

STROKE

What is a stroke?

A stroke is serious, just like a heart attack. A stroke is sometimes called a "brain attack." Most often, stroke occurs when blood flow to the brain stops because it is blocked by a clot. When this happens, the brain cells in the immediate area begin to die.

Some brain cells die because they stop getting the oxygen and nutrients they need to function. Other brain cells die because they are damaged by sudden bleeding into or around the brain. The brain cells that don't die immediately remain at risk for death. These cells can linger in a compromised or weakened state for several hours. With timely treatment, these cells can be saved.

New treatments are available that greatly reduce the damage caused by a stroke. But you need to arrive at the hospital as soon as possible after symptoms start to prevent disability. Knowing stroke symptoms, calling 911 immediately, and getting to a hospital as quickly as possible are critical.

There are two kinds of stroke. The most common kind of stroke is called ischemic stroke. It accounts for approximately 80 percent of all strokes. An ischemic stroke is caused by a blood clot that blocks or plugs a blood vessel in the brain.

Blockages that cause ischemic strokes stem from three conditions:

- the formation of a clot within a blood vessel of the brain or neck, called thrombosis
- the movement of a clot from another part of the body, such as from the heart to the neck or brain, called an embolism
- a severe narrowing of an artery in or leading to the brain, called stenosis

The other kind of stroke is called hemorrhagic stroke. A hemorrhagic stroke is caused by a blood vessel that breaks and bleeds into the brain.

One common cause of a hemorrhagic stroke is a bleeding aneurysm. An aneurysm is a weak or thin spot on an artery wall. Over time, these weak spots stretch or balloon out due to high blood pressure. The thin walls of these ballooning aneurysms can rupture and spill blood into the space surrounding brain cells.

Artery walls can also break open because they become encrusted, or covered with fatty deposits called plaque, eventually lose their elasticity and become brittle, thin, and prone to cracking. Hypertension, or high blood pressure, increases the risk that a brittle artery wall will give way and release blood into the surrounding brain tissue.

What are the effects of a stroke?

Stroke damage in the brain can affect the entire body -- resulting in mild to severe disabilities. These include paralysis, problems with thinking, trouble speaking, and emotional problems.

A common disability that results from stroke is complete paralysis on one side of the body, called hemiplegia. A related disability that is not as debilitating as paralysis is one-sided weakness, or hemiparesis. The paralysis or weakness may affect only the face, an arm, or a leg, or it may affect one entire side of the body and face.

A stroke patient may have problems with the simplest of daily activities, such as walking, dressing, eating, and using the bathroom. Movement problems can result from damage to the part of the brain that controls balance and coordination. Some stroke patients also have trouble swallowing, called dysphagia.

Stroke may cause problems with thinking, awareness, attention, learning, judgment, and memory.

In some cases of stroke, the patient suffers a neglect syndrome. The neglect syndrome means that the stroke patient has no knowledge of one side of his or her body, or one side of the visual field, and is unaware of the problem. A stroke patient may be unaware of his or her surroundings, or may be unaware of the mental problems that resulted from the stroke.

Stroke victims often have a problem forming or understanding speech. This problem is called aphasia. Aphasia usually occurs along with similar problems in reading and writing. In most people, language problems result from damage to the left hemisphere of the brain.

Slurred speech due to weakness or incoordination of the muscles involved in speaking is called dysarthria, and is not a problem with language. Because it can result from any weakness or incoordination of the speech muscles, dysarthria can arise from damage to either side of the brain.

A stroke can also lead to emotional problems. Stroke patients may have difficulty controlling their emotions or may express inappropriate emotions in certain situations. One common disability that occurs with many stroke patients is depression.

Post-stroke depression may be more than a general sadness resulting from the stroke incident. It is a serious behavioral problem that can hamper recovery and rehabilitation and may even lead to suicide. Post-stroke depression is treated as any depression is treated, with antidepressant medications and therapy.

Stroke patients may experience pain, uncomfortable numbness, or strange sensations after a stroke. These sensations may be due to many factors, including damage to the sensory regions of the brain, stiff joints, or a disabled limb.

An uncommon type of pain resulting from stroke is called central stroke pain or central pain syndrome or CPS. CPS results from damage to an area called the thalamus. The pain is a mixture of sensations, including heat and cold, burning, tingling, numbness, and sharp stabbing and underlying aching pain.

The pain is often worse in the hands and feet and is made worse by movement and temperature changes, especially cold temperatures. Unfortunately, since most pain medications provide little relief from these sensations, very few treatments or therapies exist to combat CPS.

What are the warning signs of a stroke?

If you suffer a stroke, you may not realize it at first. The people around you might not know it, either. Your family, friends, or neighbors may think you are unaware or confused. You may not be able to call 911 on your own. That's why everyone should know the signs of stroke and know how to act fast.

Warning signs are clues your body sends to tell you that your brain is not receiving enough oxygen. If you observe one or more of the following signs of a stroke or "brain attack," don't wait. **Call a doctor or 911 right away!**

These are warning signs of a stroke:

- sudden numbness or weakness of the face, arm, or leg, especially on one side of the body
- sudden confusion, trouble speaking or understanding
- sudden trouble seeing in one or both eyes
- sudden trouble walking, dizziness, loss of balance or coordination
- sudden severe headache with no known cause

Other danger signs that may occur include double vision, drowsiness, and nausea or vomiting. Sometimes the warning signs may last only a few moments and then disappear. These brief episodes, known as transient ischemic attacks, or TIAs, are sometimes called "mini-strokes."

Although brief, TIAs identify an underlying serious condition that isn't going away without medical help. Unfortunately, since they clear up, many people ignore them. Don't ignore them. Heeding them can save your life.

Don't wait for the symptoms to improve or worsen. If you believe you are having a stroke or someone you know is having a stroke, call 911 immediately. Making the decision to call for medical help can make the difference in avoiding a lifelong disability.

This simple test will help you detect stroke symptoms and **Act F.A.S.T.:**

F = FACE

Ask the person to smile. Does one side of the face droop?

A = ARMS

Ask the person to raise both arms. Does one arm drift downward?

S = SPEECH

Ask the person to repeat a simple sentence. Does the speech sound slurred or strange?

T = TIME

If you observe any of these signs, it's time to call 9-1-1 or get to the nearest stroke center or hospital.

Source: National Stroke Organization

REMEMBER: St. Anthony's is one of only two hospitals in the St. Louis metro area with a nationally accredited Primary Stroke Center. To be certified as a Primary Stroke Center, a hospital must clearly show that it has the expertise and technological resources to quickly diagnose and treat any type of stroke within one hour of arrival. Speed is critical. For the best outcomes, most stroke patients must be treated within three (3) hours after a stroke has occurred.

What are the risk factors of a stroke?

A risk factor is a condition or behavior that increases your chances of getting a disease. Having a risk factor for stroke doesn't mean you'll have a stroke. On the other hand, not having a risk factor doesn't mean you'll avoid a stroke. But your risk of stroke grows as the number and severity of risk factors increase.

High blood pressure, also called hypertension, is by far the most potent risk factor for stroke. If your blood pressure is high, you and your doctor need to work out an individual strategy to bring it down to the normal range. Here are some ways to reduce blood pressure:

- Maintain proper weight.
- Avoid drugs known to raise blood pressure.

Ways to reduce blood pressure:

- Cut down on salt.
- Eat fruits and vegetables to increase potassium in your diet.
- Exercise more.

Your doctor may prescribe medicines that help lower blood pressure. Controlling blood pressure will also help you avoid heart disease, diabetes, and kidney failure.

Cigarette smoking has been linked to the buildup of fatty substances in the carotid artery, the main neck artery supplying blood to the brain. Blockage of this artery is the leading cause of stroke in Americans. Also, nicotine raises blood pressure, carbon monoxide reduces the amount of oxygen your blood can carry to the brain, and cigarette smoke makes your blood thicker and more likely to clot.

Your doctor can recommend programs and medications that may help you quit smoking. By quitting -- at any age -- you also reduce your risk of lung disease, heart disease, and a number of cancers including lung cancer.

Heart disease, including common heart disorders such as coronary artery disease, valve defects, irregular heart beat, and enlargement of one of the heart's chambers, can result in blood clots that may break loose and block vessels in or leading to the brain. The most common blood vessel disease, caused by the buildup of fatty deposits in the arteries, is called atherosclerosis, also known as hardening of the arteries.

Your doctor will treat your heart disease and may also prescribe medication, such as aspirin, to help prevent the formation of clots. Your doctor may recommend surgery to clean out a clogged neck artery if you match a particular risk profile. A high level of total cholesterol in the blood is a major risk factor for heart disease, which raises your risk of stroke. Your doctor may recommend changes in your diet or medicines to lower your cholesterol.

Experiencing warning signs and having a history of stroke are also risk factors for stroke. Transient ischemic attacks, or TIAs, are brief episodes of stroke warning signs that may last only a few moments and then go away. If

you experience a TIA, get help at once. Most communities encourage those with stroke's warning signs to dial 911 for emergency medical assistance.

If you have had a stroke in the past, it's important to reduce your risk of a second stroke. Your brain helps you recover from a stroke by drawing on body systems that now do double duty. That means a second stroke can be twice as bad.

Having diabetes is another risk factor for stroke. You may think this disorder affects only the body's ability to use sugar, or glucose. But it also causes destructive changes in the blood vessels throughout the body, including the brain.

Also, if blood glucose levels are high at the time of a stroke, then brain damage is usually more severe and extensive than when blood glucose is well-controlled. Treating diabetes can delay the onset of complications that increase the risk of stroke.

Is a stroke preventable?

Stroke is preventable and treatable. A better understanding of the causes of stroke has helped people make lifestyle changes that have cut the stroke death rate nearly in half in the last two decades.

While family history of stroke plays a role in your risk, there are many risk factors you can control:

- If you have high blood pressure, work with your doctor to get it under control. Managing your high blood pressure is the most important thing you can do to avoid stroke.
- If you smoke, quit.
- If you have diabetes, learn how to manage it. Many people do not realize they have diabetes, which is a major risk factor for heart disease and stroke.
- If you are overweight, start maintaining a healthy diet and exercising regularly.

- If you have high cholesterol, work with your doctor to lower it. A high level of total cholesterol in the blood is a major risk factor for heart disease, which raises your risk of stroke.

How is a stroke diagnosed?

Physicians have several diagnostic techniques and imaging tools to help diagnose stroke quickly and accurately. The first step in diagnosis is a short neurological examination, or an evaluation of the nervous system.

When a possible stroke patient arrives at a hospital, a health care professional, usually a doctor or nurse, will ask the patient or a companion what happened and when the symptoms began. Blood tests, an electrocardiogram, and a brain scan such as computed tomography or CT, or magnetic resonance imaging or MRI, will often be done.

One test that helps doctors judge the severity of a stroke is the standardized NIH Stroke Scale, developed by the National Institute of Neurological Disorders and Stroke at the National Institutes of Health, or NIH. Health care professionals use the NIH Stroke Scale to measure a patient's neurological deficits by asking the patient to answer questions and to perform several physical and mental tests.

Other scales include the Glasgow Coma Scale, the Hunt and Hess Scale, the Modified Rankin Scale, and the Barthel Index.

Health care professionals also use a variety of imaging devices to evaluate stroke patients. The most widely used imaging procedure is the computed tomography or CT scan, also known as a CAT scan. A CT scan creates a series of cross-sectional images of the head and brain.

Because it is readily available at all hours at most major hospitals and produces images quickly, the CT scan is the most commonly used diagnostic technique for acute stroke. A CT scan also has unique diagnostic benefits. It will quickly rule out a hemorrhage, and can occasionally show a tumor that might mimic a stroke.

A CT scan may even show evidence of early infarction -- an area of tissue that is dead or dying due to a loss of blood supply. Infarctions generally

show up on a CT scan about six to eight hours after the start of stroke symptoms.

If a stroke is caused by hemorrhage, or bleeding into the brain, a CT scan can show evidence of this almost immediately after stroke symptoms appear. Hemorrhage is the primary reason for avoiding certain drug treatments for stroke, such as thrombolytic therapy, the only proven acute stroke therapy for ischemic stroke.

Thrombolytic therapy cannot be used until the doctor can confidently diagnose the patient as suffering from an ischemic stroke because this treatment might increase bleeding and could make a hemorrhagic stroke worse.

Another imaging technique used for stroke patients is the magnetic resonance imaging or MRI scan. MRI uses magnetic fields to detect subtle changes in the content of brain tissue. One effect of stroke is the slowing of water movement, called diffusion, through the damaged brain tissue, and MRI can show this type of damage within the first hour after the stroke symptoms start.

MRI and CT are equally accurate for determining when hemorrhage is present. The benefit of MRI over a CT scan is more accurate and earlier diagnosis of infarction, especially for smaller strokes. Also, MRI is more sensitive than CT for detecting other types of brain disease, such as brain tumor, that might mimic stroke. However, MRI cannot be performed in patients with certain types of metallic or electronic implants, such as pacemakers for the heart.

Although increasingly used in the emergency diagnosis of stroke, MRI is not immediately available at all hours in most hospitals, where CT is used for acute stroke diagnosis. Also, MRI takes longer to perform than CT, and may not be performed if it would significantly delay treatment.

What is the treatment for a stroke?

With stroke, treatment depends on the stage of the disease. There are three treatment stages for stroke: prevention, therapy immediately after stroke, and

rehabilitation after stroke. Stroke therapies include medications, surgery, and rehabilitation.

Medications

Medication or drug therapy is the most common treatment for stroke. The most popular kinds of drugs to prevent or treat stroke are antithrombotics -- which include antiplatelet agents and anticoagulants -- and thrombolytics

In treating a stroke that has just occurred, every minute counts. Ischemic strokes -- the most common kind -- can be treated with thrombolytic drugs. These drugs halt the stroke by dissolving the blood clot that is blocking blood flow to the brain. But a person needs to be at the hospital as soon as possible after stroke symptoms start to be evaluated and receive treatment.

A thrombolytic drug known as t-PA can be effective if a person receives it intravenously within 3 hours after his or her stroke symptoms have started. Since thrombolytic drugs can increase bleeding, t-PA should be used only after the doctor is certain that the patient has suffered an ischemic and not a hemorrhagic stroke.

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Antithrombotics prevent the formation of blood clots that can become stuck in an artery of the brain and cause strokes. Antiplatelet drugs prevent clotting by decreasing the activity of platelets, which are blood cells that help blood clot. By reducing the risk of blood clots, these drugs lower the risk of ischemic stroke.

In the case of stroke, doctors prescribe antiplatelet drugs mainly for prevention. The most widely known and used antiplatelet drug is aspirin. Other antiplatelet drugs include clopidogrel, ticlopidine, and dipyridamole.

Anticoagulants reduce the risk of stroke by reducing the clotting property of the blood. The most commonly used anticoagulants include warfarin, also known as Coumadin®, heparin, and enoxaparin, also known as Lovenox.

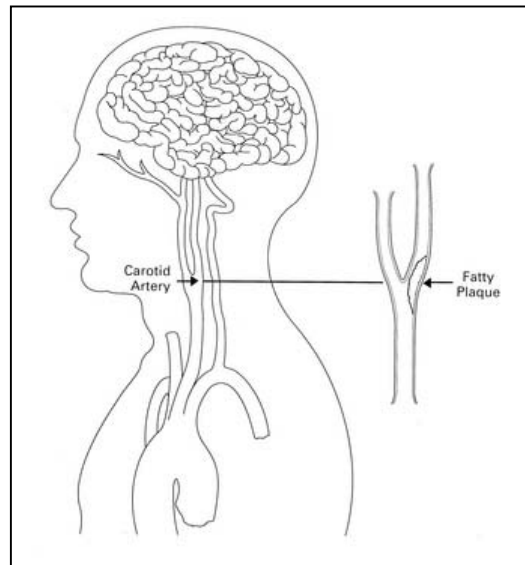
Neuroprotectants are medications that protect the brain from secondary injury caused by stroke. Although the Food and Drug Administration has not approved any neuroprotectants for use in stroke at this time, many are being tested in clinical trials.

There are several different types of neuroprotectants that show promise for future therapy, including glutamate antagonists, antioxidants, apoptosis inhibitors, and many others.

Surgery

Surgery can be used to prevent stroke, to treat stroke, or to repair damage to the blood vessels or malformations in and around the brain. The two most common types of surgery to prevent and treat stroke are carotid endarterectomy and extracranial/intracranial or EC/IC bypass. Extracranial refers to the area outside the cranium, or skull, and intracranial refers to the area inside the skull.

Carotid endarterectomy is a surgical procedure in which a doctor removes fatty deposits, or plaque, from the inside of one of the carotid arteries. The procedure is performed to prevent stroke. The carotid arteries are located in the neck and are the main suppliers of blood to the brain.



EC/IC bypass surgery is a procedure that restores blood flow to a blood-deprived area of brain tissue. The surgeon reroutes a healthy artery in the scalp to the area of brain tissue affected by a blocked artery.

The study showed that, in the long run, EC/IC does not seem to benefit these patients. The surgery is still performed occasionally for patients with an aneurysm, which is a weak or thin spot that develops on the wall of an artery or vein. Sometimes, doctors also perform EC/IC bypass on patients with some types of small artery disease or certain blood vessel abnormalities.

One useful surgical procedure for treatment of brain aneurysms that can cause hemorrhage, or bleeding, is a technique called "clipping." Clipping involves clamping off the aneurysm from the blood vessel, which reduces the chance that it will burst and bleed.

The detachable coil technique is a new therapy to treat high-risk intracranial aneurysms, or aneurysms that occur inside the skull. A small platinum coil is inserted through an artery in the thigh and threaded through the arteries to the site of the aneurysm. The coil is then released into the aneurysm, where it triggers an immune response from the body.

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This immune response causes a blood clot to form inside the aneurysm, strengthening the artery walls and reducing the risk of rupture. Once the aneurysm is stabilized, a neurosurgeon can clamp it off with less risk of bleeding and death to the patient.

Rehabilitation

Stroke is the number one cause of serious adult disability in the United States. Stroke disability is devastating to the stroke patient and family, but therapies are available to help rehabilitate patients after stroke.

For most stroke patients, rehabilitation mainly involves physical therapy. The aim of physical therapy is to have the stroke patient relearn simple motor activities such as walking, sitting, standing, lying down, and the process of switching from one type of movement to another.

To achieve this, stroke patients work with physical therapists who use training, exercises, and physical manipulation of the stroke patient's body to restore movement, balance, and coordination.

Another type of therapy to help patients relearn daily activities is occupational therapy. This type of therapy also involves exercise and training. Its goal is to help the stroke patient relearn everyday activities such as eating, drinking and swallowing, dressing, bathing, cooking, reading and writing, and toileting. Occupational therapists seek to help the patient become independent or semi-independent.

Speech and language problems arise when brain damage occurs in the language centers of the brain. Due to the brain's great ability to learn and change, which is called brain plasticity, other areas can adapt to take over some of the lost functions.

Speech therapy helps stroke patients relearn language and speaking skills, or learn other forms of communication. Speech therapy is appropriate for patients who have no problems with cognition or thinking, but have problems understanding speech or written words, or problems forming speech.

Besides helping with language skills, speech therapy also helps stroke patients develop coping skills to deal with the frustration of not being able to communicate fully. With time and patience, a stroke survivor should be able to regain some, and sometimes all, language and speaking abilities.

Many stroke patients require psychological or psychiatric help after a stroke. Psychological problems such as depression, anxiety, frustration, and anger are common disabilities in people who have suffered a stroke.

Talk therapy, along with the right medication, can help ease some of the mental and emotional problems that result from stroke. Sometimes it is

helpful for family members of the stroke patient to seek psychological help for themselves as well.

Additional information

- MedlinePlus Interactive Tutorial - *Preventing Strokes* -
<http://www.nlm.nih.gov/medlineplus/tutorials/preventingstrokes/html/index.htm>
- MedlinePlus Interactive Tutorial - *Stroke Rehabilitation* -
<http://www.nlm.nih.gov/medlineplus/tutorials/strokerehabilitation/html/index.htm>
- American Stroke Association -
<http://www.strokeassociation.org/presenter.jhtml?identifier=1200037>
- National Stroke Association -
<http://www.stroke.org/site/PageNavigator/HOME>
- St. Anthony's Medical Center - *Free Stroke Kit*-
http://stanthonysmedcenter.com/healthcareServ/neuro/order_kit.asp

Source: NIH.

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