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Stroke and Stroke Prevention

Stroke and Its Warning Signs

Nearly 800,000 Americans have a stroke each year. Stroke is the fifth leading cause of death in the United States. Stroke is the leading cause of long-term disability and the leading preventable cause of disability.

Strokes and transient ischemic attacks (TIAs) strike suddenly, often without warning. Although symptoms are sometimes subtle and often painless, strokes and TIAs are medical emergencies that require immediate medical attention.

If you notice one or more of the following signs in yourself or someone else, seek emergency help right away by calling your designated emergency number such as 911 or an emergency department. Do not drive yourself to the emergency department.



Face

Ask them to smile

Does the face look uneven?

Numbness or weakness on one side

Loss of vision in one or both eyes;

Unusually severe headache.



Arms

Ask them to raise both arms

Does one of them drift down?

Dizziness or loss of balance.



Speech

Ask them to speak a simple phrase

Does their speech sound strange?

Inability to understand speech.



Time

Test these signs then call 911

Remember

Time is Brain

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The warning signs may be temporary, lasting from a few minutes to 24 hours or longer. Even signs lasting only a short time may indicate stroke, so treat them seriously.

Every minute counts

Get emergency medical care for a stroke as quickly as you would for a heart attack. **Every minute counts.**

The success of most stroke treatments depends on how soon a person is seen by a health care provider after symptoms start. Early treatment can minimize damage to the brain and any disability that follows. The longer a stroke goes untreated, the greater the damage.

What Is a Stroke?

A stroke (also called a brain attack) is a form of cerebrovascular disease that affects the brain's arteries. A stroke happens when an artery carrying oxygen- and nutrient-rich blood to the brain becomes clogged or ruptures (Figure 1).

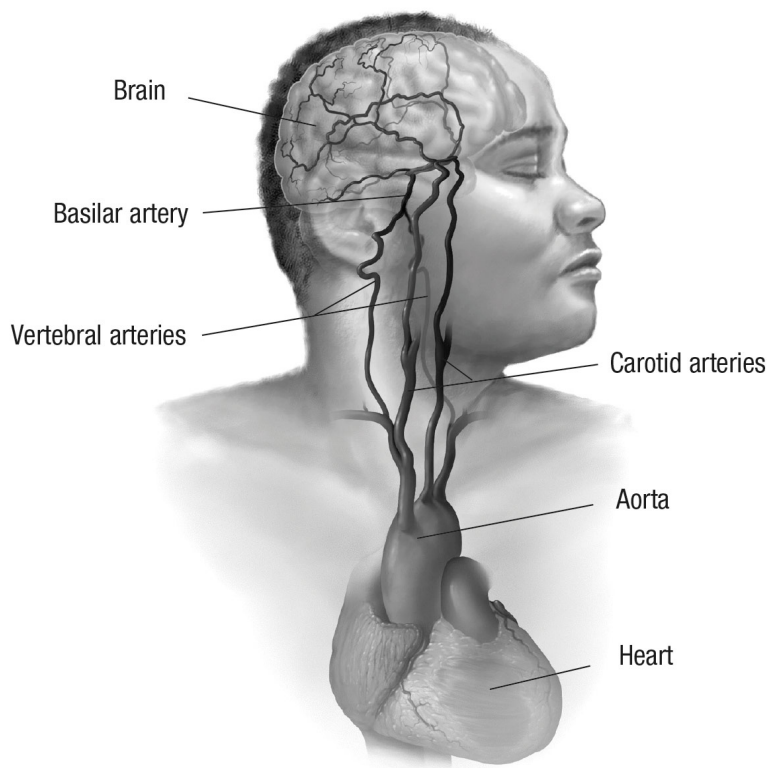


Figure 1. Blood flow to the brain

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For the brain to work correctly, it needs a constant flow of blood. When a stroke happens, the blood supply to the brain is disrupted and brain cells are starved of oxygen. This causes cells in the immediate area to die usually within minutes to a few hours of being deprived of oxygen. This area of dead cells is called an infarct.

Brain cells in the surrounding area also may be in danger. Not all the damage from a stroke happens right away. As brain cells die, they release chemical messengers setting off a “chain reaction.” This chain reaction, called secondary injury, can harm or kill brain cells in the area surrounding the infarct for several hours after the stroke has happened.

Brain cells control how we receive and interpret sensations. They also control most of our body movements. When brain cells are damaged, the functions and parts of the body controlled by these cells do not work as well as before. This may result in some or all of the following problems.

- Difficulty with speech
- Difficulty with swallowing
- Loss of memory
- Loss of vision or double vision
- Difficulty understanding others
- Weakness in the face, arm and/or leg
- Numbness or loss of sensation in the face, arm and/or leg
- Instability in standing and walking

- Lack of coordination
- Headaches
- Nausea and vomiting

The degree of disability depends on the size of the stroke and where in the brain the stroke occurs.

Types of Strokes

There are two main categories of stroke — ischemic and hemorrhagic.

Ischemic

Most strokes are ischemic (Figure 2), meaning they are caused by a lack of blood supply to the brain. Most commonly they are caused by atherosclerosis, a buildup of plaque inside the arteries. A blood clot (thrombus) can form on the plaque and block blood flow to the brain. This is a thrombotic stroke. A blood clot (thrombus) can form on the plaque and block blood flow to the brain. This is a thrombotic stroke.

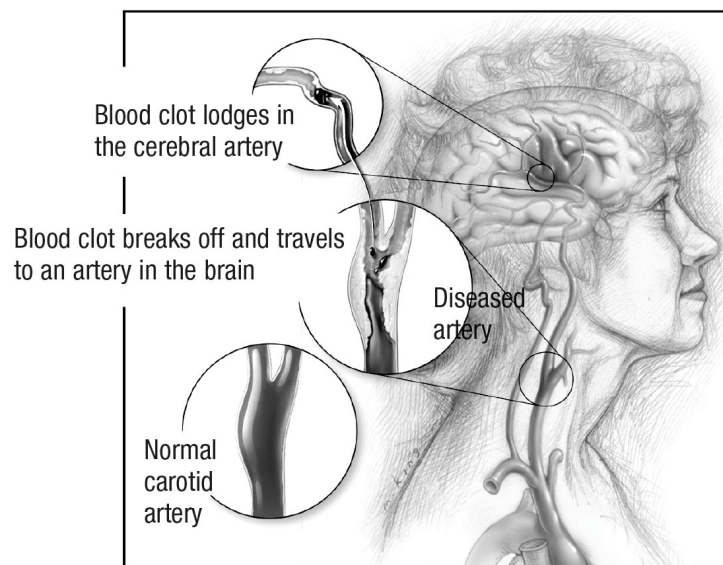


Figure 2. Ischemic stroke

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A tiny blood clot or other material such as fat, air or debris may break loose from an artery outside the brain or from within the heart and be swept through larger arteries into smaller vessels in the brain. When the clot lodges in a brain artery, blocking blood flow, an embolic stroke happens.

A common type of ischemic stroke is a lacunar stroke. It happens when the smallest arteries deep within the brain become blocked. This type usually is less severe than others.

Another type of ischemic stroke is a cryptogenic stroke. This term is used when no clear cause for the stroke is found. A possible reason might be a heart condition such as an occasional irregular

heartbeat or other blood clot source in the heart. Other possible reasons might be an increase in clotting of the blood or plaque in an artery that does not cause severe narrowing of the artery.

Hemorrhagic

A hemorrhagic stroke (Figure 3) happens when an artery in the brain leaks or ruptures. Blood puts pressure on the surrounding brain tissue, causing damage. Brain cells beyond the rupture also are deprived of blood and become damaged.

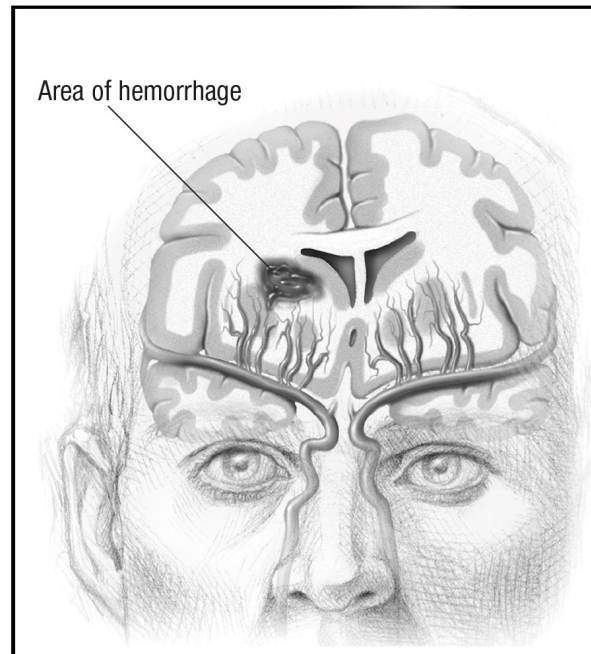


Figure 3. Hemorrhagic stroke

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The most common cause of a hemorrhagic stroke is high blood pressure. Chronic high blood pressure can weaken blood vessel walls, resulting in bleeding in the brain or a brain hemorrhage.

Another cause of a hemorrhagic stroke is leakage from an aneurysm. An aneurysm (Figure 4) is a sac-like outpouching of the wall of an artery caused by a weak spot in an artery wall that becomes thin and stretched. If the aneurysm ruptures, bleeding into the brain happens.

An aneurysm sometimes can be detected before a severe hemorrhage happens. A sudden, unexplained, severe headache may be a warning of a ruptured aneurysm.

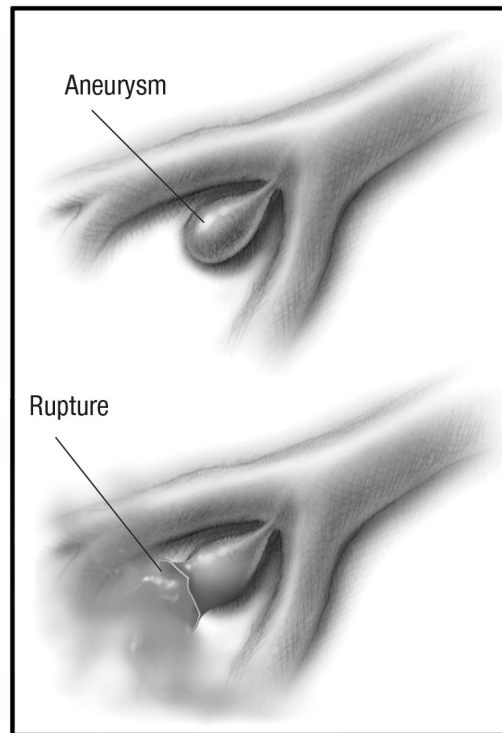


Figure 4. Aneurysm

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There are many other possible causes of brain hemorrhage. A less common cause of hemorrhage is rupture of an arteriovenous malformation. This is a group of thin-walled blood vessels that you were born with. An arteriovenous malformation (AVM) or cavernous malformation can burst and allow blood to leak into the brain, damaging or destroying tissue.

Transient Ischemic Attack (TIA)

A transient ischemic attack (TIA) is a temporary interruption of blood flow to part of the brain. The signs for a TIA are the same as for a stroke but they appear for a shorter time and then disappear. Most TIA signs last less than five minutes.

A TIA is serious and indicates that you have an increased risk of having a stroke. About one-third of all people who have a stroke have had previous TIAs.

It is important not to ignore a TIA just because the signs go away. Medical attention and evaluation are needed right away. After the underlying cause of the TIA is determined, medication, surgery, or lifestyle changes may reduce the risk of having a fatal or disabling stroke.

Risk Factors for a Stroke

Risk factors may increase the chance of having a stroke. Some risk factors cannot be changed while others can be changed or treated so that you help to lower your risk of a stroke.

Risk factors that cannot be changed

- **History of stroke, TIA or heart attack.** Your risk for having a future stroke is greater if you already have had one of these three.
- **Family history.** Your risk is greater if a parent or sibling has had a stroke or TIA. It is not clear whether the increased risk is genetic (inherited) or due to family lifestyles.
- **Age.** Your risk of stroke increases as you get older, especially after age 55.
- **Race.** African-Americans have a greater risk of stroke than people of other races.

Although you cannot change these factors, be aware of them because they may increase your chance of having a stroke. If you have any of these risk factors, it is even more important that you make lifestyle choices that reduce the risk factors you can change.

Risk factors that can be changed or treated

Check any that pertain to you. See the related information that follows.

- High blood pressure
- Smoking or using smokeless tobacco
- Diabetes
- High cholesterol
- Heart disease: irregular heartbeat, previous heart attack
- Using hormonal contraceptives
- Narrowing of the carotid artery
- Obstructive sleep apnea
- Physical inactivity
- Overweight and obesity
- Alcohol use
- Drug abuse
- Stress

High blood pressure

High blood pressure, also called hypertension, puts stress on artery walls. This stress can cause your arteries to harden and thicken. This hardening and thickening narrows the blood vessels through which blood flows. This makes the artery walls more susceptible to the buildup of cholesterol and other material on the inside of the walls. This process is called atherosclerosis. The stress on the artery walls also can lead to thinning of the walls, leading to an increased risk of brain hemorrhage.

Right after a stroke, blood pressure increases. This is acceptable for only the first two to four weeks after a stroke unless instructed otherwise by a health care provider.

What you can do to lower your risk of stroke

High blood pressure is an important risk factor you can control to reduce your risk of a stroke.

- Ask to have your blood pressure checked each time you visit your health care provider.
- Eat healthy low-fat and low-salt foods.
- Exercise regularly.
- Maintain a healthy weight. If you are overweight, lose weight.

If these lifestyle changes are not enough to control your blood pressure, you may need to take medication as prescribed by your health care provider.

Talk with your health care provider about goals for your target blood pressure level.

My blood pressure: _____ / _____ Date _____

My blood pressure goal: less than _____ / _____

Smoking or using smokeless tobacco

Those who smoke or use smokeless tobacco have about a 50 percent greater risk of having a stroke than those who do not. The risk of stroke is increased right after smoking or using smokeless tobacco. There also is a long- term increase in stroke risk.

There is some immediate benefit from stopping smoking or using smokeless tobacco. Your risk of having a stroke decreases significantly within two years after quitting smoking or using smokeless tobacco.

What you can do to lower your risk of stroke

If you smoke or use smokeless tobacco, it is important to quit. Ask your health care provider about options such as a nicotine cessation clinic to help you quit smoking or using smokeless tobacco. Avoid being around anyone who is smoking and in bars and restaurants where smoking is allowed.

Notes

Diabetes

Having diabetes doubles your risk of having a stroke. Uncontrolled diabetes can accelerate atherosclerosis, causing an increased risk of stroke.

A normal fasting blood glucose or sugar is less than 100 mg/dL. If your fasting blood sugar is between 100 and 125 mg/dl, you are at increased risk for developing diabetes and may have “metabolic syndrome,” a risk factor for stroke which includes elevated blood sugar, in addition to abnormal triglycerides and HDL cholesterol, high blood pressure, and obesity.

A fasting blood sugar greater than 126 mg/dl or a hemoglobin A1C of 7 percent or more indicates diabetes. The hemoglobin A1C test (also known as glycosylated hemoglobin or HbA1C) shows your blood glucose control over the past two or three months. The hemoglobin A1C test shows whether your blood glucose is close to normal or too high.

What you can do to lower your risk of stroke

Diabetes controlled with diet, exercise, weight control, and prescribed medication may reduce the risk of stroke.

- Exercise regularly.
- Maintain a healthy weight. If you are overweight, lose weight.
- Check your blood glucose as directed.
- Reduce or avoid foods and beverages that contain refined sugar.

If you have diabetes, talk with your diabetes health care provider about the goal for your hemoglobin A1C test. Hemoglobin A1C goal is 6.5 percent or less.

My fasting blood sugar: _____ Date _____

My hemoglobin A1C: _____ Date _____

High cholesterol

High levels of cholesterol in your blood may increase your risk of stroke by increasing atherosclerosis.

Good lipid levels

Lipids	Goal for most people without vascular risk factors	Ideal for people who have heart disease or who had ischemic stroke
Total cholesterol	Less than 200 mg/dL	Less than 170 mg/dL
Total triglycerides	Less than 150 mg/dL	Less than 150 mg/dL*
HDL cholesterol	More than 45 mg/dL in men More than 55 mg/dL in women	More than 45 mg/dL* for men More than 55 mg/dL for women
LDL cholesterol	Less than 130 mg/dL**	Less than 70 mg/dL*
Total to HDL ratio	Less than 4.0	Less than 4.0

* In general, the higher your HDL and the lower your triglycerides the better, especially if you have heart disease. Many health care providers would like to see triglycerides under 100, LDL under 70, and the ratio of total to HDL cholesterol less than 3.0.

** Ideal goal may be less than 100 mg/dL for some people who have other risk factors for heart disease.

My total cholesterol: _____ Date _____

My triglycerides: _____ Date _____

My HDL cholesterol: _____ Date _____

My LDL cholesterol: _____ Date _____

What you can do to lower your risk of stroke

A diet high in cholesterol which is found in egg yolks, fatty cuts of meat and high-fat dairy products, and fat, especially saturated fat which is found in fatty cuts of meat, high-fat dairy products, certain oils, some processed and fried food, can increase your cholesterol level.

Rather, eat a diet low in cholesterol and saturated fat.

- Eat more fruits, vegetables and whole grains. Eliminate or reduce meat intake, particularly red meat. Eat only lean cuts of red meat. Limit whole eggs to no more than two to three a week.
- Choose dairy products made with skim milk or a low-fat milk substitute.
- Reduce your saturated fat intake. Use monounsaturated oils (such as canola, olive or peanut) or polyunsaturated oils (such as corn, sunflower or soybean) instead of saturated fat (butter and lard). Avoid hydrogenated oils which are fats that are solid at room temperature.

In addition to healthy eating, exercising regularly and maintaining a healthy weight can reduce your blood cholesterol level. If you are overweight, lose weight.

If your blood cholesterol level does not improve with lifestyle changes alone, your health care provider may prescribe a cholesterol-lowering medication. People who have had a stroke thought to be related to cholesterol build-up commonly are prescribed medications called statins. In addition to lifestyle changes, statins have been shown to reduce the future risk of heart attack and stroke.

Notes

Heart disease

Heart conditions, including congestive heart failure, a previous heart attack, acute heart-valve disease or valve replacement, and atrial fibrillation (an irregular and often rapid heartbeat sometimes not discovered until the time of a stroke), put you at greater risk for a stroke. With these conditions, the heart does not pump blood as efficiently as usual. This may cause blood to form clots and increase your risk of stroke.

What you can do to lower your risk of stroke

If you have a heart condition it is important to talk with your health care provider about available treatment options. Take any medications as prescribed.

Notes

Narrowing of the carotid artery

The carotid arteries are blood vessels on either side of your neck. The carotid arteries carry blood to your brain. If plaque forms on the arteries, they can become narrowed. People who have narrowing of the carotid arteries may have an increased risk of stroke even if they have had no prior warning of stroke symptoms.

Amaurosis fugax is one symptom that people who have carotid artery stenosis may have. This means a shade of darkness comes down over one eye and often improves within minutes. This is a type of TIA which requires immediate medical attention.

What you can do to lower your risk of stroke

If you have narrowing of the carotid arteries, depending on the degree of blockage, your health care provider may prescribe blood-thinning medications or statin medications, or do a surgical procedure to reduce your risk of stroke. Attention to blood pressure and cholesterol control is very important to lower your risk for carotid artery disease.

Notes

Obstructive sleep apnea

Obstructive sleep apnea happens when your throat muscles relax and block your airway while you sleep. This causes you to stop and start breathing repeatedly as you sleep. This is a potentially serious condition.

Obstructive sleep apnea can lead to other problems including:

- Difficulty concentrating.
- Headaches in the morning.
- Sexual dysfunction.
- Heart and blood vessel problems such as high blood pressure, stroke and heart failure.
- Motor vehicle accidents.

What you can do to lower your risk of stroke

If you snore or have been told you stop breathing at night, talk to your health care provider about being evaluated for obstructive sleep apnea. Several treatments are available.

Notes

Physical inactivity

Not being active may contribute to other risk factors such as high blood pressure, high cholesterol levels and obesity.

Regular exercise strengthens the heart and improves circulation and lowers blood pressure and cholesterol levels. It also helps with weight control and managing stress.

What you can do to lower your risk of stroke

Start and continue a regular exercise program such as walking, biking or swimming. Exercise moderately at least three to four times a week for an average of 40 minutes. Talk to your health care provider before starting an exercise program.

Find ways to help you stay motivated such as exercising with a friend or keeping a calendar noting your progress.

If you already have had a stroke or if you have a disability, talk with your health care provider about modifications or programs available to you.

Notes

Overweight and obesity

Being overweight increases your chance of developing high blood pressure, heart disease, atherosclerosis and diabetes, all of which increase your risk of stroke. Being overweight means you have a body mass or BMI between 25 and 30. Being obese means you have a body mass of 30 or higher. Women should have a waist measurement of no more than 35 inches. Men should have a waist measurement of no more than 40 inches.

		Body Mass Index Table																																			
		Normal					Overweight					Obese					Extreme Obesity																				
BMI		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Height (inches)		Body Weight (pounds)																																			
58		91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191	196	201	205	210	215	220	224	229	234	239	244	248	253	258
59		94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	212	217	222	227	232	237	242	247	252	257	262	267
60		97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184	189	194	199	204	209	215	220	225	230	235	240	245	250	255	261	266	271	276
61		100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190	195	201	206	211	217	222	227	232	238	243	248	254	259	264	269	275	280	285
62		104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196	202	207	213	218	224	229	235	240	246	251	256	262	267	273	278	284	289	295
63		107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203	208	214	220	225	231	237	242	248	254	259	265	270	276	282	287	293	299	304
64		110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209	215	221	227	232	238	244	250	256	262	267	273	279	285	291	296	302	308	314
65		114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270	276	282	288	294	300	306	312	318	324
66		118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	247	253	260	266	272	278	284	291	297	303	309	315	322	328	334
67		121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	236	242	249	255	261	268	274	280	287	293	299	306	312	319	325	331	338	344
68		125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	262	269	276	282	289	295	302	308	315	322	328	335	341	348	354
69		128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243	250	257	263	270	277	284	291	297	304	311	318	324	331	338	345	351	358	365
70		132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	278	285	292	299	306	313	320	327	334	341	348	355	362	369	376
71		136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257	265	272	279	286	293	301	308	315	322	329	338	343	351	358	365	372	379	386
72		140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265	272	279	287	294	302	309	316	324	331	338	346	353	361	368	375	383	390	397
73		144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272	280	288	295	302	310	318	325	333	340	348	355	363	371	378	386	393	401	408
74		148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280	287	295	303	311	319	326	334	342	350	358	365	373	381	389	396	404	412	420
75		152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	319	327	335	343	351	359	367	375	383	391	399	407	415	423	431
76		156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	328	336	344	353	361	369	377	385	394	402	410	418	426	435	443

Source: Adapted from Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report.

Figure 5.

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My height: : _____ Date _____

My weight: _____ Date _____

My body mass index (BMI): _____

My body mass index goal: _____

What you can do to lower your risk of stroke

Talk with your health care provider about your body mass index and an appropriate weight for you. Get to and maintain a healthy weight.

Weight control is possible by altering food intake, increasing physical activity and reducing stress.

Follow a low-fat, low-cholesterol diet and eat plenty of whole grains, fruits and vegetables. Eat foods that are low in sugar and salt.

Get regular exercise such as walking, biking or swimming.

See a dietitian or nutritionist, or attend healthy eating classes for helpful information and tools to improve your eating habits. Joining a weight loss program may be helpful. Talk with your health care provider about options.

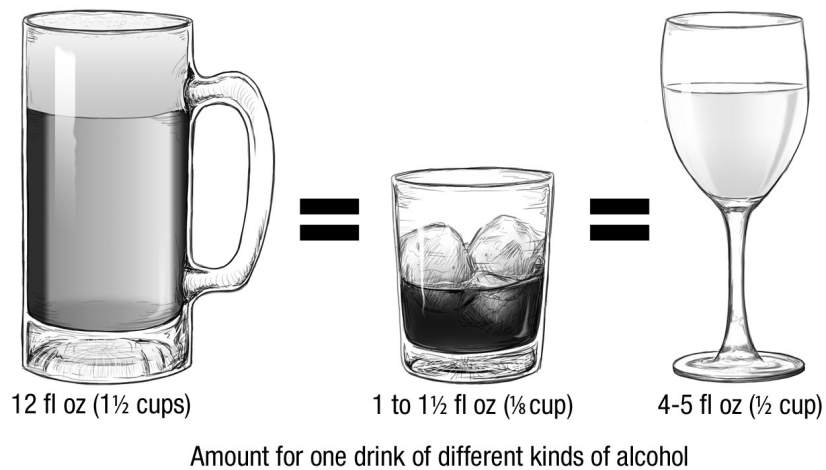
Notes

Alcohol use

Too much alcohol may increase your blood pressure, alter your triglycerides and add unnecessary calories to your diet. Excess alcohol increases the risk of hemorrhagic stroke.

What you can do to lower your risk of stroke

Do not drink alcohol or drink it in moderation. Women of all ages and men older than age 65 should not have more than one drink a day. Men age 65 and younger should not have more than two drinks a day. If you have questions about alcohol use, talk with your health care provider.



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Notes

Drug abuse

Use of illegal drugs including amphetamines, cocaine, and heroin can cause a sudden rise in blood pressure and weaken blood vessels in the brain, as well as cause the heart to beat irregularly, all of which can lead to a stroke.

What you can do to lower your risk of stroke

Seek a treatment program if you use illegal drugs.

Notes

Stress

Stress often is associated with high blood pressure. Research suggests that certain blood factors that make clotting more likely increase with stress.

What you can do to lower your risk of stroke

Learn to relax and reduce or manage stress and stressful conditions effectively. Strategies for coping with stress include:

- Increasing your physical activity.
- Limiting caffeine.
- Avoiding things that upset you.
- Learning to work through anger and other stressful emotions.

You may wish to attend a stress management class, seek counseling, or wellness coaching. Talk with your health care provider about options.

And finally....

Be sure to follow your health care provider's recommendations about any medications. Talk with your care provider about any over the counter supplements or herbal medications that you want to take.

Diagnosing a Stroke

People who have symptoms of a stroke or a TIA must be evaluated by a health care provider right away. Emergency medical care needs to be provided as health care providers determine the cause of the stroke and where it occurred in the brain. By determining the cause, your health care providers can tailor their recommendations of blood thinners or other medications to prevent another stroke.

A diagnosis is made by evaluating the symptoms, reviewing the medical history and doing a physical examination. There are many tests that can be done to discover the type of stroke and the amount of damage. This information can be used to develop the best treatment plan for each individual. Each person is unique, so recommendations for tests and treatments may vary, depending on individual needs.

Your health care provider will decide which tests are most appropriate for you. Common tests that may be done to determine the cause of a stroke and where it occurred including:

- Blood tests.
- Computed tomography (CT) scan.
- Computed tomography angiography (CTA).
- Magnetic resonance imaging (MRI).
- Magnetic resonance angiography (MRA).
- Carotid artery ultrasound.
- Echocardiogram.
- Cerebral angiography.
- Transcranial doppler ultrasound.

Computed tomography (CT) scan — Also called a CAT scan. This is a painless X-ray technique that uses a computer to construct a cross-section image of the body. This X-ray may reveal the size, location and cause of the stroke, as well as any brain damage that has occurred (Figure 6). During this test, people lie on the CT scanner table with their head inside the opening of the scanning machine. Sometimes a contrast medium or dye is injected to help highlight areas.

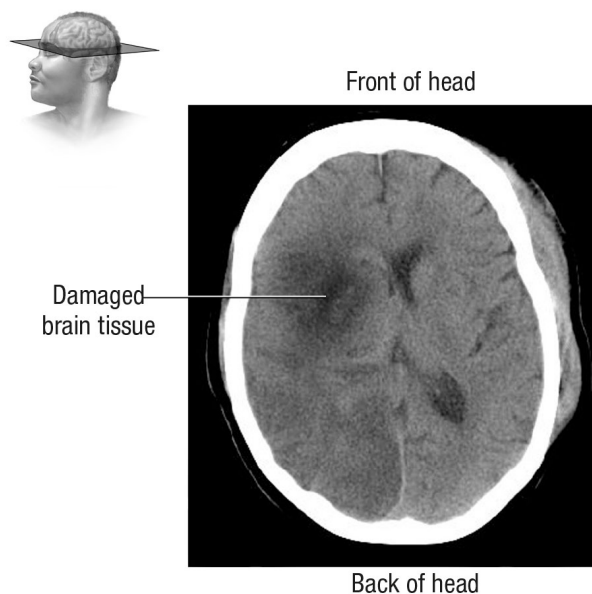


Figure 6. Darker area on head CT scan shows brain tissue damaged by stroke.

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Computed tomography angiography (CTA) — CT scanning also may be used to find changes in arteries, such as blockages, narrowings or aneurysms. A CTA combines a CT scan and an angiogram. It is noninvasive. The procedure itself is similar to that described for a CT scan.

Magnetic resonance imaging (MRI) (Figure 7) — This painless, noninvasive scan uses a magnetic field and radio waves to construct images of the inside of the body. This test is most sensitive for detecting an area of brain tissue damaged by an ischemic stroke. During this test, the patient lies on a table. When the test begins, the table moves into the opening of the MRI machine. The test generally takes 30 to 90 minutes. Most people find that after several minutes of imaging they become quite relaxed and have few problems lying still for the required period of time.

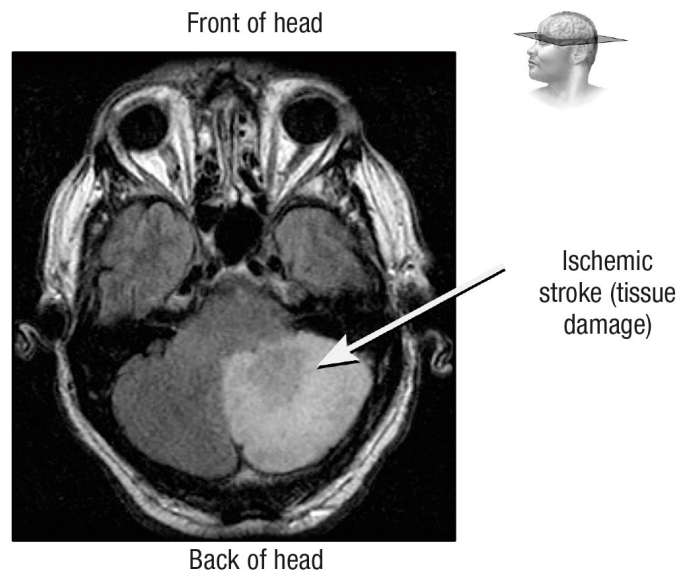


Figure 7. Lighter area on head MRI scan shows brain tissue damaged by stroke

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Magnetic resonance angiography (MRA) — A test that detects blood vessel changes such as blockage or narrowing or the presence of an aneurysm. This test combines an MRI and an angiogram but is noninvasive. The procedure is similar to that described for an MRI.

Carotid ultrasound — A noninvasive, painless test that evaluates the blood flow of the carotid arteries. During this test, a gel is applied to the neck over the carotid artery. A transducer (probe) is used to send an ultrasound signal. The reflected signal is received and transmitted to a computer that calculates how fast the blood is traveling. Then the degree of narrowing in an artery can be estimated.

Echocardiogram — This noninvasive, painless test uses ultrasound to show images of the beating heart. Information gained from the images includes the measurement of muscle thickness, chamber size and valve function. It also can show the presence of blood clots in the heart. Blood flow through the heart also can be measured using the Doppler effect.

Transesophageal echocardiogram (TEE) — A TEE is an echocardiogram in which you swallow a very small tube with a tiny ultrasound probe on the tip. The images are taken closer to the heart and may provide additional information that adds to that from the standard echo. This test may be done in addition to a standard echocardiogram. Before this test, you are given intravenous (IV) medication to sedate you.

Cerebral angiography (also arteriography) — A test that uses X-rays to check for impaired blood flow or blockage of the arteries that supply blood to the brain. It also can detect an aneurysm or an arteriovenous malformation. Cerebral angiography provides detailed pictures of blood vessels that cannot be obtained by other means. A contrast medium or dye is injected into a blood vessel through a small tube called a catheter. The dye allows the blood vessels to be seen when X-rays are taken.

Transcranial doppler ultrasonography — A noninvasive, painless test that uses sound waves to look at the blood flow moving through the arteries to the brain and to find whether the arteries are narrowed or blocked. During this test, a gel is applied to the neck or temple. A transducer (probe) is used to send an ultrasound signal. The reflected signal is received and transmitted to a microcomputer that calculates how fast the blood is traveling.

Treating a Stroke

A stroke is a medical emergency. Treatment must begin as soon as a stroke is diagnosed to ensure that no further damage to brain cells happens and to increase the chance for full recovery. Medical and surgical treatment options depend on where in the brain the stroke occurred and whether the stroke is ischemic or hemorrhagic.

For both ischemic and hemorrhagic strokes, treatment begins with careful control of blood pressure. High blood pressure is very common after stroke. The goal blood pressure differs for a hemorrhagic versus ischemic stroke. If blood pressure lowering is needed, it must be lowered slowly with medication. A sudden drop in blood pressure may lead to a further decrease in the blood supply to the area affected by the stroke.

Ischemic stroke

Treatment of an ischemic stroke is aimed at improving blood flow. Medications that may dissolve clots may be used during the first hours after a stroke in an effort to limit brain damage by restoring the free flow of blood. These drugs are most beneficial when given within the first few hours. Rarely blood clot retrieval is possible but it must be done within hours of the stroke symptoms. **This means early recognition of symptoms and seeking medical care promptly are extremely important.**

Tests may be done to determine the extent of the carotid artery disease if the stroke involved the carotid artery. If there is mild blockage, blood thinners may be enough to prevent blood from clotting and to prevent existing blood clots from becoming larger.

If there is severe blockage of the carotid artery, a carotid endarterectomy may be recommended. This is a surgical procedure to remove plaque buildup in the carotid artery.

A carotid endarterectomy also may be recommended as a preventive measure to someone who has a blocked carotid artery but who has not had a stroke.

A procedure called angioplasty may be done instead of surgery. In this procedure, a catheter containing a small, inflatable balloon is placed at the blocked or narrowed area in the artery. The balloon is inflated, pushing the blockage to the side of the artery. A small wire mesh tube called a stent may be put into the artery to prevent the blockage from returning quickly.

If the stroke involves the back part of the brain, the blood is supplied by the vertebral and basilar arteries. Blockage in these arteries usually is not treated with surgery or angioplasty although some people may need these procedures. Usually, blood-thinning medication may be used to prevent additional strokes.

A number of medications may be used to prevent another stroke. The medication selected depends on the location, type, and severity of the stroke. Medication options include aspirin and/or other blood-thinning medications. Talk with your health care provider about the medication that is best for you.

Hemorrhagic stroke

The goal for treating a hemorrhagic stroke is to correct the cause of the hemorrhage and protect the brain from further damage. Hemorrhage causes blood to collect in the brain. Because the brain is confined within the skull, pooled blood (hematoma) sometimes can cause dangerous increases in pressure in the brain and can damage delicate tissue. Increased pressure also can decrease circulation to the uninjured areas of the brain.

Treatment is complex and individualized. However, part of treatment may involve limiting fluids and giving medications to minimize temporary swelling of brain tissue. Surgery to remove blood clots from within the area of damaged brain tissue is not usually done.

If an aneurysm or blood vessel malformation is detected, surgery may be needed to prevent further bleeding into the brain.

Effects of a Stroke

Physical

The physical effects of a stroke may be slight or severe, temporary or permanent, depending on:

- The type of stroke.
- Which brain cells are damaged.
- How widespread the damage is.
- How well the body repairs the blood supply to the brain.
- How quickly other areas of the brain take over the work of the damaged cells.

The brain is divided into two halves or hemispheres. Though they look the same, each hemisphere controls different body functions. Each hemisphere controls the movement and sensation on the opposite side of your body. For example, the left hemisphere of your brain controls the right side of your body.

When a stroke happens, it usually takes place in a single area in one hemisphere. A stroke in the left hemisphere affects the right side of the body, while a stroke in the right hemisphere affects the left side of the body.

A stroke on the right side of the brain may cause:

- Weakness (hemiparesis), complete paralysis (hemiplegia), or lack of coordination of the face, arm or leg on the left side of the body.
- Lack of feeling and position on the left side of the body.
- Decreased ability to judge distances, size, position, rate of movement and form.
- Inability to think clearly.

- Loss of awareness or forgetting objects on the left side (left-sided neglect). The neglect is usually more severe with strokes on the right side of the brain.
- Quick and impulsive behavior.
- Difficulty drawing, dressing, or following a map.

A stroke on the left side of the brain may cause:

- Weakness (hemiparesis), complete paralysis (hemiplegia), or lack of coordination of the face, arm or leg on the right side of the body.
- Lack of feeling and position on the right side of the body.
- Difficulty in speaking (slurred or distorted speech), listening, writing, reading, calculating with numbers or understanding what others say (aphasia).*
- Behavior changes (slow, cautious and somewhat disorganized).
- Loss of awareness or forgetting objects on the right side of the body (right-sided neglect).
- Inability to think clearly.

*These symptoms depend on which side of the brain is “dominant.” Some left-handed people have speech and language difficulties after strokes on the right side.

Dysphagia

Dysphagia is a swallowing disorder that often happens as a result of a stroke. If dysphagia is not managed, it can lead to poor nutrition, pneumonia, and increased disability.

A person who has dysphagia is at increased risk for getting food or liquid in the airway or lungs. This is called aspiration. Normally, aspiration causes a cough but a stroke can reduce that sensation. Aspiration can lead to pneumonia.

After a stroke, a speech language pathologist or occupational therapist can test swallowing by evaluating how well the muscles in the mouth move when a person talks and swallows.

Emotional

After a stroke, returning to life can be challenging. Recovering from a stroke and adjusting to a new normal may cause some of the following emotional responses.

Intermittent distress

This type of stress comes and goes and is the least worrisome type of depression after a stroke. As long as the person is able to be cheerful at times and feel that things are getting better, he or she will probably cope well in the long term.

Major depression

Sometimes depression may last more than a few weeks. The person who has had a stroke may believe that he or she will not get better. Signs of depression may include a change in appetite, change in sleep patterns, loss of energy and enthusiasm, and loss of interest in activities and people.

Grief

A person may feel a true sense of grief if he or she has trouble walking or talking after a stroke. At this time, the support of family and friends is very important, helping the person to acknowledge losses and providing support during the grief process.

Other effects of a stroke

A stroke may cause other effects including:

- **Fatigue.**
- **Disturbed sleep or appetite.** A stroke may affect the brain centers that control sleep and appetite. Problems with sleep and appetite may happen even when people do not show signs of depression or sadness. Disturbances of sleep and appetite can include both overeating or sleeping too much and undereating or not getting enough sleep.
- **Uncontrolled crying and/or laughing.** After a stroke, people may cry or laugh inappropriately — even when they do not feel particularly sad or happy. It may happen when people are exerting physical effort (such as trying to speak).
- **Slow adjustment to new things.** People may find it hard to deal with the many changes in their lifestyles during the recovery period after a stroke. People may fear change and become confused or irritable when change occurs.
- **Problems with bowel and bladder control.** People who have had a stroke may find it difficult to tell when to empty their bladders or have bowel movements. Also, if people have difficulty speaking, it may be hard for them to communicate this need to a family member. If people have problems with mobility, they may not be able to get to the bathroom alone.
- **Sexuality concerns.** The physical aftereffects of stroke may make people feel uncomfortable with their bodies. It is common for people to fear rejection or be unsure about the ability to perform sexually.

After a Stroke

After a stroke, it is very important that you:

- Follow your health care provider's instructions for recovery, rehabilitation, and prevention of another stroke.
- Keep all your scheduled appointments.
- Keep up your relationship with your primary health care provider. If you do not have a primary health care provider, get one as soon as possible.
- Reschedule promptly if you cannot keep an appointment. Your health care provider may need to do tests or change medications.
- Keep all appointments with the rehabilitation providers (physicians, therapists) and do therapy as prescribed.
- Take your medications as prescribed by your health care provider.



Face

Ask them to smile

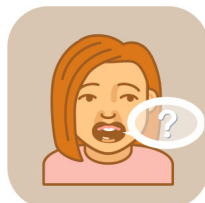
Does the face look uneven?
Numbness or weakness on one side
Loss of vision in one or both eyes;
Unusually severe headache.



Arms

Ask them to raise both arms

Does one of them drift down?
Dizziness or loss of balance.



Speech

Ask them to speak a simple phrase

Does their speech sound strange?
Inability to understand speech.



Time

Test these signs then call 911

Remember
Time is Brain

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