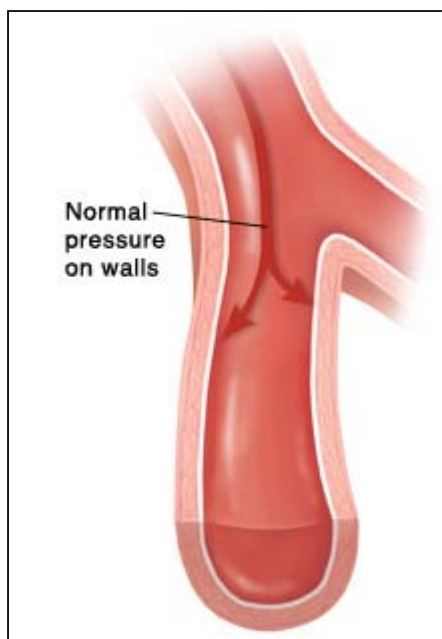




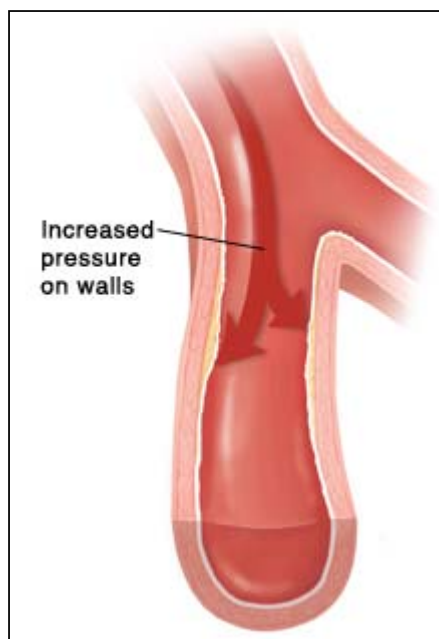
85658

## What Is High Blood Pressure?

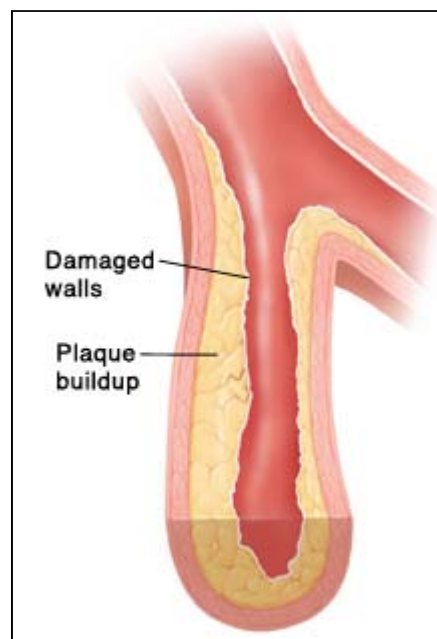
High blood pressure (also called hypertension) is known as the “silent killer.” This is because most of the time it doesn’t cause symptoms. In fact, many people don’t know they have it until other problems develop. In most cases, high blood pressure can’t be cured. It’s a disease that requires lifelong treatment. The good news is that it CAN be managed.



Blood flows freely through a healthy artery.



Artery walls are roughened by high blood pressure. This makes it easier for plaque to build up.



Plaque collects, narrowing and stiffening the wall of the artery.

### Understanding Blood Pressure

The circulatory system is made up of the heart and blood vessels that carry blood through the body. Your heart is the pump for this system. With each heartbeat (contraction), the heart sends blood out through large blood vessels called arteries. Blood pressure is a measure of how hard the moving blood pushes against the walls of the arteries.

### High Blood Pressure Can Harm Your Health

High blood pressure makes the heart work harder to pump blood. Frequent high blood pressure can also cause changes in the artery walls. The walls thicken and become rough, which leads to a buildup of plaque (a fatty material). This can damage the arteries. It can also reduce blood flow through the artery. If blood pressure is not controlled, all these effects can lead to serious health problems. These include heart disease, heart attack (also known as acute myocardial infarction, or AMI), stroke, kidney disease, and blindness.

### Measuring Blood Pressure

Your blood pressure is too high if it measures 140/90 (140 over 90) or higher most of the time. The top number is the pressure of blood against the artery walls during a heartbeat (**systolic**). The bottom number is the pressure of blood against artery walls between heartbeats (**diastolic**).

	<b>Normal</b>	<b>Prehypertensive</b>	<b>Too High</b>
--	---------------	------------------------	-----------------

Top (systolic)	Below 120	120–139	140 or higher
Bottom (diastolic)	Below 80	80–89	90 or higher

## Controlling Blood Pressure

If your blood pressure is too high, work with your doctor on a plan for lowering it. Below are steps you can take that will help lower your blood pressure.

- **Choose heart-healthy foods:** Eating healthier meals helps you control your blood pressure. Ask your doctor about the DASH eating plan. This plan helps reduce blood pressure.
- **Maintain a healthy weight:** Being overweight makes you more likely to have high blood pressure. Losing excess weight helps lower blood pressure.
- **Exercise regularly:** Daily exercise helps your heart and blood vessels work better and stay healthier. It can help lower your blood pressure.
- **Stop smoking:** Smoking increases blood pressure and damages blood vessels.
- **Limit alcohol:** Drinking too much alcohol can raise blood pressure. Men should have no more than 2 drinks a day. Women should have no more than 1. (A drink is equal to 1 beer, or a small glass of wine, or a shot of liquor.)
- **Control stress:** Stress makes your heart work harder and beat faster. Controlling stress helps you control your blood pressure.

## Facts About High Blood Pressure

- **Feeling okay does not mean that blood pressure is under control.** Likewise, feeling bad doesn't mean it's out of control. The only way to know for sure is to check your pressure regularly.
- **Medication is only one part of controlling high blood pressure.** You also need to manage your weight, get regular exercise, and adjust your eating habits.
- **High blood pressure is usually a lifelong problem.** But it can be controlled with healthy lifestyle changes and medication.
- **Hypertension is not the same as stress.** Although stress may be a factor in high blood pressure, it's only one part of the story.
- **Blood pressure medications need to be taken every day.** Stopping suddenly may cause a dangerous increase in pressure.

© 2000-2014 Krames StayWell, 780 Township Line Road, Yardley, PA 19067. All rights reserved. This information is not intended as a substitute for professional medical care. Always follow your healthcare professional's instructions.



82044

## Controlling High Blood Pressure

**High blood pressure** (hypertension) is called the silent killer. This is because many people who have it don't know it. Normal blood pressure is less than 120/80. Know your blood pressure and remember to check it regularly. Doing so can save your life. Here are some things you can do to help control your blood pressure.

### Choose heart-healthy foods

- Select low-salt, low-fat foods.
- Limit canned, dried, cured, packaged, and fast foods. These can contain a lot of salt.
- Eat 8–10 servings of fruits and vegetables every day.
- Choose lean meats, fish, or chicken.
- Eat whole-grain pasta, brown rice, and beans.
- Eat 2–3 servings of low-fat or fat-free dairy products
- Ask your doctor about the DASH eating plan. This plan helps reduce blood pressure.

### Maintain a healthy weight

- Ask your healthcare provider how many calories to eat a day. Then stick to that number.
- Ask your healthcare provider what weight range is healthiest for you. If you are overweight, weight loss of only 10 lbs can help lower blood pressure.
- Limit snacks and sweets.
- Get regular exercise.

### Get up and get active

- Choose activities you enjoy. Find ones you can do with friends or family.
- Park farther away from building entrances.
- Use stairs instead of the elevator.
- When you can, walk or bike instead of driving.
- Rake leaves, garden, or do household repairs.
- Be active for at least 30 minutes a day, most days of the week.

### Manage stress

- Make time to relax and enjoy life. Find time to laugh.
- Visit with family and friends, and keep up with hobbies.

### Limit alcohol and quit smoking

- Men: Have no more than 2 drinks per day.
- Women: Have no more than 1 drink per day.
- Talk with your healthcare provider about quitting smoking. Smoking increases your risk for heart disease and stroke. Ask about local or community programs that can help.



## Medications

If lifestyle changes aren't enough, your healthcare provider may prescribe high blood pressure medicine. Take all medications as prescribed.

© 2000-2014 Krames StayWell, 780 Township Line Road, Yardley, PA 19067. All rights reserved. This information is not intended as a substitute for professional medical care. Always follow your healthcare professional's instructions.



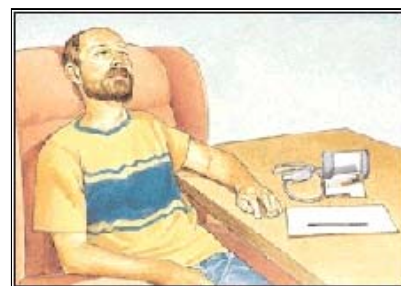
84253

## Taking Your Blood Pressure

Blood pressure is the force of blood as it moves from the heart through the blood vessels. You can take your own blood pressure reading using a digital monitor. Take readings as often as your doctor instructs. Take each reading at the same time of day.

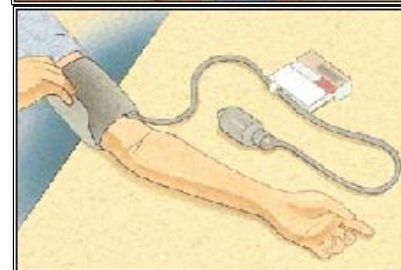
### 1. Relax

- Wait at least a half-hour after smoking, eating, or exercising.
- Sit comfortably at a table. Place the monitor near you.
- Rest for a few minutes before you begin.



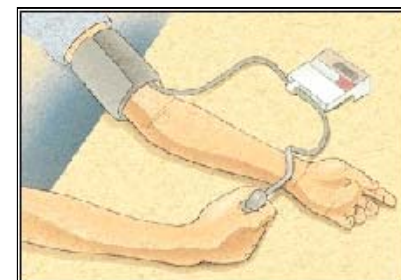
### 2. Wrap the Cuff

- Place your arm on the table, palm up. Your arm should be at the level of your heart. Wrap the cuff around your upper arm, just above your elbow. It's best done on bare skin, not over clothing.
- Make sure your cuff fits. If it doesn't wrap around your upper arm, order a larger cuff.



### 3. Inflate the Cuff

- Pump the cuff until the scale reads 160. If you have a self-inflating cuff, push the button that starts the pump.
- The cuff will tighten, then loosen.
- The numbers will change. When they stop changing, your blood pressure reading will appear.
- If you get a reading that is too high or too low for you, relax for a few minutes. Then do the test again.



### 4. Write Down the Results

- Write down your blood pressure numbers. Note the date and time. Keep your results in one place, such as a notebook.
- Remove the cuff from your arm. Turn off the machine.



© 2000-2014 Krames StayWell, 780 Township Line Road, Yardley, PA 19067. All rights reserved. This information is not intended as a substitute for professional medical care. Always follow your healthcare professional's instructions.



84546

## Understanding Food and Cholesterol

What you eat has a big effect on your body's cholesterol level. Eating certain foods can raise your cholesterol. Other foods can help you lower it. Watching what you eat can help you get your cholesterol level under control.

### Know High-Cholesterol Foods

#### Foods high in fat, cholesterol, or both:

- Fatty beef, cold cuts, bacon, sausage
- Creamy sauces and fatty gravies
- Cookies, donuts, muffins, and pastries
- Fried foods
- Egg yolks
- Shortening, butter, coconut oil, palm oil, hydrogenated oils (read labels)
- High-fat dairy products, such as whole milk, cheese, and ice cream



#### Better choices:

- Lean beef, skinless white-meat poultry, fish
- Tomato sauce, vegetable puree
- Dried fruit, bagels, bread with jam
- Baked, broiled, steamed, or roasted foods
- Egg whites or egg substitute
- Tub margarine, canola oil, and olive oil in moderation
- Low-fat or nonfat dairy products, such as 1% or fat-free milk, reduced-fat cheese, and nonfat frozen yogurt

### Use Fiber to Help Control Cholesterol

Foods high in fiber can help you keep your cholesterol down. Good sources of fiber are:

- Oats, barley
- Whole grains
- Beans
- Vegetables
- Cornmeal, popcorn
- Berries, apples, other fruits

© 2000-2014 Krames StayWell, 780 Township Line Road, Yardley, PA 19067. All rights reserved. This information is not intended as a substitute for professional medical care. Always follow your healthcare professional's instructions.



## High Cholesterol: Assessing Your Risk

Have you been told that your cholesterol is too high? If so, you could be heading for a heart attack, also known as acute myocardial infarction, or AMI, or stroke without knowing it. This is especially true if you have other risk factors for heart disease. Get smart about cholesterol and your heart disease risk. This sheet can help you understand your heart disease risk and how your cholesterol level affects it. Talk to your healthcare provider about how to get started controlling your cholesterol.

### Why Is High Cholesterol a Problem?

Blood cholesterol is a fatty substance. It travels through the bloodstream. When blood cholesterol is high, it forms plaque. The plaque builds up in the walls of arteries (blood vessels that carry blood from the heart to the body). This narrows the opening for blood flow. Over time, this can lead to coronary artery disease, heart attack, or stroke.

### 3 Steps to Assessing Your Risk

#### 1. Find Your Risk Factors for Heart Disease

How your cholesterol numbers affect your heart health depends on other risk factors for heart attack and stroke. Check off each risk factor below that applies to you:

- Are you a man 45 years old or older or a woman 55 years old or older?
- Does your family have a history of heart problems? This includes heart attack, coronary heart disease, or atherosclerosis.
- Do you have high blood pressure? Are you on blood pressure medication?
- Do you smoke?
- Do you have diabetes?

#### 2. Test Your Cholesterol

Cholesterol testing most often needs no preparation. Sometimes you may be asked to fast (not eat) before your test. A blood sample is taken and sent to a lab. There, the amount of cholesterol in your blood is measured. There are two types of cholesterol in the sample. The first is HDL (“good cholesterol”). The second is LDL (“bad cholesterol”). Cholesterol test results are most often shown as the total of HDL and LDL cholesterol numbers. You may also be told the separate HDL and LDL cholesterol results.

Fill in your numbers below.

HDL cholesterol: \_\_\_\_\_ LDL cholesterol: \_\_\_\_\_ Total cholesterol: \_\_\_\_\_

#### 3. Set Your LDL Cholesterol Goal

Once you know your LDL cholesterol number, take steps to lower it if needed. Changes to your diet can help lower the amount of cholesterol in your blood. The table below shows you what your target LDL cholesterol goal should be. Your healthcare provider can help you get started on a plan to lower your cholesterol.

If You Have	Start a Cholesterol-Lowering Plan If Your LDL Cholesterol Is	Your LDL Goal Is
No heart disease and fewer than two risk factors other than high LDL cholesterol	160 or more	Less than 160
No heart disease but two or more risk factors other	130 or more	Less than

than high LDL cholesterol		130
Definite heart disease, diabetes, or other atherosclerotic disease*	100 or more	Less than 100

\*Other atherosclerotic disease may include carotid (neck) artery disease, peripheral (arms or legs) arterial disease, and abdominal aortic aneurysm.

*Based on the National Cholesterol Education Program (NCEP) Executive Summary of the Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (ATP III), 2001, National Institutes of Health, NIH Publication 01-3670.*

© 2000-2014 Krames StayWell, 780 Township Line Road, Yardley, PA 19067. All rights reserved. This information is not intended as a substitute for professional medical care. Always follow your healthcare professional's instructions.





82036

## Controlling Your Cholesterol

Cholesterol is a waxy substance. It travels in your blood through the blood vessels. When you have high cholesterol, it builds up in the walls of the blood vessels. This makes the vessels narrower. Blood flow decreases. You are then at greater risk for having a heart attack or a stroke.

### Good and Bad Cholesterol

Lipids are fats. Blood is mostly water. Fat and water don't mix. So our bodies need lipoproteins (lipids inside a protein shell) to carry the lipids. The protein shell carries its lipids through the bloodstream. There are two main kinds of lipoproteins:

- LDL (low-density lipoprotein) is known as “bad cholesterol.” It mainly carries cholesterol. It delivers this cholesterol to body cells. Excess LDL cholesterol will build up in artery walls. This increases your risk for heart disease and stroke.
- HDL (high-density lipoprotein) is known as “good cholesterol.” It is mostly a protein shell. The shell collects excess cholesterol that LDLs have left behind on blood vessel walls. That's why high levels of HDL cholesterol can decrease your risk of heart disease and stroke.

### Controlling Cholesterol Levels

Total cholesterol includes LDL and HDL cholesterol, as well as other fats in the bloodstream. If your total cholesterol is high, follow the steps below to help lower your total cholesterol level.

- Eat Less Unhealthy Fat
  - Cut back on saturated fats and trans (also called hydrogenated) fats. A diet that's high in these fats increases your bad cholesterol. It's not enough to just cut back on foods containing cholesterol.
  - Eat about 2 servings of fish per week. Most fish contain omega-3 fatty acids. These help lower blood cholesterol.
  - Eat more whole grains and soluble fiber (such as oat bran). These lower overall cholesterol.
- Be Active
  - Choose an activity you enjoy. Walking, swimming, and riding a bike are some good ways to be active.
  - Start at a level where you feel comfortable. Increase your time and pace a little each week.
  - Work up to 30 minutes on most days. You can break this up into three 10-minute periods.
  - Remember, some activity is better than none.
  - If you haven't been exercising regularly, start slowly. Check with your doctor to make sure the exercise plan is right for you.
- Quit Smoking: Quitting smoking can improve your lipid levels. It also lowers your risk for heart disease and stroke.
- Take Medication As Directed: Many people need medication to get their LDL levels to a safe level. Medication to lower cholesterol levels is effective and safe. (But taking medication is not a substitute for exercise or watching your diet!) Your doctor can tell you whether you might benefit from a cholesterol-lowering medication.

### Healthy Cholesterol Targets

These are common targets. Ask your doctor for target numbers that are right for you.

Total cholesterol: Under 200

Your target number: \_\_\_\_\_

HDL: 40 or higher for men, 50 or higher for women      Your target number:\_\_\_\_\_

LDL: Under 100      Your target number:\_\_\_\_\_

Triglycerides: Under 150      Your target number:\_\_\_\_\_

© 2000-2014 Krames StayWell, 780 Township Line Road, Yardley, PA 19067. All rights reserved. This information is not intended as a substitute for professional medical care. Always follow your healthcare professional's instructions.



85182

## Understanding Your Cholesterol Numbers

The higher your blood cholesterol, the greater your risk for heart attack, also known as acute myocardial infarction, or AMI, or stroke. That's why you need to know your cholesterol level. If it's high, you can take steps to bring it down. Eating the right foods and getting enough exercise can help. Some people also need medication to control their cholesterol. Your healthcare provider can help you get started on a plan to control your cholesterol.

### Checking Your Cholesterol

Your cholesterol is checked with a simple blood test. The results tell you how much cholesterol you have in your blood. Get checked as often as your healthcare provider suggests. As you work to lower your cholesterol, your numbers will change slowly. But they will change. Be patient and stay on track.

### Your Total Cholesterol Number

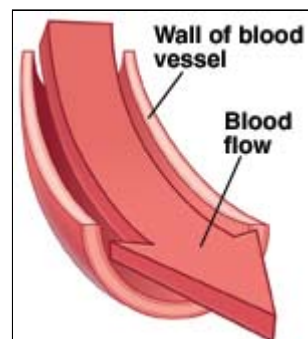
A blood test will give you a number for the total amount of cholesterol in your blood. The higher this number, the more likely it is that cholesterol will build up in your blood vessels. For your health, it is suggested that your total cholesterol be lower than 200. Even if your cholesterol is just slightly high, you are at increased risk for health problems.

**My total cholesterol is:** \_\_\_\_\_

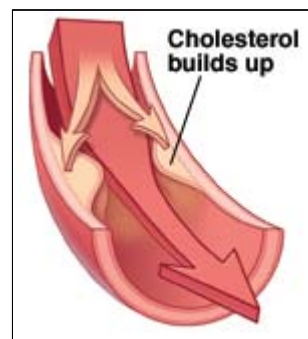
### Your Lipid Numbers

Total cholesterol is just one part of the story. Cholesterol is made up of different kinds of fats, or "lipids." If your total cholesterol is high, knowing your lipid profile is important. The two most important lipids are HDL and LDL. Lipids are checked during a "fasting" blood test (you don't eat for a certain amount of time before the test is done). And along with cholesterol, triglyceride (another type of fat) can also lead to blocked arteries. So, knowing your HDL, LDL, and triglyceride numbers as well as your total cholesterol gives you a more complete picture of your cholesterol level.

- **HDL** is called the "good" cholesterol. It moves out of the bloodstream and does not block your blood vessels. HDL levels are affected by how much you exercise and what you eat. For most people, HDL should be 40 or higher if you're a man and 50 or higher if you're a woman. **My HDL cholesterol is:** \_\_\_\_\_
- **LDL** is called the "bad" cholesterol. This is because it can stick to your artery walls and block blood flow. LDL levels are most affected by what you eat. For most people, LDL should be lower than 100. **My LDL cholesterol is:** \_\_\_\_\_
- **Triglyceride** is a type of fat the body uses to store energy. Too much triglyceride can increase your risk for heart disease. Triglyceride levels should be under 150. **My triglyceride is:** \_\_\_\_\_



**Blood flows easily when blood vessels are clear.**



**Less blood flows when cholesterol builds up in the walls of the blood vessels.**

© 2000-2014 Krames StayWell, 780 Township Line Road, Yardley, PA 19067. All rights reserved. This information is not intended as a substitute for professional medical care. Always follow your healthcare professional's instructions.



85159

## Lifestyle Changes to Control Cholesterol

Exercise, quitting smoking, and taking your medications right can help you control your cholesterol.

### Exercise

Regular exercise is a good way to help your body control cholesterol. Regular exercise has many benefits. It can:

- Raise your good cholesterol.
- Help lower your bad cholesterol.
- Let blood flow better through your body.
- Give more oxygen to your muscles and tissues.
- Help you manage your weight.



### Quitting Smoking

Smoking and other tobacco use can raise cholesterol and make it harder to control. Quitting is tough. But millions of people have given up tobacco for good. You can quit, too! Think about some of the reasons below to quit smoking. Do any of them make you think twice about your smoking habit?

#### Quit smoking because it:

- Keeps your cholesterol high, even if you make all the other changes you're supposed to.
- Damages your body, especially your heart, lungs, and blood vessels.
- Makes you more likely to have a heart attack (also known as acute myocardial infarction, or AMI), stroke, or cancer.
- Stains your teeth and makes your skin, clothes, and breath smell bad.
- Costs a lot of money.

### Making the Most of Medications

Healthy eating and exercise are a good start to keeping your cholesterol down. But you may need some extra help from medication. If your doctor prescribes medication, be sure to take it exactly as directed. Remember:

- Tell your doctor about all other medications you take, including vitamins and herbs.
- Tell your doctor if you have any side effects after starting to take a medication. Examples of side effects to watch for include: muscle aches, weakness, blurred vision, rust-colored urine, or headache.
- Don't skip a dose or stop taking your medication because you feel better or because your cholesterol numbers go down. Never stop taking your medication unless your doctor has told you it's okay.

© 2000-2014 Krames StayWell, 780 Township Line Road, Yardley, PA 19067. All rights reserved. This information is not intended as a substitute for professional medical care. Always follow your healthcare professional's instructions.

**Patient information: Controlling your blood pressure through lifestyle (The Basics)**

Written by the doctors and editors at UpToDate

**What does my lifestyle have to do with my blood pressure?** — The things you do and the foods you eat have a big effect on your blood pressure and your overall health. Following the right lifestyle can:

- Lower your blood pressure or keep you from getting high blood pressure in the first place
- Reduce your need for blood pressure medicines
- Make medicines for high blood pressure work better, if you do take them
- Lower the chances that you'll have a heart attack or stroke, or develop kidney disease

**Which lifestyle choices will help lower my blood pressure?** — Here's what you can do:

- Lose weight (if you are overweight)
- Choose a diet rich in fruits, vegetables, and low-fat dairy products, and low in meats, sweets, and refined grains
- Eat less salt (sodium)
- Do something active for at least 30 minutes a day on most days of the week
- Limit the amount of alcohol you drink

If you have high blood pressure, it's also very important to quit smoking (if you smoke). Quitting smoking might not bring your blood pressure down. But it will lower the chances that you'll have a heart attack or stroke, and it will help you feel better and live longer.

**Start low and go slow** — The changes listed above might sound like a lot, but don't worry. You don't have to change everything all at once. The key to improving your lifestyle is to “start low and go slow.” Choose 1 small, specific thing to change and try doing it for a while. If it works for you, keep doing it until it becomes a habit. If it doesn't, don't give up. Choose something else to change and see how that goes.

Let's say, for example, that you would like to improve your diet. If you're the type of person who eats cheeseburgers and French fries all the time, you can't switch to eating just salads from 1 day to the next. When people try to make changes like that, they often fail. Then they feel frustrated and tend to give up. So instead of trying to change everything about your diet in 1 day, change 1 or 2 small things about your diet and give yourself time to get used to those changes. For instance, keep the cheeseburger but give up the French fries. Or eat the same things but cut your portions in half.

As you find things that you are able to change and stick with, keep adding new changes. In time, you will see that you can actually change a lot. You just have to get used to the changes slowly.

**Lose weight** — When people think about losing weight, they sometimes make it more complicated than it really is. To lose weight, you have to either eat less or move more. If you do both of those things, it's even better. But there is no single weight-loss diet or activity that's better than any other. When it comes to weight loss, the most effective plan is the 1 that you'll stick with.

**Improve your diet** — There is no single diet that is right for everyone. But in general, a healthy diet can include:

- Lots of fruits, vegetables, and whole grains
- Some beans, peas, lentils, chickpeas, and similar foods
- Some nuts, such as walnuts, almonds, and peanuts
- Fat-free or low-fat milk and milk products
- Some fish

To have a healthy diet, it's also important to limit or avoid sugar, sweets, meats, and refined grains. (Refined grains are found in white bread, white rice, most forms of pasta, and most packaged “snack” foods.)

**Reduce salt** — Many people think that eating a low-sodium diet means avoiding the salt shaker and not adding salt when cooking. The truth is, not adding salt at the table or when you cook will only help a little. Almost all of the sodium you eat is already in the food you buy at the grocery store or at restaurants ([figure 1](#)).

The most important thing you can do to cut down on sodium is to eat less processed food. That means that you should avoid most foods that are sold in cans, boxes, jars, and bags. You should also eat in restaurants less often.

To reduce the amount of sodium you get, buy fresh or fresh-frozen fruits, vegetables, and meats. (Fresh-frozen foods have had nothing added to them before freezing.) Then you can make meals at home, from scratch, with these ingredients.

As with the other changes, don't try to cut out salt all at once. Instead, choose 1 or 2 foods that have a lot of sodium and try to replace them with low-sodium choices. When you get used to those low-sodium options, find another food or 2 to change. Then keep going, until all the foods you eat are sodium-free or low in sodium.

**Become more active** — If you want to be more active, you don't have to go to the gym or get all sweaty. It is possible to increase your activity level while doing everyday things you enjoy. Walking, gardening, and dancing are just a few of the things that you might try. As with all the other changes, the key is not to do too much too fast. If you don't do any activity now, start by walking for just a few minutes every other day. Do that for a few weeks. If you stick with it, try doing it for longer. But if you find that you don't like walking, try a different activity.

**Drink less alcohol** — If you are a woman, do not have more than 1 “standard drink” of alcohol a day. If you are a man, do not have more than 2. A “standard drink” is:

- A can or bottle that has 12 ounces of beer
- A glass that has 5 ounces of wine
- A shot that has 1.5 ounces of whiskey

**Where should I start?** — If you want to improve your lifestyle, start by making the changes that you think would be easiest for you. If you used to exercise and just got out of the habit, maybe it would be easy for you to start exercising again. Or if you actually like cooking meals from scratch, maybe the first thing you should focus on is eating home-cooked meals that are low in sodium.

Whatever you tackle first, choose specific, realistic goals, and give yourself a deadline. For example, do not decide that you are going to “exercise more.” Instead, decide that you are going to walk for 10 minutes on Monday, Wednesday, and Friday, and that you are going to do this for the next 2 weeks.

When lifestyle changes are too general, people have a hard time following through.

Now go. You can do it!

**Patient information: Atherosclerosis (The Basics)**

Written by the doctors and editors at UpToDate

**What is atherosclerosis?** — Atherosclerosis is a condition in which fatty deposits called “plaques” build up inside the arteries in the body. (Arteries are the blood vessels that carry blood away from the heart out to the body.) Atherosclerosis is the reason most people have a heart attack or a stroke.

Atherosclerosis can affect arteries all over the body. There are different names for atherosclerosis depending on which arteries it affects.

- **Carotid artery disease** is a form of atherosclerosis that affects the carotid arteries, which bring blood to the brain ([figure 1](#)). This form of atherosclerosis can lead to stroke.
- **Coronary heart disease** is a form of atherosclerosis that affects the coronary arteries, which bring blood to the heart muscle. This form of atherosclerosis can cause chest pain and lead to heart attack ([figure 2](#)).
- **Renal artery stenosis** is a form of atherosclerosis that affects the renal arteries, which bring blood to the kidneys. This form of atherosclerosis can cause high blood pressure or lead to kidney disease.
- **Peripheral artery disease** is a form of atherosclerosis that affects the arteries that bring blood to the arms and legs ([figure 3](#)). People with this condition sometimes have pain, tingling, or numbness in their legs when they walk.

**How does atherosclerosis cause heart attacks, strokes, and other problems?** — Atherosclerosis-related plaques can cause problems in 2 ways:

- Plaques can get too big and reduce blood flow to certain body parts ([figure 4](#)). This can cause symptoms (such as pain) in the part of the body that is not getting enough blood.
- Plaques can break open, or rupture. When that happens, blood clots form inside the artery and block the blood supply to tissues past the clot. This is what happens during a stroke or a heart attack ([figure 2](#)).

**Who is at risk for atherosclerosis?** — A person has a higher chance of getting atherosclerosis if he or she:

- Has a high cholesterol or triglycerides (triglycerides are a type of fat found in blood)
- Has high blood pressure
- Has diabetes



- Smokes
- Has an unhealthy diet
- Is overweight or does very little physical activity
- Has a mother or father who got atherosclerosis before the age of 50 years

**Will I need tests?** — Maybe. Doctors do not typically order tests to check for atherosclerosis in general. Instead, they order tests if they think a patient might have a specific form of atherosclerosis, such as coronary heart disease or peripheral artery disease. The tests for each of these conditions are all very different.

A general test that is often done in people who might have atherosclerosis is called a “lipid profile.” This is a blood test that measures the amounts of different forms of fat and cholesterol.

**Can the problems caused by atherosclerosis be prevented?** — Yes. To reduce your chances of having a heart attack, stroke, or related problem, do the following:

- Take the medicines your doctor prescribes to treat high blood pressure, high cholesterol, and to prevent clots.
- Lose weight (if you are overweight).
- Choose a diet rich in fruits, vegetables, and low-fat dairy products. Don't eat a lot of meats, sweets, or refined grains.
- Do something active for at least 30 minutes a day on most days of the week.
- Quit smoking (if you smoke). Ask your doctor for help.
- Limit the amount of alcohol you drink. Have no more than 2 drinks a day if you are a man. Have no more than 1 drink a day if you are a woman.

**What if my child gets atherosclerosis?** — If your child gets atherosclerosis, work with your child to change his or her lifestyle. Having atherosclerosis increases a child's chance of having a heart attack or stroke at an early age. Try to make sure that your child eats right, exercises, and stays at a healthy weight. The habits your child learns now will have lasting effects on his or her health.

All topics are updated as new evidence becomes available and our [peer review process](#) is complete. **This topic retrieved from UpToDate on:** Feb 13, 2014.

The content on the UpToDate website is not intended nor recommended as a substitute for medical advice, diagnosis, or treatment. Always seek the advice of your own physician or other qualified health care professional regarding any medical questions or conditions. The use of UpToDate content is governed by the [UpToDate Terms of Use](#). ©2014 UpToDate, Inc. All rights reserved.

**Patient information: Can foods or supplements lower cholesterol? (The Basics)**

Written by the doctors and editors at UpToDate

**Can I lower my cholesterol by changing my diet?** — Yes, you can lower your cholesterol some if you avoid red meat, butter, fried foods, cheese, and other foods that have a lot of saturated fat. But if you are interested in improving your health, it's best not to focus just on cholesterol. There are changes you can make to your diet that will reduce your risk of heart disease and other problems—even if they don't lower your cholesterol much.

No single diet is right for everyone. But in general, a healthy diet can include:

- Lots of fruits, vegetables, and whole grains (examples of whole grains include whole wheat, oats, and barley)
- Some beans, peas, lentils, chickpeas, and similar foods
- Some nuts, such as walnuts, almonds, and peanuts
- Fat-free or low-fat milk and milk products
- Some fish

To have a healthy diet, it's also important to limit or avoid sugar, sweets, and refined grains. (Refined grains are found in white bread, white rice, most forms of pasta, and most packaged “snack” foods.)

**What about eggs?** — Eggs are OK, but don't overdo it. The news is often littered with stories about the health benefits or risks of eggs. The truth is, eggs are a good source of protein and do not raise cholesterol much, even though they have a lot of cholesterol in them.

**Are there specific foods that can lower my cholesterol?** — Maybe. There are some foods that seem to lower cholesterol, but scientists are still not sure. Here are some foods that are being studied:

- **Foods rich in omega 3 fatty acids** – Foods rich in omega 3 fatty acids include oily fish, and olive and canola oil. These foods seem to raise good cholesterol and might lower certain types of bad cholesterol. More important, studies show that people who eat lots of these foods are less likely than those who eat less of them to have heart disease. If you want, it's fine to eat 1 to 2 servings of oily fish a week (such as salmon, herring, or tuna). If you would like to take fish oil supplements, talk to your doctor or nurse.
- **Nuts** – Some studies show that eating certain nuts, such as walnuts and pistachios, can help lower cholesterol and even the risk of heart attack or death.
- **Fiber-rich foods** – Fiber-rich foods, such as fruits, vegetables, beans, and oats, seem to lower cholesterol and are generally good for your health. Some doctors even recommend fiber supplements.

**What about designer foods that claim to lower cholesterol?** — Be careful with these foods. There are now many foods that have added plant extracts called “sterols” or “stanols.” Examples include Minute Maid HeartWise orange juice, Danacol yogurt, and special margarines such as Benecol and Promise activ. Foods with added sterols or stanols can lower cholesterol. But it’s not clear whether those foods help reduce the risk of heart attack or stroke. Plus, research in animals shows that these extracts might actually cause health problems. Experts think more research is needed before they can recommend that people eat foods with added plant sterols or stanols.

**Should I take supplements to lower my cholesterol?** — Maybe. Some research has shown that certain supplements can lower cholesterol. But there is almost no research showing that supplements can help prevent heart attacks, strokes, or any of the problems caused by high cholesterol. If you decide to try supplements, keep in mind that in the United States, the government does not regulate supplements very well. That means that what’s on a supplement’s label is not always actually in the bottle.

Here are some supplements that might help with cholesterol:

- **Red yeast rice** – This supplement can contain the same ingredient that is in a prescription medicine to lower cholesterol. Red yeast rice helps lower cholesterol, but the products that claim to have it might not always have much of the active ingredient.
- **Calcium** – Some studies show that calcium supplements can lower cholesterol. But there are no studies showing that they lower the risk of heart attack or stroke. Some studies even suggest that calcium supplements can increase these risks.

The content on the UpToDate website is not intended nor recommended as a substitute for medical advice, diagnosis, or treatment. Always seek the advice of your own physician or other qualified health care professional regarding any medical questions or conditions. The use of this website is governed by the [UpToDate Terms of Use](#) ©2014 UpToDate, Inc.

### Patient information: High cholesterol and lipids (hyperlipidemia) (Beyond the Basics)

#### Author

Robert S Rosenson, MD

Section Editor

Mason W Freeman, MD

Deputy Editor

David M Rind, MD

#### Disclosures

All topics are updated as new evidence becomes available and our [peer review process](#) is complete.  
**Literature review current through:** Jan 2014. | **This topic last updated:** Dec 27, 2013.

**INTRODUCTION** — Hyperlipidemia refers to increased levels of lipids (fats) in the blood, including cholesterol and triglycerides. Although hyperlipidemia does not cause symptoms, it can significantly increase your risk of developing cardiovascular disease, including disease of blood vessels supplying the heart (coronary artery disease), brain (cerebrovascular disease), and limbs (peripheral vascular disease). These conditions can in turn lead to chest pain, heart attacks, strokes, and other problems. Because of these risks, treatment is often recommended for people with hyperlipidemia.

This topic reviews the risk factors for coronary artery disease (sometimes called just “coronary disease”), the types of lipids, and when cholesterol testing should begin. The treatment of high cholesterol is discussed separately. (See ["Patient information: High cholesterol treatment options \(Beyond the Basics\)"](#).)

**OTHER RISK FACTORS FOR CARDIOVASCULAR DISEASE** — In addition to hyperlipidemia, there are a number of other factors that increase the risk of cardiovascular disease and its complications:

- Diabetes mellitus, type 1 and 2 (See ["Patient information: Diabetes mellitus type 1: Overview \(Beyond the Basics\)"](#) and ["Patient information: Diabetes mellitus type 2: Overview \(Beyond the Basics\)"](#).)
- Hypertension (people with hypertension include those with a blood pressure at or above 140/90 and those who use blood pressure medication) (See ["Patient information: High blood pressure in adults \(Beyond the Basics\)"](#).)
- Kidney disease (See ["Patient information: Chronic kidney disease \(Beyond the Basics\)"](#).)
- Cigarette smoking
- Family history of coronary disease at a young age in a parents or sibling (young, in this case, means younger than 55 for men and younger than 65 for women)
- Gender: Men have a higher risk of cardiovascular disease than women at every age

- Age: There is an increasing risk of cardiovascular disease with increasing age

**LIPID TYPES** — The term lipids includes cholesterol and triglycerides. There are many different types of lipid (also called lipoproteins). Blood tests can measure the level of your lipoproteins. The standard lipid blood tests include a measurement of total cholesterol, LDL (low density lipoproteins) and HDL (high density lipoproteins), and triglycerides.

**Total cholesterol** — A high total cholesterol level can increase your risk of cardiovascular disease. However, decisions about when to treat high cholesterol are usually based upon the level of LDL or HDL cholesterol, rather than the level of total cholesterol.

- A total cholesterol level of less than 200 mg/dL (5.17 mmol/L) is **normal**.
- A total cholesterol level of 200 to 239 mg/dL (5.17 to 6.18 mmol/L) is **borderline high**.
- A total cholesterol level greater than or equal to 240 mg/dL (6.21 mmol/L) is **high**.

The total cholesterol level can be measured any time of day. It is not necessary to fast (avoid eating for 12 hours) before testing.

**LDL cholesterol** — The low density lipoprotein (LDL) cholesterol (sometimes called "bad cholesterol") is a more accurate predictor of cardiovascular disease than total cholesterol. Higher LDL cholesterol levels increase your risk of cardiovascular disease.

Most healthcare providers prefer to measure LDL cholesterol after you have not eaten (fasted) for 12 to 14 hours. A test to measure LDL in people who have not fasted is also available, although the results may differ slightly.

Some healthcare providers make decisions about how to treat lipids based on a goal LDL cholesterol. If your healthcare provider uses this strategy, your goal LDL cholesterol will depend on several factors, including any history of cardiovascular disease and your risk of developing cardiovascular disease in the future (see '[Calculating risk](#)' below). People at higher risk are often assigned a lower LDL cholesterol goal.

### **10-year risk of developing coronary artery disease**

The 10-year risk score is based on information from the Framingham Heart Study, a large study that has followed participants, as well as their children and grandchildren, for greater than 50 years. The 10-year risk can be calculated for women ([calculator 1](#)) and for men ([calculator 2](#)).

**Triglycerides** — High triglyceride levels are also associated with an increased risk of cardiovascular disease, although this association is not typically important once other risk factors are taken into account. Triglyceride levels are divided as follows:

- Normal - less than 150 mg/dL (1.69 mmol/L)
- Borderline high - 150 to 199 mg/dL (1.69 to 2.25 mmol/L)
- High - 200 to 499 mg/dL (2.25 to 5.63 mmol/L)
- Very high - greater than 500 mg/dL (5.65 mmol/L)

Triglycerides should be measured after fasting for 12 to 14 hours.

**HDL cholesterol** — Not all cholesterol is bad. Elevated levels of HDL cholesterol actually lower the risk of cardiovascular disease. A level greater than or equal to 60 mg/dL or 1.55 mmol/L is excellent, while levels of HDL cholesterol less than 40 mg/dL or 1.03 mmol/L are lower than desired. There are no treatments for raising HDL cholesterol that has been proven to reduce the risk of heart attacks and strokes.

Similar to total cholesterol, the HDL-cholesterol can be measured on any blood specimen. It is not necessary to be fasting.

**Non-HDL cholesterol** — Non-HDL cholesterol is calculated by subtracting HDL cholesterol from total cholesterol. Since total cholesterol and HDL cholesterol can be measured without fasting, so can non-HDL cholesterol. Non-HDL cholesterol is a good predictor of cardiovascular risk and is a better predictor of risk than LDL cholesterol in people with type 2 diabetes and in women.

An appropriate non-HDL cholesterol goal can be calculated by adding 30 mg/dL (0.78 mmol/L) to your LDL cholesterol goal. As discussed, the LDL cholesterol goal depends on a number of factors. (See '[LDL cholesterol](#)' above.)

**CALCULATING RISK** — Risk calculators are typically based on large studies of populations that are followed to see who develops cardiovascular disease. One such study, the Framingham Heart Study, has followed participants, as well as their children and grandchildren, for more than 50 years. Data from the Framingham Heart Study are used in the following calculators of 10-year risk for cardiovascular disease for women ([calculator 1](#)) and for men ([calculator 2](#)).

**WHEN SHOULD I HAVE MY CHOLESTEROL LEVEL TESTED?** — Many expert groups have guidelines for cholesterol screening. The guidelines differ in their recommendations about when to start screening, how frequently you should be screened, and when to stop.

One expert group, the United States Preventive Services Task Force recommends the following:

- Lipid screening should start at age 35 in men without other risk factors for coronary artery disease and at age 20 to 35 in men with risk factors. These include men with:
  - Diabetes
  - A family history of heart disease in a close male relative younger than age 50 or a close female relative younger than age 60
  - A family history of high cholesterol
  - A personal history of multiple coronary disease risk factors (eg, smoking, high blood pressure).
- Lipid screening should definitely start at age 45 and perhaps at age 20 in women with risk factors for coronary disease. No recommendation for or against screening was made for women without risk factors for coronary disease. UpToDate authors believe that even low risk women should be screened starting at age 45.

- Those at risk for coronary disease should be treated based upon the results of their screening test.
- Screening should include total cholesterol and HDL-cholesterol levels and can be measured anytime (with or without fasting).
- The optimal time interval between screenings is uncertain; reasonable options include every five years, with a shorter interval for those with high-normal lipid levels and longer intervals for low-risk individuals with low or normal levels.
- There is no recommendation to stop screening at a particular age.
- Screening may be appropriate in older people who have never been screened, although screening a second or third time is less important in older people because lipid levels are less likely to increase after age 65.

**HIGH CHOLESTEROL TREATMENTS** — The treatment options for people with high cholesterol and lipids are discussed separately. (See "[Patient information: High cholesterol treatment options \(Beyond the Basics\)](#)".)

**WHERE TO GET MORE INFORMATION** — Your healthcare provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our web site ([www.uptodate.com/patients](http://www.uptodate.com/patients)). Related topics for patients, as well as selected articles written for healthcare professionals, are also available. Some of the most relevant are listed below.

**Patient level information** — UpToDate offers two types of patient education materials.

**The Basics** — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

**Patient information: High cholesterol (The Basics)**

Written by the doctors and editors at UpToDate

**What is cholesterol?** — Cholesterol is a substance that is found in the blood. Everyone has some. It is needed for good health. The problem is, people sometimes have too much cholesterol. Compared with people with normal cholesterol, people with high cholesterol have a higher risk of heart attacks, strokes, and other health problems. The higher your cholesterol, the higher your risk of these problems.

**Are there different types of cholesterol?** — Yes, there are a few different types. If you get a cholesterol test, you may hear your doctor or nurse talk about:

- Total cholesterol
- LDL cholesterol – Some people call this the “bad” cholesterol. That’s because having high LDL levels **raises** your risk of heart attacks, strokes, and other health problems.
- HDL cholesterol – Some people call this the “good” cholesterol. That’s because having high HDL levels **lowers** your risk of heart attacks, strokes, and other health problems.
- Non-HDL cholesterol - Non-HDL cholesterol is your total cholesterol minus your HDL cholesterol.
- Triglycerides – Triglycerides are not cholesterol. They are a type of fat. But they often get measured when cholesterol is measured. (Having high triglycerides also seems to increase the risk of heart attacks and strokes.)

**What should my numbers be?** — Ask your doctor or nurse what your numbers should be. Different people need different goals. (If you live outside the United States, see the Table ([table 1](#))). In general, people who do not already have heart disease should aim for:

- Total cholesterol below 200
- LDL cholesterol below 130 – or much lower, if they are at risk of heart attacks or strokes
- HDL cholesterol above 60
- Non-HDL cholesterol below 160 – or lower, if they are at risk of heart attacks or strokes
- Triglycerides below 150

Keep in mind, though, that many people who cannot meet these goals still have a low risk of heart attacks and strokes.

**What should I do if my doctor tells me I have high cholesterol?** — Ask your doctor what your **overall** risk of heart attacks and strokes is. High cholesterol, by itself, is not always a reason to worry. Having high cholesterol is just one of many things that can increase your risk of heart attacks and strokes. Other factors that increase your risk include:



- Cigarette smoking
- High blood pressure
- Having a parent, sister, or brother who got heart disease at a young age (Young, in this case, means younger than 55 for men and younger than 65 for women.)
- Being a man (Women are at risk, too, but men have a higher risk.)
- Older age

If you are at high risk of heart attacks and strokes, having high cholesterol is a problem. On the other hand, if you have are at low risk, having high cholesterol may not mean much.

**Should I take medicine to lower cholesterol?** — Not everyone who has high cholesterol needs medicines. Your doctor or nurse will decide if you need them based on your age, family history, and other health concerns.

You should probably take a cholesterol-lowering medicine called a statin if you:

- Already had a heart attack or stroke
- Have known heart disease
- Have diabetes
- Have a condition called peripheral artery disease, which makes it painful to walk, and happens when the arteries in your legs get clogged with fatty deposits
- Have an abdominal aortic aneurysm, which is a widening of the main artery in the belly

Most people with any of the conditions listed above should take a statin no matter what their cholesterol level is. If your doctor or nurse puts you on a statin, stay on it. The medicine may not make you feel any different. But it can help prevent heart attacks, strokes, and death.

**Can I lower my cholesterol without medicines?** — Yes, you can lower your cholesterol some by:

- Avoiding red meat, butter, fried foods, cheese, and other foods that have a lot of saturated fat
- Losing weight (if you are overweight)
- Being more active

Even if these steps do little to change your cholesterol, they can improve your health in many ways.

The content on the UpToDate website is not intended nor recommended as a substitute for medical advice, diagnosis, or treatment. Always seek the advice of your own physician or other qualified health care professional regarding any medical questions or conditions. The use of this website is governed by the [UpToDate Terms of Use](#) ©2014 UpToDate, Inc.

### Patient information: High cholesterol treatment options (Beyond the Basics)

#### Author

Robert S Rosenson, MD

Section Editor

Mason W Freeman, MD

Deputy Editor

David M Rind, MD

#### Disclosures

All topics are updated as new evidence becomes available and our [peer review process](#) is complete.

**Literature review current through:** Jan 2014. | **This topic last updated:** Dec 20, 2013.

**INTRODUCTION** — High cholesterol and lipid levels can significantly increase a person's risk of developing chest pain, heart attack, and stroke. Fortunately, a number of effective treatment options are available.

Lipid levels can almost always be lowered with a combination of diet, weight loss, exercise, and medications. As lipid levels fall, so does the risk of developing cardiovascular disease (CVD), including disease of blood vessels supplying the heart (coronary artery disease), brain (cerebrovascular disease), and limbs (peripheral vascular disease). This results in a lower risk of suffering a heart attack or stroke. It is not too late if CVD is already present; lipid-lowering treatment can be lifesaving.

An explanation of what cholesterol and lipids are, how they affect health, and when levels should be measured is available in a separate topic (see "[Patient information: High cholesterol and lipids \(hyperlipidemia\) \(Beyond the Basics\)](#)"). This topic will review when treatment is recommended, the available treatment options, and the risks, benefits, and effectiveness of each treatment.

**WHO NEEDS TREATMENT FOR HIGH CHOLESTEROL?** — The decision to start lipid-lowering treatment is made on a case-by-case basis. Healthcare providers consider current lipid levels, the presence or absence of CVD, and other risk factors for CVD.

**People with CVD** — Several large trials have demonstrated that aggressive lipid lowering is beneficial in people with coronary heart disease. Many healthcare providers recommend treating all patients with CVD with high-dose statin therapy. People who have a heart attack (myocardial infarction or MI) are started on cholesterol-lowering medication while **in** the hospital and are advised to make lifestyle changes, regardless of their LDL cholesterol level (see "[Patient information: Heart attack recovery \(Beyond the Basics\)](#)"). In addition to simply placing a patient on statin therapy, some healthcare providers recommend that lipid lowering treatment achieve specific goals in patients with known CVD:

- A target LDL cholesterol level below 70 to 80 mg/dL (1.81 to 2.07 mmol/L) is recommended for people who have CVD **and** have multiple major risk factors (eg, people with diabetes or who smoke).
- A target LDL cholesterol level less than 100 mg/dL (2.59 mmol/L) is recommended for people who have CVD but do not have many additional risk factors. Lifestyle changes as well as nonstatin medications may be recommended when LDL cholesterol levels are higher than 100 mg/dL (2.59 mmol/L).

These general guidelines may be modified by other individual factors.

**People without CVD** — People without a history of CVD also appear to benefit from lipid lowering therapy, although the treatments are not as aggressive as in patients with CVD. Many experts make recommendations, based on the global risk of developing CVD as predicted by a risk calculator (see "[Patient information: High cholesterol and lipids \(hyperlipidemia\) \(Beyond the Basics\)](#)", section on '[Calculating risk](#)'). Some clinicians recommend treatment at a particular level of risk (such as a 7.5 percent or 10 percent risk of developing CVD over 10 years), while others may focus more on your individual preferences for taking medications to reduce risk. In either case, as with patients with CVD, when a medication is prescribed the initial choice is almost always a statin.

### **Other special groups**

**Hypertriglyceridemia** — High triglycerides have not generally been thought to pose the same risk of CHD as LDL cholesterol. However, healthcare providers often recommend treatment for people with elevated triglyceride levels if they:

- Have very high levels (>500 to 1000 mg/dL or 5.65 to 11.3 mmol/L)
- Also have high LDL cholesterol or low HDL cholesterol levels
- Have a strong family history of CHD
- Have other risk factors for CHD

**Diabetes mellitus** — People with diabetes (type 1 or 2) are at high risk of heart disease. Thus, an LDL level below 100 mg/dL (2.59 mmol/L) is recommended in many people with diabetes. (See "[Patient information: Diabetes mellitus type 2: Overview \(Beyond the Basics\)](#)".)

**Elderly** — The decision to treat high cholesterol levels in an elderly person depends upon the individual's chronologic age (age in years) and physiologic age (health, fitness). A person with a limited life span and underlying illness is probably not a good candidate for drug therapy. On the other hand, an otherwise healthy elderly person should not be denied drug therapy simply on the basis of age alone. In general, the treatment goals discussed above are followed for elderly people.

**HIGH CHOLESTEROL TREATMENT OPTIONS** — Lipid levels can be lowered with lifestyle changes, medications, or a combination of these approaches. In certain cases, a healthcare provider will recommend a trial of lifestyle changes before recommending a medication.

**Lifestyle changes** — All patients with high LDL cholesterol should try to make some changes in their day-to-day habits, by reducing total and saturated fat in the diet, losing weight (if overweight or obese), performing aerobic exercise, and eating a diet rich in fruits and vegetables. (See "[Patient information: Exercise \(Beyond the Basics\)](#)" and "[Patient information: Diet and health \(Beyond the Basics\)](#)".)

The benefits of such lifestyle modifications usually become evident within 6 to 12 months. However, the success of lipid lowering with lifestyle modification varies widely, and healthcare providers sometimes elect to begin drug therapy before this time period is over.

**Medications** — There are many medications available to help lower elevated levels of LDL cholesterol and triglycerides, but only a few for increasing HDL cholesterol. Each category of medication targets a specific lipid and varies in how it works, how effective it is, and how much it costs. Your healthcare provider will recommend a medication or combination of medications based on blood lipid levels and other individual factors.

**Statins** — Statins are among the most powerful drugs for lowering LDL cholesterol and are the most effective drugs for prevention of coronary heart disease, heart attack, stroke, and death. Statins include [lovastatin](#), [pravastatin](#), [simvastatin](#), [fluvastatin](#), [atorvastatin](#), and [rosuvastatin](#) ([table 1](#)). These medications decrease the body's production of cholesterol and can reduce LDL levels by as much as 20 to 60 percent. In addition, statins can lower triglycerides and slightly raise HDL cholesterol levels. Statins may prevent heart attacks and strokes in more ways than just lowering cholesterol levels. For instance, statins seem to help keep buildups in blood vessels (known as plaques) from rupturing. Plaque rupture is an important event that can lead to a heart attack.

It is important to closely follow the dosing instructions for when to take statins; some are more effective when taken before bedtime while others should be taken with a meal.

In addition, some foods, such as grapefruit or grapefruit juice, can increase the risk of side effects of statins. Most manufacturers recommend that people who take [lovastatin](#), [simvastatin](#), or [atorvastatin](#) consume no more than one-half of a grapefruit or 8 ounces of grapefruit juice per day.

**Ezetimibe** — [Ezetimibe](#) (brand name: Zetia) impairs the body's ability to absorb cholesterol from food as well as cholesterol that the body produces internally. It lowers LDL cholesterol levels when used alone. It has relatively few side effects when used alone.

However, there are no studies showing that people who take [ezetimibe](#), either alone or in combination with other cholesterol-lowering medications, have fewer heart attacks or strokes than those who do not take the drug. Further study is needed before ezetimibe is recommended as a first-line treatment.

**Bile acid sequestrants** — The bile acid sequestrants include [cholestyramine](#), [colestipol](#), and [colesevelam](#) ([table 1](#)). These medications bind to bile acids in the intestine, reducing the amount of cholesterol absorbed from foods.

Bile acid sequestrants may be recommended to treat mild to moderately elevated LDL cholesterol levels. However, side effects can be bothersome, and may include nausea, bloating, cramping, and liver injury.

Taking [psyllium](#) (a fiber supplement, such as Metamucil) can sometimes reduce the dose required and the side effects.

Bile acid sequestrants can interact with some medications, including as [digoxin](#) (brand name: Lanoxin) and [warfarin](#) (brand name: Coumadin), and with the absorption of fat-soluble vitamins (including vitamins A, D, K, and E). Taking these medications at different times of day can solve these problems in some cases.

**Nicotinic acid (Niacin)** — Nicotinic acid is a vitamin that is available in immediate-release, sustained-release, and extended-release formulations ([table 1](#)). Nicotinic acid may be recommended for people with elevated cholesterol levels and some types of familial hyperlipidemia.

- Side effects — Nicotinic acid has several possible side effects, including flushing (when the face or body turns red and becomes warm), itching, nausea, and numbness and tingling. This medication can also injure the liver; patients who use it require regular monitoring of liver function.

Taking nicotinic acid with food and taking [aspirin](#) (325 to 650 mg) 30 minutes before can decrease the side effects. Side effects often improve after 7 to 10 days. The immediate-release formulation is more likely to produce side effects, but is also more effective at lowering cholesterol levels and less likely to injure the liver than certain sustained-release formulations. The sustained-release and extended-release formulations have fewer side effects and are usually taken at night with a meal or snack.

Nicotinic acid can produce other side effects in some people. For example, it can blunt the body's reaction to insulin, which can increase blood sugar levels in diabetics. It can increase uric acid levels in people with gout and is not recommended for this group. Nicotinic acid can also produce low blood pressure in people taking vasodilator medications such as [nitroglycerin](#), and it can sometimes worsen angina pectoris (chest pain).

**Fibrates** — Fibrate medications ([gemfibrozil](#), fenofibrate and fenofibric acid) can lower triglyceride levels and raise HDL cholesterol levels ([table 1](#)).

Fibrates may be recommended for people with elevated triglyceride and cholesterol levels. Fibrates have been associated with muscle toxicity (causing muscle pain or weakness), especially when used by people with kidney insufficiency or when used in combination with a statin medication. Fenofibrate/fenofibric acid (brand names: Tricor, Triglide, Trilipex) are less likely to interact with statins than [gemfibrozil](#), and are safer in people who must use both medications.

### **Nutritional supplements**

**Fish oil** — Oily fish, such as anchovies and tuna, contain two important fatty acids, called DHA and EPA. Eating a diet that includes one to two servings of oily fish per week can reduce triglyceride levels and reduce the risk of death from coronary heart disease. Fish oil supplements are believed to have the same benefit. A daily 1 gram fish oil supplement may be recommended if you do not eat enough fish.

**Soy protein** — Soy protein contains isoflavones, which mimic the action of estrogen. A diet high in soy protein can slightly lower levels of total cholesterol, LDL cholesterol, and triglycerides, and raise levels of HDL cholesterol. However, normal protein should not be replaced with soy protein or isoflavone supplements in an effort to lower cholesterol levels.

Soy foods and food products (eg, tofu, soy butter, edamame, some soy burgers, etc.) are likely to have beneficial effects on lipids and cardiovascular health because they are low in saturated fats and high in unsaturated fats.

**Garlic** — A large trial showed that garlic is not effective in lowering cholesterol [1]. In this study, participants with an elevated LDL took one of several types of garlic extract (raw, powdered, aged) or a placebo (inactive pill) six days per week for six months. At the end of the study, the LDL levels were not improved in the garlic group compared to the group that took the placebo. We do not recommend garlic to lower cholesterol.

**Plant stanols and sterols** — Plant stanols and sterols may act by blocking the absorption of cholesterol in the intestine. They are naturally found in some fruits, vegetables, vegetable oils, nuts, seeds, and legumes. They are also available in commercially prepared products such as margarine (Promise Active™ and Benecol), orange juice (Minute Maid Premium Heart Wise), rice milk (Rice Dream Heart Wise™), as well as dietary supplements (Benecol SoftGels and Cholest-Off). The margarines cost about five times what ordinary margarines cost.

Despite lowering cholesterol levels, there are no studies demonstrating a reduced risk of coronary heart disease in people who consume supplemental plant stanols and sterols. There is some evidence that these supplements might actually increase risk.

**STICKING WITH TREATMENT** — The treatment of high cholesterol and/or triglycerides is a lifelong process. Although medications can rapidly lower your levels, it often takes 6 to 12 months before the effects of lifestyle modifications are noticeable. Once you have an effective treatment plan and you begin to see results, it is important to stick with the plan. Stopping treatment usually allows lipid levels to rise again.

Most people who stop treatment do so because of side effects. However, there are a wide variety of medications available today, which should make it possible for most people to find an option that works for them. Talk with a healthcare provider if a specific medication is not working; he or she can recommend alternatives that are compatible with your lifestyle and beliefs.

**WHERE TO GET MORE INFORMATION** — Your healthcare provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our web site ([www.uptodate.com/patients](http://www.uptodate.com/patients)). Related topics for patients, as well as selected articles written for healthcare professionals, are also available. Some of the most relevant are listed below.

**Patient level information** — UpToDate offers two types of patient education materials.



**The Basics** — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.