together seamlessly.

Genes are the blueprint of our bodies. Each person receives his or her specific genes from each parent at conception. As bodies grow and develop, genes send "messages" to the rest of the body to lay out the design of bones, organs, skin pigment, eye color, etc.

On rare occasions, unfavorable genetic traits are passed down from our parents, or there is an error (mutation) in a gene. Unfavorable genetic traits may be present when we are born, or the genetic traits may not appear until later in life (example: increased risk for breast cancer).

Genetic testing is becoming more prevalent in the treatment of cardiovascular disease. Specifically, genetic tests are being ordered (1) to make sure individuals are on medications that are effective and/or (2) to help individuals avoid medications that may cause adverse effects. For example, those with a history of cardiovascular disease (heart attack, bypass, or angioplasty) who carry the CYP2C19 gene might not benefit from being on the medication clopidogrel bisulfate. Because each person's genetic makeup is unique, be sure to talk to your primary care doctor or cardiologist about whether you should consider genetic testing prior to starting your cardiac medications.

Before agreeing to a genetic test, you should ask your doctor the following questions:

1) Will the cost of the genetic test be covered by my health insurance plan?
2) Will I be able to meet with a genetic counselor to discuss the results of testing?
3) Where is my genetic information going to be stored, and who will have access to the data?

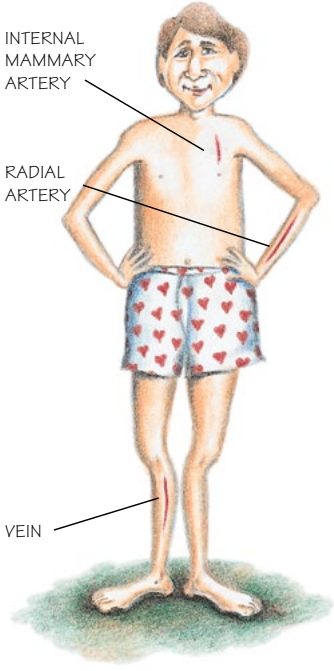
4) Will the results of the genetic testing be reported to my primary care doctor?

5) Does the health care provider offer long-term follow-up?

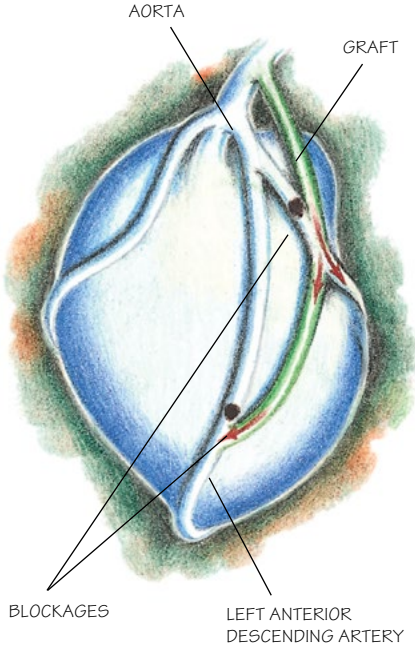
If a solution to my genetic issue is not found for several years, will the provider follow up with me if a treatment or clinical research study becomes available?

Bypass surgery

Bypass surgery is a cardiovascular procedure designed to correct blood flow to the heart that angioplasty cannot correct. The cardiovascular surgeon uses a piece of artery and/or vein to reroute blood around the blockage.

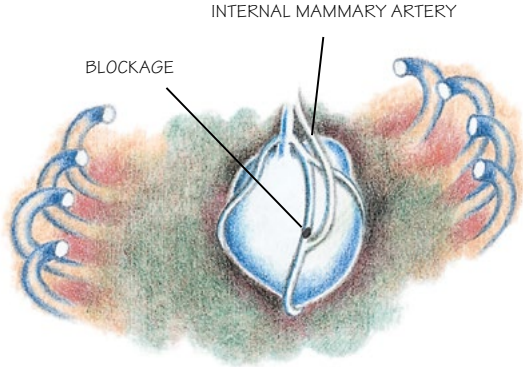


The surgeon may use a vein from the leg, and/or the internal mammary artery found in the chest, and/or the radial artery of the forearm.



The vein is attached to the aorta. The supply of blood is then rerouted around the blockage. One piece of vein may be used for multiple bypasses. The number of blockages where blood has been rerouted — not the number of veins used — determines the number of bypasses.

If the internal mammary artery is used, the artery originates from a branch off the aorta and is re-attached to the coronary artery downstream from the blockage.



Newer techniques allow bypass surgery to be performed "off-pump" (without circulating the blood through the bypass pump "heart and lung" machine) for some patients. Less invasive procedures — including robot-assisted bypass surgery — are also being evaluated. Because they can be used only for 1 or 2 bypasses, these surgery techniques are not appropriate for many patients.

And Now for a Little Heart to Heart…

It has been mentioned throughout the book, but the importance of seeing your doctor and having a complete physical exam cannot be stressed enough. (The next section of this book contains questions you may want to ask your doctor.)

If necessary, sit down with a dietitian to review your current eating pattern. Then, if your doctor agrees, get moving. Start a simple exercise program — mainly walking. There are no guarantees you will reduce your risk of having a cardiac event, but at least you will be taking an aggressive approach to improving your health.

Afterword

Your doctor will manage your care very closely. Generally, the cardiologist may recommend that you:

- quit smoking
- take a beta blocker drug (after a heart attack)
- lower your blood pressure to 120/80 mmHg or lower
- discuss a cholesterol treatment plan with your doctor
- take a daily enteric-coated aspirin (81 mg or greater) unless you have other medical complications
- keep strict control of diabetes and lower your A1C below 7%
- follow a heart-healthy diet and begin a basic exercise program, mainly walking.

Your doctor will prescribe medications designed to improve your overall health. Be sure to follow these medication guidelines:

- Refill your prescriptions unless otherwise instructed by your doctor or physician's assistant.
- Take the medication as instructed.
- Take the medication at the prescribed time of day.
- Try not to miss taking the medication. Similarly, don't take extra doses.

Contact your doctor before discontinuing any medication.

Talk to your doctor or cardiologist about:

- How often you should have an office visit with your primary care doctor and cardiologist (generally once a year with each doctor)
- How often you should have a cholesterol test
- How often you should have a glucose and hemoglobin A1C test
- When you should get a flu vaccine
- For individuals with heart failure, talk to your cardiologist about how often you should have an echocardiogram
- Discuss how long you will be on antiplatelet medication

In addition to talking to your doctor about heart disease, be sure to discuss the following:

- If you are over age 50, discuss when you should have your next colorectal exam
- If you are a male over age 50, discuss whether you should have a PSA test
- If you are a female between 21 and 65, discuss when you should have your next Pap smear
- If you are a female over age 40, discuss when you should have your next mammography exam

Additional questions for your doctor:

- What are my medications? What is each one for?
- What time of day should I take each one?
- Do I have any exercise limitations? What are they?
- Should I have a treadmill test before I start to exercise? What is my target heart rate?
- Are there any concerns that I should be aware of before having/resuming sexual activity?
- Based on my weight, blood pressure, and blood cholesterol level, should I talk to someone about changing my diet?

The Christ Hospital hopes that you have found the information in this book to be helpful. For additional information about services offered within The Christ Hospital Cardiovascular Team, please click on The Christ Hospital logo below:

Bibliography

American College of Sports Medicine position stand. "The Recommended Quality and Quantity of Exercise for Developing and Maintaining Cardiorespiratory and Muscular Fitness in Healthy Adults." *Medicine and Science in Sports and Exercise* April 1990.

American Diabetes Association (2014). Living with diabetes. Retrieved October 19, 2014, from http://www.diabetes.org.

American Heart Association Consensus Panel Statement. "Preventing Heart Attack and Death in Patients With Coronary Disease." *Circulation* 1995; 2-4.

Angell, M. "Caring for women's health – What is the problem?" *New England Journal of Medicine* 1993: 271.

Burke, A.P., and A. Farb, G.T. Malcom, Y. Liang, J. Smialek, R. Virmani. "Coronary Risk Factors and Plaque Morphology in Men with Coronary Disease Who Died Suddenly." *New England Journal of Medicine* 1 May 1997: 1276-1282.

Centers for Disease Control and Prevention (2014). Childhood Obesity Facts. Retrieved March 4, 2018, from https://www.cdc.gov/obesity/data/childhood.html.

Centers for Disease Control and Prevention. Health, United States, 2005. Retrieved March 4, 2018, from https://www.cdc.gov/nchs/data/hus/hus05.pdf.

Chan, A. W., and D.J. Moliterno, P.B. Berger, et al. "Triple antiplatelet therapy during percutaneous coronary intervention is associated with improved outcomes including one-year surviaval: results from the Do Tirofiban and ReoPro Give Similar Efficacy Outcome Trial (TARGET)." *Journal of American College of Cardiology* 2003; 42:1188-1195.

Cogswell, M.E. "Nicotine Withdrawal Symptoms." *North Carolina Medical Journal* 1 Jan. 1995: 40-45.

Collins, R., and R. Peto, C. Baigent, P. Sleight. "Aspirin, Heparin, and Fibrinolytic Therapy in Suspected Acute Myocardial Infarction." *New England Journal of Medicine* 20 March 1997: 847-860.

Da Costa, F.D., et al. "Myocardial Revascularization with the Radial Artery: A Clinical and Angiographic Study." *Annals of Thoracic Surgery* Aug. 1996: 475-480.

Danesh, J., and J.G. Wheeler, G . Hirschfield, et al. "C-reactive protein and other circulation markers of inflammation in the prediction of coronary heart disease." *New England Journal of Medicine* 2004; 350:1387-1397.

Eckel, R.H. "Obesity in Heart Disease." *Circulation* 1997: 3248-3250.

Ervine, R.B. (2009). Prevalence of Metabolic Syndrome Among Adults 20 Years of Age and Over, by Sex, Age, Race and Ethnicity, and Body Mass Index; United States, 2003-2006. Retrieved October 19, 2014, from http://www.cdc.gov/nchs/data/nhsr/nhsr013.pdf.

Executive Summary of the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). JAMA, May 16, 2001, Vol. 285, No. 19: 2486-2497.

Friedman, G.D., and A.L. Klatsky. "Is Alcohol Good for Your Health?" *New England Journal of Medicine* 16 Dec. 1993: 1882-1883.

Gellar, A. "Common Addictions." *Clinical Symposia*. Ciba-Geigy Corporation 1996.

Grossman, E., and F.H. Messerli. "Diabetic and Hypertensive Heart Disease." *Annals of Internal Medicine* 15 Aug. 1996: 304-310.

Grundy, S.M., and J.I. Cleeman, C.N.B. Merz et al. "Implications of recent clinical trials for the national cholesterol education program adult treatment panel III guidelines." *Circulation* 2004; 110:227-239.

Grundy, S.M., and N.J. Stone, A.L. Bailey et al. "2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA guideline on the management of blood cholesterol: a report of the American College of Cardiology/American Heart Associateion Task Force on Clinical Practice Guidelines." *Circulation* 2018; DOI10:1161/CIR.0000000000000625.

Henningfield, J.D., and R.M. Keenan. "The Anatomy of Nicotine Addiction." *Health Values* March/April 1993: 12-19.

Hermiller, J.B., and M. W, Jrucoff, D. J. Kereiakes, et al. on behalf of the DAPT study investigators. "Benefits and risks of extended dual antiplatelet therapy after everolimus-eluting stents." JACC CI. 2016; 9:138-147.

Inflamation and Heart Disease. Retrieved December 29, 2017 from http://www.heart.org.

James, P.A., and S. Oparil, B. Carter, Evidence-Based Guideline for the Management of High Blood Pressure in Adults. Retrieved October 19, 2014, from http://jama.jamanetwork.com/article.aspx?articleid=1791497.

Joint National Committee. The Fifth Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure. Bethesda (MD): National Institutes of Health, National Heart, Lung, and Blood Institute; 1993. NIH publication No. 93-1008.

Kannel, W.B., and R.B. D'Agostino, J.L. Cobb. "Effects of Weight on Cardiovascular Disease." *American Journal of Clinical Nutrition* March 1996: 419S-422S.

Kenney, W.L. et al. *American College of Sports Medicine Guidelines for Exercise Testing and Prescription*. 5th ed. Media, Pa.: Williams & Wilkins, 1995.

Kereiakes, D.J., and R.W. Yeh, J.M. Massaro, et al. on behalf of the DAPT study investigators. "Antiplatelet Therapy Duration Follow Bare Metal or Drug-Eluting Coronary Stents: the Dual Antiplatelet Therapy Randomized Clinical Trial." *Journal of the American Medical Association* 2015; 313(11):1113-1121.

Koenig, W., and H. Lowel, J. Baumert, and C. Mesisinger. "C-reactive protein modulates risk prediction based on the Framingham score. Implications for future risk assessment: results from a large cohort study in Southern Germany." *Circulation* 2004; 109:1349-1353.

Kong, D.F., and V. Hasselblad, and R.A. Harrington et al. "Meta-analysis of survival with platelet glycoprotein IIb/IIIa antagonists for percutaneous coronary interventions." *American Journal of Cardiology* 2003; 92:651-655.

Lincoff, A.M., and I.A. Bittle, R.A. Harrington et al. "Bivalirudin and provisional glycoprotein IIb/IIIa blockade compared with heparin and planned glycoprotein IIb/IIIa blockade during percutaneous coronary intervention: REPLACE-2 randomized trial." *Journal of the American Medical Association* 2003; 289:853-863.

Margolis, S., and P.J. Goldschmidt-Clermont. *The Johns-Hopkins White Papers*. Baltimore: The Johns-Hopkins Medical Institutions, 1996.

Mauri, L., and D.J. Kereiakes, R.W. Yeh, et al. for the DAPT study investigators (2014). "Dual Antiplatelet Therapy Beyond One Year After Drug-eluting Coronary Stent Procedures." New England Journal of Medicine. 2014; 371:2155-2166

McCarron, D.A., and M.E. Reusser. "Body Weight and Blood Pressure Regulation." *American Journal of Clinical Nutrition* March 1996: 423S-425S.

Meeker, M.H., and J.C. Rothrock. *Alexander's Care of the Patient in Surgery,* 10th ed. St. Louis: Mosby, 1995.

Mehta, S.R., S. Yusuf, and R. J. Peters et al. "Effects of pretreatment with clopidogrel and aspirin followed by long-term therapy in patients undergoing percutaneous coronary intervention: the PCI-CURE study." *Lancet* 2001; 358: 527-533.

Office of the Surgeon General (2010). *The Surgeon General's Vision for a Healthy and Fit Nation.* Rockville, MD: U.S. Department of Health and Human Services.

Peterson, J.A., and C.X. Bryant, *The Fitness Handbook; 2nd edition,* St. Louis: Wellness Bookshelf, 1995.

Peterson, T.A., and G.A. Mensah, R.W. Alexander et al. "Markers of inflammation and cardiovascular disease. Application to clincial and public health practice." *Circulation* 2003; 107:499-511.

Ridker, P.M. "Clinical application of C-reactive protein for cardiovascular disease detection and prevention." *Circulation* 2003; 107: 363-369.

Ridker, P.M., and J.E. Buring, N.R. Cook, N. Rifai. "C-reactive protein, the metabolic syndrome and risk of incident cardiovascular events: an 8-year follow-up of 14,719 initially healthy American women." *Circulation* 2003; 107;391-397.

Ridker, P.M., and N. Rifai, L. Rose, et al. "Comparison of C-reactive protein and low-density lipoprotein cholesterol levels in the prediction of first cardiovascular events." *New England Journal of Medicine* 2002; 347:1557-1565.

Ridker, P.M., and B. M. Everett, T. Thuren, et al. CANTOS Study group. "Antiinflammatory Therapy with Canakinumab for Atherosclerotic Disease." *New England Journal of Medicine* 2017; 377(12):1119-1131.

Ryan, T.J., and J.L. Anderson, E.M. Autman, et al. "ACC/AHA Guidelines for the Management of Patients with Acute Myocardial Infarction: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Management of Acute Myocardial Infarction)." *Journal of the American College of Cardiology* 1 Nov. 1996: 1328-1428.

St. Jeor, S.T., and K.D. Brownell, R.L. Atkinson, C. Bouchard, et al. "Obesity Workshop III." *Circulation 1996*: 1391-1396.

Schlant, R.C., and R.W. Alexander. *The Heart, 8th ed.* New York: McGraw-Hill, 1994.

Steinhubl, S.R., and P.B. Berger, and J.T. Mann, et al. "Early and sustained dual oral antiplatelet therapy following percutaneous coronary intervention: randomized controlled tria.l" *Journal of the American Medical Association* 2002; 288:2411-2420.

Superko, H.R. "The Most Common Cause of Coronary Heart Disease can be Successfully Treated by the Least Expensive Therapy — Exercise." *Certified News* 1998: 1-5.

United States Surgeon General. Department of Health and Human Services. *The Health Consequences of Smoking. Nicotine Addiction.* Washington, D.C.: U.S. Department of Health and Human Services, 1988.

United States Surgeon General on his priorities at https://www.surgeongeneral.gov/priorities/prevention/strategy/active-living.html accessed March 4, 2018.

Voors, A.A., et al. "Smoking and Cardiac Events After Venous Coronary Bypass Surgery." *Circulation* Jan 1, 1995: 42-47.

Voutilainen, S., et al. "Angiographic 5-Year Follow-up Study of Right Gastroepiploic Artery Grafts." *Annals of Thoracic Surgery* Aug. 1996: 501-505.

White H.D., and J.J. Van de Werf. "Thrombolysis for Acute Myocardial Infarction." *Circulation* 28 April 1998: 1632-1646.

Yeh, E.T.H., and J.T. Willerson. "Coming of age of C-reactive protein: using inflammation markers in cardiology." *Circulation* 2003; 107:370-372.

Yufuf S., and F. Zhao, S.R. Mehta, et al. "Effects of clopidogrel in addition to aspirin in patients with acute coronary syndromes without ST-segment elevation." *New England Journal of Medicine* 2001; 345:494-502.

Zelasko, C.J. "Exercise for Weight Loss: What are the Facts?" *Journal of the American Dietetic Association* Dec. 1995: 973-1031.

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