

A stroke is a medical emergency that is every bit as dire as a heart attack, a similarity that has led some experts to call it a “brain attack.” Just as a heart attack chokes off the blood supply to the heart, a stroke starves the brain of blood.

A stroke occurs when an injury to a blood vessel supplying the brain causes it to burst or become blocked. Deprived of a constant blood supply carrying oxygen and nutrients, some of the cells of the brain die, possibly taking with them the ability to move, speak, feel, think, or even recognize people. In this way, a stroke threatens the very core of one’s humanity. When brain cells die as a result of stroke, it is called a cerebral infarction.

Recovery after a stroke depends on how well healthy areas of the brain take over duties that had been performed by the damaged brain tissue. One of the miraculous features of the brain is its plasticity — its ability to rewire itself after damage so that it can still do its important work. Sometimes this rewiring happens on its own, but it also can be encouraged with rehabilitation techniques.

The most common consequences of stroke include

- impaired movement, loss of sensation, or both, usually on one side of the body
- difficulty with speech and language
- limited field of vision and trouble with visual perception
- loss of emotional control and changes in personality and mood
- problems with memory, judgment, problem solving, or a combination of these.

There are two major types of stroke: ischemic stroke and hemorrhagic stroke. Each has a different cause. About 80% of strokes are ischemic, which means they result from an interruption in the flow of blood to the brain, almost always because a blood clot has blocked a blood vessel. Most of the remaining 20% are hemorrhagic (bleeding) strokes, caused by the rupture of a blood vessel in the brain. Once a blood

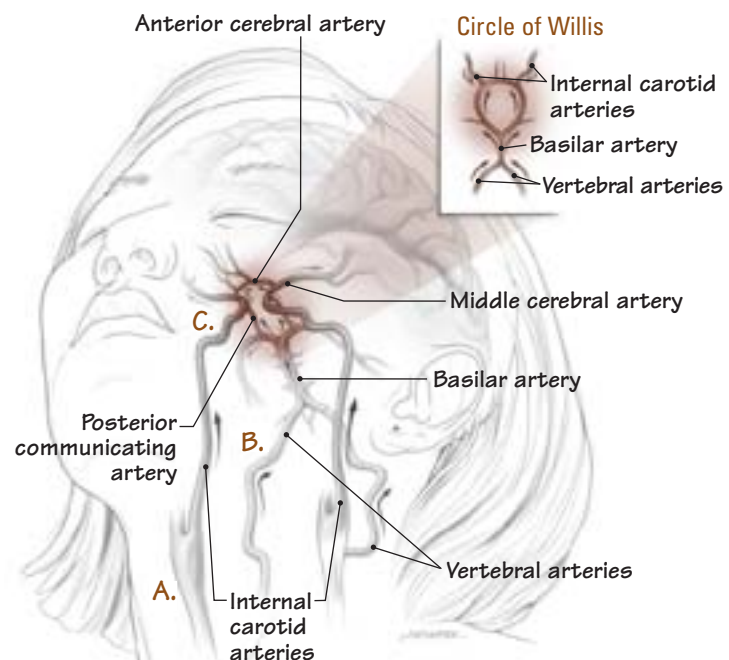
vessel ruptures, blood accumulates and compresses essential vessels, blocking the blood flow to brain tissue.

Immediate treatment is crucial to limiting stroke damage. Starting treatment within 60 minutes of the onset of a stroke can often save enough brain cells to help prevent serious disability. As doctors often say, “Time is brain.”

How common is stroke?

Stroke is the third leading cause of death in the United States and other industrial countries, trailing only heart disease and cancer. In the United States, about 750,000 people have a stroke each year. If you have a stroke, the risk of dying from it increases with age: It is 40% for people age 85 and older, 34% for peo-

Your brain’s blood supply



There is more than one way for your brain to get the all-important blood it needs. Your brain has four main arteries delivering blood: two internal carotid arteries (A) and two vertebral arteries (B). If one of these becomes narrowed or blocked, your brain may be able to get the blood it needs via one of the other arteries connected by the Circle of Willis (C), which links the four arterial pathways (see inset).

ple ages 75–84, 14% for people ages 65–74, and 11% for younger people. About two-thirds of people who have a stroke have some resulting disability and require rehabilitation.

The odds of having a stroke more than double for each decade after age 55. Two-thirds of strokes involve people over age 65. Men and women are about equally likely to have a stroke, but women have a greater risk of dying from one.

The risk of stroke varies according to your race as well as your age. African Americans are twice as likely as are white people to have a stroke and die from it. One reason is that several risk factors for stroke are more common among blacks, especially high blood pressure, diabetes, obesity, and smoking.

Stroke emergencies

When stroke symptoms occur, quick action is vital. Warning signs can begin anywhere from a few minutes to days before a stroke happens. If you think you or someone with you is having a stroke or a transient ischemic attack (TIA), seek immediate medical attention. If you can't reach your doctor by telephone, go to a hospital emergency room, preferably one that



Warning signs of stroke

Any one of the following can be a warning sign of stroke:

- weakness in an arm, hand, or leg
- numbness on one side of the body
- sudden dimness or loss of vision, particularly in one eye
- sudden difficulty speaking
- inability to understand what someone is saying
- dizziness or loss of balance
- sudden, excruciating headache

specializes in treating stroke as it occurs (called acute stroke). If you know you are at risk for stroke, find out ahead of time the name and location of the nearest hospital that specializes in treating acute stroke, in case you need it.

In a Gallup survey, 97% of people over age 50 did not recognize the warning signs of a stroke. Everyone, especially those who are at increased risk for strokes, should learn these warning signs and know what to do if they occur.

Seek help early. Over the last 20 years, researchers have developed rapid, safe, and effective diagnostic techniques that accurately identify the extent and location of a stroke and the nature of the vascular problem causing it. The goal of treatment is to restore blood circulation before the brain dies. The time frame for reaching this goal is frighteningly slim. Treatment usually has to begin within 60 minutes of a stroke to prevent brain cell death that is significant enough to cause disability.

One of the main clot-dissolving drugs, recombinant tissue plasminogen activator (tPA), is best given early. Patients treated with tPA one hour after the onset of a stroke were more than three times as likely to survive with few disabilities compared with those treated two hours after stroke onset, according to two trials sponsored by the National Institute of Neurological Disorders and Stroke. An important goal of research is to find treatments that can buy time by protecting the patient's brain until blood circulation is restored, thus improving the odds of survival and decreasing disability.

Prepare for emergency. If you are at risk of having a stroke, you can help prepare for an emergency by displaying important phone numbers prominently next to the telephone, such as the number of your doctor and a relative or close friend who should be contacted. It's also a good idea to keep on hand a current list of the prescription medications and other drugs you use and a brief medical history to take to

How the Brain Works

The human brain weighs only about three pounds, but it is one of the most complex systems known to science. It has a dizzying array of interconnecting nerve cells that chatter incessantly in languages both chemical and electrical.

A micro view of the brain

The brain consists of about 100 billion neurons, specialized nerve cells that communicate with one another using chemical and electrical signals. Each neuron has a body that contains a nucleus, a long fiber called an axon, and many shorter branching fibers called dendrites. Neurons talk with one another across microscopic gaps called synapses. When a cell body or dendrite receives a message from a neighboring neuron, an electrical impulse is generated. This signal travels the length of the neuron to the end of the axon, where it prompts the cell to release a chemical messenger called a neurotransmitter into the synapse. Certain neurotransmitters pass on messages by creating an electrical impulse in the receiving cell, and the process of electrical-to-chemical signaling is repeated. Other neurotransmitters suppress the transmission of signals to neighboring neurons.

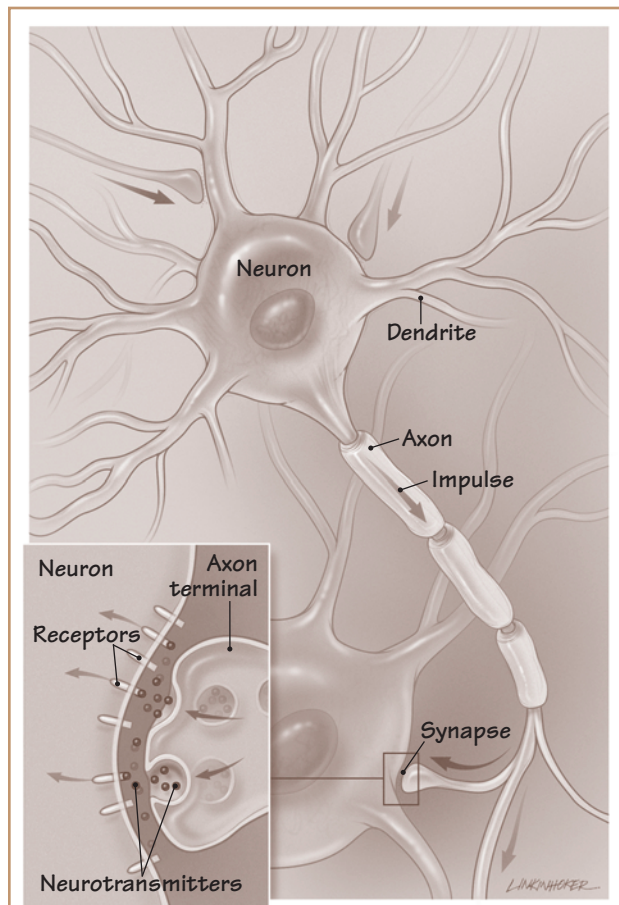
The connections between neurons are where the brain's work is done. This is where thinking and feeling take place and all the basic processes of human life, including movement and breathing, are controlled. In the early stages of development, the brain is highly flexible: Damage to a specific area can often be repaired because existing neurons can form new connections with other nerve cells. By the end of childhood, however, the brain loses much of this reparative power. While the adult brain can rewire itself to some degree, most of the neurons that die cannot be replaced. Unlike the heart, which can still support a marathon runner after losing 10% of its tissue, a 10% loss in the adult brain can result in devastating disability.

A macro view of the brain

The human brain is the product of millions of years of evolution. It has three interconnected levels: the brainstem and cerebellum, the limbic system, and the cerebral cortex. The brainstem, an extension of the

spinal cord, is the oldest part of the brain in evolutionary terms. It connects the rest of the brain to the spinal cord and regulates blood pressure, breathing, chewing, swallowing, and eye movements. At the top of the brainstem is the thalamus, which relays sensory information to other parts of the brain. At the back, near the brainstem, lies the cerebellum, which is responsible for maintaining balance and posture and coordinating movement.

The cerebellum's role is crucial. For example, when you are learning a new, complex skill such as playing the violin, the larger, domed part of the brain known as the cerebral cortex helps you understand the process



How brain cells communicate

Brain cells (neurons) communicate with each other by generating an electrical impulse that travels down an arm called an axon. Chemicals called neurotransmitters (see inset) cross the space (synapse) between neurons to deliver messages by activating receptors on a neighboring neuron.

of playing the violin. But with practice, it is the cerebellum that helps you accomplish real mastery and makes the activity second nature.

The limbic system, a step up the evolutionary ladder from the brainstem, is a group of related structures that help regulate emotion, memory, and certain aspects of movement. One of these structures, the hippocampus, is vital to the storage of recently acquired information — one of the brain's most important functions. Damage to the hippocampus can destroy the ability to learn new information or cause the loss of recent knowledge. Emotions such as fear, anger, and pleasure are stored nearby in the amygdala; damage to this structure can erase emotion-charged memories, such as details of your wedding day or a family reunion. Deep in the brain, clusters of neurons called basal ganglia play an important role in movement.

At the top of the evolutionary ladder sits the cerebral cortex, which is involved in all forms of conscious experience. It is the large, dome-shaped mass of gray matter that most people imagine when they picture the human brain. The cerebral cortex covers the top and the outermost sides of the brain and is divided into left and right hemispheres. The two halves communicate through a vital superhighway of neurons called the corpus callosum.

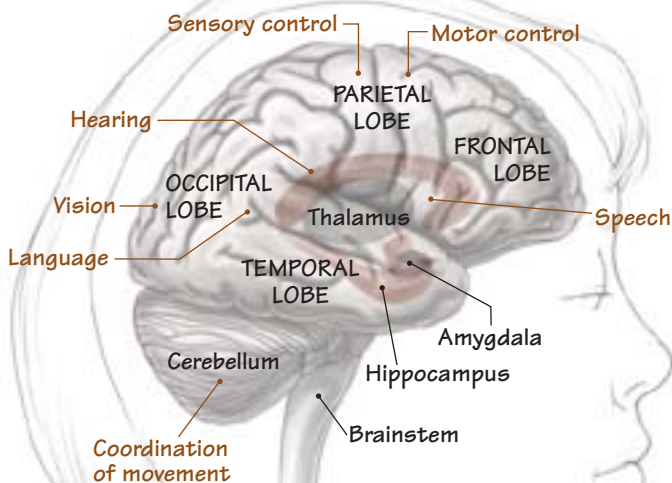
Each hemisphere of the cerebral cortex consists of four lobes. Although there is some overlap among these sections, each has distinct functions. The front portion is the frontal lobe, which controls motor function, planning, and the expression of language. Behind it lies the parietal lobe, which interprets sensation and enables you to understand language. Farther back is the occipital lobe, which perceives and interprets vision. Wrapped around the sides is the temporal lobe, which is involved in hearing, long-term memory, and behavior.

The visual cortex, where vision is processed, is in the occipital lobe, in the back of the cerebral cortex. The right visual cortex controls the left visual field for both eyes, and the left visual cortex controls the right visual field. That's why defective vision or blindness in half the visual field of one or both eyes — a condition called hemianopia — is a common consequence of stroke.

The left side of the brain usually controls activity on the right side of the body, and the right side of the brain controls the left side of the body. Damage to the left hemisphere can produce paralysis or loss of sensation on the right side of the body, and vice versa. Such impairment on one side of the body is one of the hallmarks of stroke. Weakness that is limited to one side is called hemiparesis; paralysis on one side of the body is known as hemiplegia.

Speech centers are on the left side of the brain. Motor speech (the physical movements of the mouth, tongue, and lips) is formulated in Broca's area of the frontal lobe, while understanding written and spoken words occurs in Wernicke's

Functions of the brain



Each hemisphere of the brain is divided into four specialized lobes. When stroke damages an area within one of these lobes, the following functions may be impaired: The frontal lobe controls motor function, planning, and language expression, while the parietal lobe interprets sensation and controls understanding of language. The occipital lobe perceives and interprets vision, and the temporal lobe is involved in hearing, long-term memory, and behavior.

area. These two regions are in constant communication through a dense bundle of neurons.

When stroke strikes

The symptoms that come on in the hours after a stroke begins often provide clues about its type and its location in the brain. A stroke on the left side of the brain, for example, may result in confusion, abnormally slow movements, abnormal speech, an inability to speak or understand speech, or an inability to see objects in the right half of the visual field. People with this type of stroke may have difficulty reading, writing, or calculating. They may also become slow, cautious, and disorganized when faced with an unfamiliar situation.

People with right-sided strokes may ignore or fail to recognize objects or sensations on their left side or even neglect parts of the left side of their body. Deficits on the right side of the brain may also interfere with spatial perception, leading to difficulties with common tasks such as eating, drinking, dressing, operating a wheelchair, or reading. People with this type of stroke may engage in impulsive or dangerous behavior.

Just four minutes after the brain's blood supply is cut off, permanent damage begins to set in.

The brain is especially vulnerable to injury, which is one reason it has a strong skull for protection. Although the brain accounts for only 2% of a person's total body weight, it uses about one-quarter of the body's oxygen and expends more than two-thirds of the body's chief source of energy, glucose. Despite these intense needs, the brain cannot store oxygen or glucose and therefore must be supplied by a constant flow of blood. Cutting off the brain's blood supply for only 30 seconds can cause unconsciousness, and after only four minutes permanent damage begins to set in. That's why it's important to get medical help quickly when the signs and symptoms of stroke first appear.

Blood delivers fuel and nourishment through a complex system of blood vessels that reaches every neighborhood of the brain. The carotid arteries, which run up the left and right sides of the neck, are especially important, supplying blood to the front of the brain and the cerebral cortex. The vertebral arteries, which run up the back of the neck and join at the base of the skull to form the basilar artery, supply the cerebellum, the brainstem, and the back parts of the brain. These major arteries join at the base of the brain to form the Circle of Willis, from which other vessels branch off. ■

Life after stroke

Recovery doesn't stop when your rehabilitation program ends. Even if rehabilitation goes very well, you may have some lingering disability that lasts for months or longer. The transition from rehabilitation to living on your own can be extremely trying, physically and emotionally. This is a time when the support of relatives and friends can make a tremendous difference in your well-being. Knowing that you're not alone can give you the strength to face this new phase of your life.

The emotional impact of stroke

Given that the brain is the cradle of your emotions and your psyche, it is not surprising that a brain attack can cause psychological reverberations. As you recover from your stroke, you may find yourself flooded with feelings that are overpowering or misplaced. It's not uncommon to feel an increased urge to laugh or cry inappropriately, or to get angry easily. You may also experience sexual dysfunction. Although counseling is part of rehabilitation, your need for counseling may last far

longer than your need for muscle-strengthening exercises or speech therapy. Psychosocial counseling for you and your family can help you learn to live with the aftershocks of your stroke.

Depression

About 25% of people who've had a stroke develop major depression. Left untreated, depression can undermine efforts at rehabilitation and worsen cognitive disabilities, such as difficulty with speech and language. For some people, depression is a reaction to the impairments caused by the stroke. For others, it may stem from injury to certain parts of the brain. If you think you are suffering from depression, talk to your doctor. If you are getting rehabilitation therapy, find out if there is a psychologist affiliated with the rehab program. Psychotherapy, antidepressants, or both may be helpful.

Sex after a stroke

Though there is no medical reason to avoid having sex after a stroke, you may find it difficult to have sexual relations. Neurological damage may interfere with sensation. Men may have difficulty achieving an erection or ejaculating. You may have little or no desire for sex because you feel self-conscious or troubled by the way your body looks, or because you feel tired much of the time.

While it's impossible to overestimate the pain that sexual difficulties can cause a couple, it's important to know that there are solutions to these difficulties. The most constructive thing you and your partner can do is to talk. The trouble you're having is not anyone's fault. Nonsexual physical contact is often a good start. Massage, for example, is a way to bring people together physically. It needn't always be a full-body massage. Try massaging the feet or hands, the back, or even the face. For sexual intercourse, it is sometimes helpful to try different positions to find one that's comfortable. If you get tired in the evening, try making love earlier in the day. If erectile dysfunction is a problem, tell your doctor and find out whether medication or another therapy is appropriate.

Depression and sexual difficulties often go hand in hand. Depression can cause erectile dysfunction or a loss of desire, and these sexual problems can con-

Quiz: Is it depression?

The following test can help determine whether you are suffering from serious depression after a stroke. (Answer yes or no.)

- 1 I feel downhearted, blue, and sad.
- 2 I don't enjoy the things I used to.
- 3 I've felt so low that I've thought of suicide.
- 4 I feel that I'm not useful or needed.
- 5 I notice that I am losing weight.
- 6 I have trouble sleeping through the night.
- 7 I am restless and can't keep still.
- 8 My mind isn't as clear as it used to be.
- 9 I get tired for no reason.
- 10 I feel hopeless about the future.

You may be suffering from depression if you answered yes to at least five of these questions, including yes to either question 1 or 2, and these symptoms have persisted for at least two weeks. If you answered yes to question 3, seek professional help immediately regardless of your other responses.

tribute to depression. Antidepressant medication can sometimes cause sexual dysfunction as well. Psychological counseling can be useful, sometimes along with medication for impotence.

Returning home

How soon can you go home after being in the hospital or rehab facility? What condition can you realistically expect to be in? The answers depend on the severity of your stroke, the areas of the brain it affected, and other factors.

Some people who've had a stroke can return home after a few days or weeks in the hospital or a rehabilitation facility. A few stroke survivors require long-term nursing care. In order to live at home after a stroke, you must be able to manage activities of daily living, such as dressing, eating, and using the toilet. You also have to follow medical advice and take prescribed medications. But you probably won't be able to do these things alone. Plan on having a relative, friend, or home health aide stay with you for at least the first night that you're home and possibly longer. If you've been in a rehabilitation facility, chances are that someone in charge of discharge planning will visit your home ahead of time to evaluate what equipment and assistance you will need.

Before returning home permanently, it's a good idea for you to visit for a day or a weekend so that relatives or caregivers will have a chance to identify and correct potential problems. If you have trouble getting around the house, for instance, furniture may need to be rearranged, throw rugs removed, and handrails built. If you need a wheelchair, doorways may have to be widened and ramps or lifts installed.

Advice for caregivers

If a relative or a close friend has had a stroke, you are affected, too. You miss the person's companionship and worry about his or her well-being. But you have a vital role to play in the person's recovery. You may need to

offer practical help with the person's care, and you will certainly need to be supportive when your loved one's spirits fall. Your encouragement can make the crucial difference between rehabilitation results that are mediocre and results that are successful. When you step in to help your relative or friend, keep the following hints in mind:

- Take care of yourself by eating well, getting enough rest, and taking time to do things that you enjoy. Don't be afraid to ask for help from other family members and friends or to hire some help if you can.
- Make everyone's life easier by learning about and using assistive devices that will help the patient do as much alone as possible.



- Take advantage of support groups and other resources for caregivers.
- Learn as much as you can about stroke and rehabilitation.
- Support the patient's efforts to participate in decisions about rehabilitation.
- If the patient has trouble communicating, ask your doctor or a speech therapist for advice. For example, speaking slowly and allowing plenty of time for a response can help. So can using pictures, photographs, gestures, and sounds or computerized communication devices.
- Ask to attend some of the rehabilitation sessions to learn

how the program works. Make sure the staff suggests activities that fit the patient's needs and interests.

- Encourage and help the patient practice the skills learned in rehabilitation.
- Find out what the patient can do on his or her own, what he or she needs help with, and what he or she can't do at all. Then try not to do tasks that you know the patient can do without your help.

- Consider adult day care. A local adult day care program can be a good option if the patient is living at home but has some degree of mental impairment. Adult day care can help give a few hours respite to a relative who is caring for the patient at home. It would not be suitable for a patient who is relatively self-sufficient.

Preventing stroke

Many strokes can be prevented. If you've had a stroke, you can cut your odds of having another one with medical treatment as well as changes in your diet and other health habits. If you've never had a stroke, you can reduce your risk of ever having one.

Preventing stroke is largely a matter of healthy living and having regular checkups to detect conditions that can lead to stroke, such as hypertension, heart disease, high cholesterol, and diabetes. You should have your blood pressure checked every two years if it is normal and at least yearly if it is higher. All adults age 20 and older should have their cholesterol checked every five years using a fasting lipid profile, according to the National Heart, Lung, and Blood Institute, part of the National Institutes of Health (NIH). The American Diabetes Association, the Centers for Disease Control and Prevention, and the NIH recommend diabetes testing for all healthy Americans 45 and older. People under 45 with a family history of the disease should talk to their doctors about having their blood glucose levels tested. Here are some of the things you can do to lower your risk of stroke:

- Maintain a normal blood pressure.
- Maintain a normal cholesterol level.
- Maintain a normal weight.
- Don't smoke.
- Reduce animal fats in your diet, including butter and other dairy fat.
- Exercise regularly.

What's your risk of stroke?

You can't control some risk factors, such as age. But you can reduce or eliminate other risk factors through lifestyle changes or medical treatment.

Risk factors you cannot control:

- Age: People over 55 are at higher risk of stroke than are younger people.
- Race: People of African descent have a higher risk of stroke.
- Family medical history: Your risk of stroke is higher if someone in your immediate family has had a stroke.
- Heart disease: Your risk of stroke is higher if you have had a heart attack or if you have certain other heart conditions, such as atrial fibrillation.
- Diabetes: Your risk of stroke is higher if you have diabetes.

Risk factors you can control:

- hypertension (high blood pressure)
- high cholesterol
- smoking
- obesity
- physical inactivity
- heavy alcohol consumption
- a diet high in salt and saturated fats
- use of combination estrogen/progestin hormone therapy.

Lower your blood pressure

Untreated hypertension is the leading cause of all types of stroke in the United States, and controlling blood pressure is probably the most powerful weapon in the preventive arsenal. High blood pressure damages vessel walls, and this damage sets in motion a domino effect of problems that can culminate in a stroke. It encourages scarring, which in turn leads to plaque build-up and, eventually, atherosclerosis.

Blood pressure measurements are written as a pair of numbers: The *systolic pressure* (the top number) is a measure of the pressure the blood exerts against the arterial walls when the heart contracts, and the *diastolic pressure* (the bottom number) is the pressure between contractions. Normal blood pressure is considered to be less than 120/80 mm Hg.

A person with a blood pressure of 160/95 mm Hg is about four times more likely to have a stroke than someone with normal blood pressure. Even if just one of the blood pressure numbers is elevated, your risk of stroke rises. In a review of nine studies, which involved 420,000 people, those with the highest diastolic blood pressure (105 mm Hg) were 10 times more likely to have a stroke than those with the lowest (76 mm Hg). Elevated systolic blood pressure also increases the risk of stroke. Many elderly people, especially women, have isolated systolic hypertension, a condition in which only the first of the two blood pressure numbers is elevated.

High blood pressure is often called “the silent killer” because it rarely causes symptoms. The only sure way for you to know if you have hypertension is to have your blood pressure checked regularly.

Hypertension can sometimes be lowered by lifestyle changes alone, such as eating a diet rich in fruits, vegetables, fish, and low-fat dairy products; reducing salt intake; exercising regularly; and losing weight. Diets high in potassium may help reduce stroke risk through an association with lower blood pressure.

Often, to effectively control blood pressure, these modifications need to be combined with blood pressure medications, such as diuretics, beta blockers, ACE inhibitors, receptor blockers, or alpha blockers. Many studies have demonstrated that lowering blood pressure is well worth the trouble. A recent analysis of 14 studies showed that reducing diastolic pressure by 5–6 mm Hg resulted in 42% fewer strokes. Other research has found that treating systolic blood pressure can reduce the risk two- to fourfold.

Lower your cholesterol

High levels of low-density lipoproteins (LDLs), the “bad” cholesterol, help lay the foundation for atherosclerotic plaque, so it’s not surprising that lowering LDLs can help prevent atherosclerosis and reduce the risk of stroke. The National Cholesterol Education Program (NCEP) has issued guidelines for total cholesterol levels as well as for LDLs, HDLs (high-density lipoproteins, the “good” cholesterol), and triglycerides.

The safest and cheapest way to treat high cholesterol is to change your diet. A diet with proven benefits for cardiovascular health consists of plenty of fruits

and vegetables, as well as fish and other foods that contain “good fats” instead of “bad fats.” The good fats help increase HDLs, the form of cholesterol that enhances the health of your heart and blood vessels. The good fats are polyunsaturated fats (found in vegetable oils, nuts, and fish) and monounsaturated fats (found in olive and canola oils). The bad fats, which raise LDLs, are saturated fats (found in meat and dairy products) and trans fats (found mainly in partially hydrogenated vegetable oils).

In 2002, the Health Professionals Follow-up Study, an ongoing study of thousands of men, found that men who ate fish as little as once a month were 43% less likely to have ischemic strokes than men who ate seafood less frequently. The Nurses’ Health Study, an ongoing study of thousands of women, found similar results. Data from two long-term studies, the Framingham Heart Study and the Nurses’ Health Study, also suggest that people who eat the most fruits and vegetables are less likely to have strokes than those who eat the least.

If you are unable to lower your cholesterol levels within six months or more after changing your diet, or if your LDL is higher than 190 mg/dL, the next option is medication. Several types are available; some are more effective than others, depending on the circumstances. Talk with your doctor about which one is best for you.



What’s your blood pressure?

There is no single normal blood pressure; instead, blood pressure readings range from ideal at the low end to acceptable in the middle and abnormally high at the top. The following are the standard levels for people age 18 and over. If your blood pressure is high, have it taken again a few minutes later to determine your category.

Category	Systolic blood pressure (mm Hg)	Diastolic blood pressure (mm Hg)
Normal	less than 120	less than 80
Prehypertensive	120–139	80–89
Hypertension		
Stage 1	140–159	90–99
Stage 2	160 or higher	100 or higher

Avoid tobacco smoke

Smoking contributes to many of the risk factors for stroke. It raises your blood pressure, reduces the level of beneficial HDL cholesterol, damages the protective lining of the blood vessels, and makes blood more prone to clot. The more you smoke, the greater your risk of stroke. In the Framingham Heart Study, men who smoked more than 40 cigarettes a day were twice as likely to have a stroke as were those who lit up fewer than 10 cigarettes a day. A similar pattern has been found in women.

Quitting smoking is one of the cornerstones of stroke prevention. In one British study, people who had smoked fewer than 20 cigarettes daily before quitting lowered their risk to the level of those who had never smoked. Although heavier smokers who quit did not eliminate their excess risk, they did decrease it. Re-

sults from both the Framingham and Honolulu Heart studies confirm these findings. Switching from cigarettes to pipes or cigars doesn't reduce your risk at all.

Experts recommend a three-pronged approach to quitting smoking: Wear a nicotine patch or chew nicotine gum to help decrease the urge to smoke, join a support group or seek counseling, and learn techniques that will distract you from the thought of smoking.

Watch your weight

Being overweight or obese increases the risk of stroke. You are considered obese if your body mass index (BMI), a ratio of weight to height, is 30 or over. Being overweight, which means having a BMI of 25–29, also increases your risk of stroke. Excess pounds strain the entire circulatory system and predispose you to other stroke risk factors such as high blood pressure, diabetes, high cholesterol, and obstructive sleep apnea. A doctor can recommend a sensible weight-loss plan that relies on both diet and exercise. A reasonable goal is losing one or two pounds a week.

Boost physical activity

Physical inactivity appears to raise the risk of stroke, according to several studies. The cardiovascular benefits of exercise include making blood less likely to clot, controlling weight, lowering blood pressure, and increasing levels of protective HDL cholesterol.

The latest guidelines from the National Academy of Sciences recommend that you aim to get an hour of moderately intense exercise on most days. Moderate exercise includes walking briskly (at 3–4 miles per hour) or golfing while carrying or pulling clubs. Sedentary people who have high blood pressure, chest pain, or dizzy spells should check with their doctors before beginning an exercise program.

Moderate your drinking

Alcohol plays a complex role in stroke. Moderate consumption (an average of one to two drinks a day) may actually lower the risk of ischemic stroke, just as it lowers the risk of heart disease. Researchers from Columbia University's College of Physicians and Surgeons in New York tracked the stroke rate of 677 people age 40 and older for four years and found that those who consumed one or two drinks a day had a 45% lower risk of ischemic stroke than those who drank no alcohol. It didn't seem to matter what kind of alcohol;

Cholesterol and triglyceride levels

Total cholesterol level	Category
Less than 200 mg/dL	Desirable
200–239 mg/dL	Borderline high
240 mg/dL and above	High
LDL cholesterol level	Category
Less than 100 mg/dL	Optimal
100–129 mg/dL	Near optimal/above optimal
130–159 mg/dL	Borderline high
160–189 mg/dL	High
190 mg/dL and above	Very high
HDL cholesterol level	Category
Less than 40 mg/dL	Low (representing increased risk)
60 mg/dL and above	High (heart-protective)
Triglyceride level	Category
Less than 150 mg/dL	Normal
150–199 mg/dL	Borderline high
200–499 mg/dL	High
500 mg/dL and above	Very high

Adapted from the Third Report of the National Cholesterol Education Program of the National Heart, Lung, and Blood Institute.

the results were the same for wine, beer, and spirits. But heavy drinkers fared worse. Those who consumed seven or more drinks a day had nearly three times the risk of ischemic stroke. For hemorrhagic stroke, any amount of drinking appears to increase the risk by two to four times.

The reason moderate drinking may reduce the risk of ischemic stroke is that alcohol inhibits blood clotting and raises protective HDL cholesterol. But heavy drinking can cause heart rhythm disturbances and boost blood pressure, thereby increasing the likelihood of a stroke. Moderate drinking is considered no more than two drinks a day for men and one for women.

Weigh the risks of hormone therapy

The latest studies show that combined estrogen/progestin hormone replacement therapy (HRT) slightly increases the risk of stroke. In July 2002, results of a large clinical trial, the Women's Health Initiative, showed that women who used Prempro, the most common form of HRT, had a small increased risk of breast cancer, heart attack, stroke, and blood clots. The study of combined hormones was discontinued as a result, although a portion of the study examining estrogen alone continues.

If you are considering HRT to control menopausal symptoms, discuss the risks and benefits with your doctor. Using this therapy on a short-term basis to relieve troubling menopausal symptoms such as hot

flashes is generally considered safe. Long-term use should be reserved for specific patients and purposes.

There is no convincing evidence that most healthy women who use low-dose oral contraceptives have an increased risk of stroke. However, women taking the pill who smoke and have migraines, high blood pressure, or blood-clotting problems have a higher risk, especially if they have a family history of stroke.

Treat atrial fibrillation

Atrial fibrillation is a common arrhythmia, or heart rhythm disturbance, that affects about 2 million people in the United States. For reasons that aren't fully understood, the upper chambers of the heart (the atria) quiver erratically instead of beating forcefully and predictably, making it difficult to expel all the blood in the ventricles. The stagnant blood in the left atrium may form clots that can cause a stroke if they break loose and make their way to the brain.

Atrial fibrillation, which is most common among people over age 65, has been estimated to cause 15% of all strokes. In the Framingham Heart Study, atrial fibrillation was blamed for one of every four strokes among people over age 80. Taking medications that prevent blood clotting can reduce the risk of stroke by 68% in people with atrial fibrillation in addition to other stroke risk factors.

Prevent or treat other heart conditions

Body mass index (BMI)

To estimate your body mass index (BMI), first identify your weight (to the nearest 10 pounds) in the top row of the chart. Next, move your finger down the column below that weight until you come to the row that represents your height. The number at the intersection of your height and weight is your BMI.

BMI	Interpretation
Under 18.5	Underweight
18.5–24	Normal
25–29	Overweight
30 and above	Obese

HEIGHT	WEIGHT															
	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250
5'0"	20	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49
5'1"	19	21	23	25	26	28	30	32	34	36	38	40	42	43	45	47
5'2"	18	20	22	24	26	27	29	31	33	35	37	38	40	42	44	46
5'3"	18	19	21	23	25	27	28	30	32	34	35	37	39	41	43	44
5'4"	17	19	21	22	24	26	27	29	31	33	34	36	38	39	41	43
5'5"	17	18	20	22	23	25	27	28	30	32	33	35	37	38	40	42
5'6"	16	18	19	21	23	24	26	27	29	31	32	34	36	37	39	40
5'7"	16	17	19	20	22	23	25	27	28	30	31	33	34	36	38	39
5'8"	15	17	18	20	21	23	24	26	27	29	30	32	33	35	36	38
5'9"	15	16	18	19	21	22	24	25	27	28	30	31	32	34	35	37
5'10"	14	16	17	19	20	22	23	24	26	27	29	30	32	33	34	36
5'11"	14	15	17	18	20	21	22	24	25	26	27	28	30	32	33	35
6'0"	14	15	16	18	19	20	22	23	24	26	27	28	30	31	33	34
6'1"	13	15	16	17	18	20	21	22	24	25	26	28	29	30	32	33
6'2"	13	14	15	17	18	19	21	22	23	24	26	27	28	30	31	32
6'3"	12	14	15	16	17	19	20	21	22	24	25	26	27	29	30	31
6'4"	12	13	15	16	17	18	19	21	22	23	24	26	27	28	29	30

Having a heart attack (*myocardial infarction*) can cause an embolic stroke. A blood clot may form at the site of the heart attack, then break off and, like a marble in a pinball machine, travel to the brain and lodge in a blood vessel there, cutting off the brain's blood supply. About 3%–4% of people who have a heart attack go on to have an embolic stroke, almost all of these occurring in the first month following the heart attack.

Stroke risk is also higher for people with other heart conditions that increase the chance of clot formation, such as congestive heart failure, left ventricular hypertrophy (a thickening of the wall of the left

ventricle), valve disease, or arrhythmias. Proper treatment of these conditions can help prevent stroke.

Control diabetes

If you have diabetes, your odds of having an ischemic stroke are several times greater than those of people without the disease. Diabetes increases the tendency of the blood to form clots, which can dam up the arteries. High blood sugar, the hallmark of diabetes, promotes the development of peripheral artery disease, which can cause blockages in the arteries leading to the brain. It is unclear whether keeping blood glucose levels within normal limits can reduce the risk of stroke, but keeping your blood pressure and cholesterol in control can certainly reduce your risk.

Know your family medical history

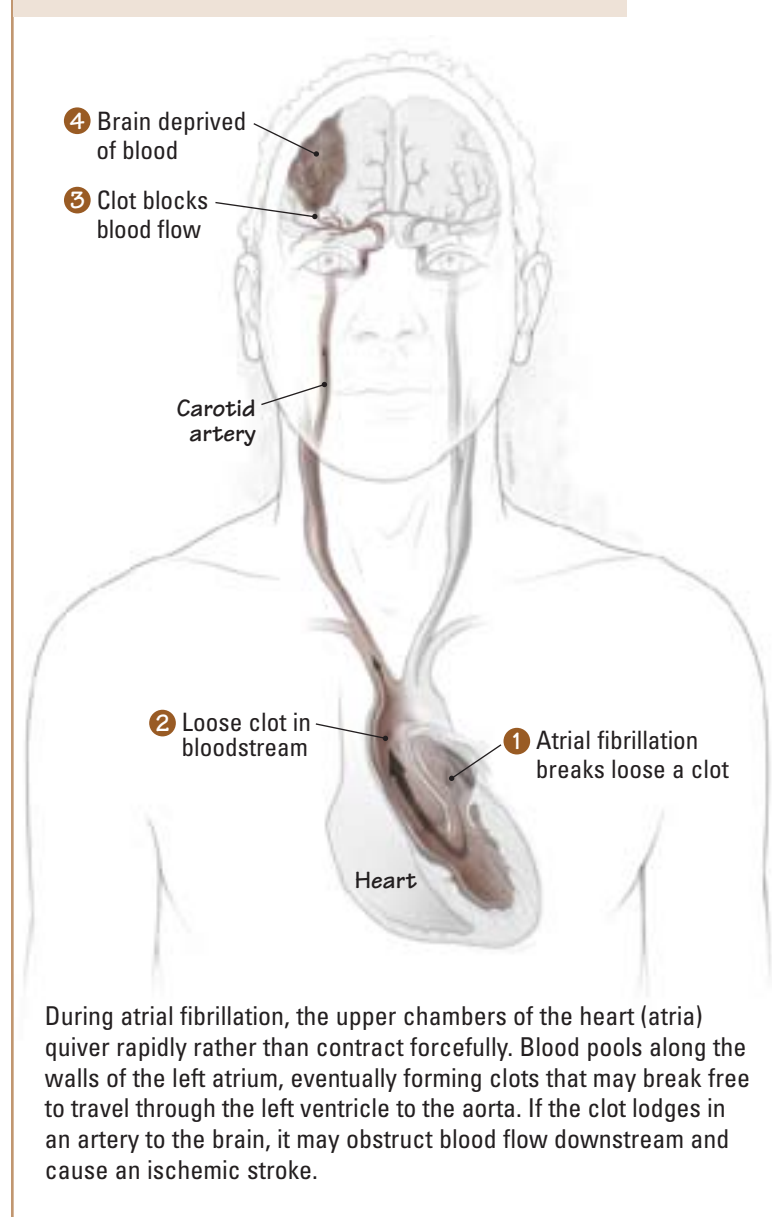
As with many other illnesses, the risk of stroke runs in families. Genetic factors influence blood clotting and the development of atherosclerosis and hypertension, all of which affect the risk of stroke. Aneurysms and arteriovenous malformations, two conditions that cause hemorrhagic strokes, clearly have a genetic basis. But genes alone may not be at fault. In addition to sharing many genes, relatives may also share eating habits and other behaviors that can promote strokes. If you have a strong family history of stroke, talk with your doctor about preventive measures you should take.

Control sleep apnea

Obstructive sleep apnea is a life-threatening disorder, most common among overweight men, in which breathing stops hundreds of times each night. It occurs when the upper airway is blocked by excess tissue such as a large uvula, tongue, tonsils, fatty deposits, or a floppy rim at the back of the palate. The hallmark of this condition is heavy snoring, but many snorers do not have this problem.

Because up to 44% of strokes occur during sleep, some researchers believe that obstructive sleep apnea may trigger

Atrial fibrillation



many TIAs or strokes. Some research has found that people who had these events were much more likely to have a history of sleep apnea than their healthy peers. So far, however, researchers have not yet established how obstructive sleep apnea may cause a stroke.

If apnea can't be reduced by losing weight, avoiding alcohol, and discontinuing medications that may suppress breathing, then ventilation, drugs, or surgery may be necessary.

Detect carotid bruit

Carotid bruit is an abnormal rushing sound made by blood flowing through a narrowed vessel. Doctors may be able to hear it when they press a stethoscope against either one of the carotid arteries, which run up the left and right sides of the neck. Although people who have carotid bruits have an elevated risk of heart disease and stroke, less than half of those with bruits actually have a significant obstruction or narrowing of the carotid artery. Many experts now recommend that, after a bruit is detected, physicians perform a more sensitive ultrasound test.

Even if the carotid artery is not severely obstructed and you have not had a TIA or a stroke, you'll still need to take some preventive measures against stroke, such as quitting smoking, losing weight, exercising regularly, and improving your diet. Your doctor may also recommend that you take medication to reduce your blood pressure, cholesterol, or both. Your doctor will probably want to monitor the blockage by scheduling periodic ultrasounds.

If the narrowing increases, or if you develop symptoms, you may need carotid endarterectomy, surgery to remove the obstruction. This surgery is necessary if you have a narrowing that is severe enough to cause blood pressure in the affected artery to drop. If you are a candidate for carotid endarterectomy but the surgery is too risky for you, your doctor may prescribe warfarin, an anticoagulant, to help prevent stroke.

As many as half of all strokes cannot be explained by high blood pressure, diabetes, and the other established causes. Therefore, doctors strongly suspect that there are other risk factors not yet identified. Leading candidates are infection and inflammation of the blood vessels. Because these are part of the cascade of events

that causes coronary artery disease, some researchers think that they may promote ischemic strokes, too. One question under investigation is whether antibiotics or anti-inflammatory medications such as aspirin can reduce the risk of stroke through this mechanism. Another question is whether people of different ethnic backgrounds may have different risk factors for stroke.

Another possible risk factor for stroke is a high level of homocysteine, an amino acid in the blood. Research suggests that elevated homocysteine may be a major risk factor for heart disease and that even modestly increased levels may promote atherosclerosis. Because atherosclerosis is also a risk factor for ischemic stroke, high homocysteine may increase your odds of having this type of stroke. Many studies show that a cause of high homocysteine is a lack of vitamin B₆ and folic acid in the diet. An easy way to keep your homocysteine level normal is to follow a healthy diet that contains these nutrients and to take a multivitamin to make sure you are getting enough of them. ■

How blood clots

The delicate balance between blood flow and blood clotting is maintained by an intricate system whose chief components are platelets and coagulation factors. Platelets are cell-like structures that circulate in the blood. Normally they are shaped like discs and are inactive, but when they receive a chemical signal that says a blood vessel has been injured, they change shape. They also become bristly, like Velcro. These "activated" platelets then stick to the damaged section and to one another. At the same time, coagulation factors circulating in the blood interact with the platelets to create a fine, gel-like mesh. The result is a blood clot.

Drugs known as blood thinners interfere with clot formation in one of two ways. Anticoagulants such as warfarin (Coumadin) inhibit the coagulation process. Antiplatelet agents, such as aspirin or clopidogrel (Plavix), inhibit the action of the platelets. A thrombolytic such as recombinant tissue plasminogen activator, known as tPA (Activase), dissolves blood clots by converting plasminogen (a chemical in the blood) to the enzyme plasmin, which in turn breaks down fibrin, the long, stringy proteins that are the main component of blood clots.