

Stroke

A stroke is an interruption of the blood supply to any part of the brain. A stroke is sometimes called a "brain attack."

Causes

A stroke happens when blood flow to a part of the brain is interrupted because a blood vessel in the brain is blocked or bursts open.

If blood flow is stopped for longer than a few seconds, the brain cannot get blood and oxygen. Brain cells can die, causing permanent damage.

There are two major types of stroke: ischemic stroke and hemorrhagic stroke.

ISCHEMIC STROKE

Ischemic stroke occurs when a blood vessel that supplies blood to the brain is blocked by a blood clot. This may happen in two ways:

- A clot may form in an artery that is already very narrow. This is called a thrombus. If it completely blocks the artery, it is called a thrombotic stroke.
- A clot may break off from somewhere in the body and travel up to the brain to block a smaller artery. This is called an embolism. It causes an embolic stroke.
- Ischemic strokes may result from clogged arteries, a condition called atherosclerosis. (See: Stroke secondary to atherosclerosis) This may affect the arteries within the brain or the arteries in the neck that carry blood to the brain. Fat, cholesterol, and other substances collect on the wall of the arteries, forming a sticky substance called plaque. Over time, the plaque builds up. This often makes it hard for blood to flow properly, which can cause the blood to clot.
- Ischemic strokes may also be caused by blood clots that form in the heart. These clots travel through the blood and can get stuck in the small arteries of the brain. This is known as a cerebral embolism.
- Certain drugs and medical conditions can make your blood more likely to clot and raise your risk for ischemic stroke. A common cause of ischemic stroke in people under age 40 is carotid dissection, or a tear in the lining of the carotid artery. The tear lets blood flow between the layers of the carotid artery. This causes narrowing of the carotid artery that is not due to plaque buildup.

HEMORRHAGIC STROKE

Hemorrhagic stroke occurs when a blood vessel in part of the brain becomes weak and bursts open, causing blood to leak into the brain. Some people have defects in the blood vessels of the brain that make this more likely. The flow of blood that occurs after the blood vessel ruptures damages brain cells.

STROKE RISKS

- High blood pressure is the number one risk factor for strokes. The following also increase your risk for stroke:
 - Diabetes
 - Family history of stroke
 - Heart disease
 - High cholesterol
 - Increasing age
- Certain medications make blood clots more likely, and therefore your chances for a stroke. Birth control pills can increase the chances blood clots, especially in woman who smoke and who are older than 35.
- Men have more strokes than women. But, women have a risk of stroke during pregnancy and the weeks immediately after pregnancy.

The following can increase the risk of bleeding into the brain, which makes you more likely to have a stroke:

- Alcohol use
- Bleeding disorders
- Cocaine use
- Head injury

Symptoms

The symptoms of stroke depend on what part of the brain is damaged. In some cases, a person may not even be aware that he or she has had a stroke.

Symptoms usually develop suddenly and without warning, or they may occur on and off for the first day or two. Symptoms are usually most severe when the stroke first happens, but they may slowly get worse.

A headache may occur, especially if the stroke is caused by bleeding in the brain.

The headache:

Starts suddenly and may be severe

Occurs when lying flat

Wakes you up from sleep

Gets worse when you change positions or when you bend, strain, or cough
Other symptoms depend on the severity of the stroke and what part of the brain is affected. Symptoms may include:

- Muscle weakness in the face, arm, or leg (usually just one side)
- Numbness or tingling on one side of the body
- Trouble speaking or understanding others who are speaking
- Problems with eyesight, including decreased vision, double vision, or total loss of vision
- Sensation changes that affect touch and the ability to feel pain, pressure, different temperatures, or other stimuli
- Changes in hearing
- Change in alertness (including sleepiness, unconsciousness, and coma)
- Personality, mood, or emotional changes
- Confusion or loss of memory
- Difficulty swallowing
- Changes in taste
- Difficulty writing or reading
- Loss of coordination
- Loss of balance
- Clumsiness
- Trouble walking
- Dizziness or abnormal sensation of movement (vertigo)
- Lack of control over the bladder or bowels

Exams and Tests

A complete physical and neurological exam should be performed. Your doctor will:

- Check for problems with vision, movement, sensation, reflexes, understanding, and speaking. Your doctor and nurses will repeat this exam over time to see if your stroke is getting worse or is improving.
- Listen for an abnormal sound, called a "bruit," when using a stethoscope to listen to the carotid arteries in the neck. A bruit is caused by turbulent blood flow.
- Check and assess your blood pressure, which may be high.
- Tests can help your doctor determine the type, location, and cause of the stroke and to rule out other disorders that may be responsible for the symptoms.

- A CT scan of the brain is often done soon after symptoms of a stroke begin. An MRI scan of the brain may be done instead or afterwards.
- Magnetic resonance angiography (MRA) or CT angiography may be done to check for abnormal blood vessels in the brain that may have caused the stroke.
- Echocardiogram may be done if the stroke could have been caused by a blood clot from the heart.
- Carotid duplex (a type of ultrasound exam) can show if narrowing of the neck arteries (carotid stenosis) led to the stroke.
- An angiogram of the head can reveal which blood vessel is blocked or bleeding, and help your doctor decide if the artery can be reopened using a thin tube.
- Laboratory tests will include a complete blood count (CBC), bleeding time, and blood clotting tests (prothrombin time or partial thromboplastin time).
- Electrocardiogram (ECG) and heart rhythm monitoring can help determine if an irregular heart beat (such as atrial fibrillation) caused the stroke.
- A spinal tap (cerebrospinal fluid exam) may also be done.

Treatment

A stroke is a medical emergency. Immediate treatment can save lives and reduce disability. Call 911 or your local emergency number or seek immediate medical care at the first signs of a stroke.

It is important to get the person to the emergency room immediately to determine if the stroke is due to bleeding or a blood clot so appropriate treatment can be started within 3 hours of when the stroke began.

Treatment depends on the severity and cause of the stroke. A hospital stay is required for most strokes.

TREATMENT IN THE HOSPITAL

Clot-busting drugs (thrombolytic therapy) may be used if the stroke is caused by a blood clot. Such medicine breaks up blood clots and helps restore blood flow to the damaged area. However, not everyone can receive this type of medicine.

For these drugs to work, a person must be seen and treatment must begin within 3 hours of when the symptoms first started. A CT scan must be done to see whether the stroke is from a clot or from bleeding.

If the stroke is caused by bleeding rather than clotting, clot-busting drugs (thrombolytics) can cause more bleeding.

Other treatments depend on the cause of the stroke:

Blood thinners such as heparin or warfarin (Coumadin) are used to treat strokes

due to blood clots. Aspirin or clopidogrel (Plavix) may also be used.

Other medications may be needed to control other symptoms, including high blood pressure. Painkillers may be given to control severe headache.

In some situations, a special stroke team and skilled radiologists may be able to use angiography to highlight the clogged blood vessel and open it up.

For hemorrhagic stroke, surgery is often required to remove blood from around the brain and to repair damaged blood vessels.

Surgery on the carotid artery may be needed. See also Carotid artery disease and Carotid artery surgery.

Nutrients and fluids may be necessary, especially if the person has swallowing difficulties. These may be given through a vein (intravenously) or a feeding tube in the stomach (gastrostomy tube). Swallowing difficulties may be temporary or permanent.

Physical therapy, occupational therapy, speech therapy, and swallowing therapy will all begin in the hospital.

LONG-TERM TREATMENT

The goal of long-term treatment is to help the patient recover as much function as possible and prevent future strokes. The recovery time and need for long-term treatment differs from person to person. Depending on the symptoms, rehabilitation may include:

- Occupational therapy
- Physical therapy
- Speech therapy
- Therapies such as repositioning and range-of-motion exercises can help prevent complications related to stroke, such as infection and bed sores. Those who have had a stroke should try to remain as active as physically possible.
Alternative forms of communication such as pictures, verbal cues, and other techniques may be needed in some cases.
- Sometimes, urinary catheterization or bladder and bowel control programs may be needed to control incontinence.
A safe environment must be considered. Some people with stroke appear to have no awareness of their surroundings on the affected side. Others show indifference or lack of judgment, which increases the need for safety precautions.
- Caregivers may need to show the person pictures, repeatedly demonstrate how to perform tasks, or use other communication strategies, depending on the type and extent of the language problems.

- In-home care, boarding homes, adult day care, or convalescent homes may be required to provide a safe environment, control aggressive or agitated behavior, and meet medical needs.
- Family counseling may help in coping with the changes required for home care. Visiting nurses or aides, volunteer services, homemakers, adult protective services, and other community resources may be helpful.
- Legal advice may be appropriate. Advance directives, power of attorney, and other legal actions may make it easier to make ethical decisions regarding the care of a person who has had a stroke.

See also: Stroke recovery

Support Groups

Additional support and resources are available from the American Stroke Association -- www.strokeassociation.org.

Outlook (Prognosis)

The outlook depends on the type of stroke, how much brain tissue is damaged, what body functions have been affected, and how quickly treatment is received. Recovery may occur completely, or there may be some permanent loss of function. Over half of the people who have a stroke are able to function independently at home.

If treatment with clot-busting drugs is successful, the symptoms of a stroke may completely go away. However, patients do not often arrive at the hospital soon enough to receive these drugs, or there are complicating medical conditions that preclude their use.

People who have an ischemic stroke (stroke due to a blood clot) have a better chance of surviving than those who have a hemorrhagic stroke (stroke due to bleeding in the brain).

The risk for a second stroke is highest over the first few weeks or months after the first stroke and then begins to lessen.

Possible Complications

- Breathing in a food into the airway (aspiration)
- Decreased life span
- Difficulty communicating
- Permanent loss of brain functions
- Permanent loss of movement or sensation in one or more parts of the body
- Problems due to loss of mobility, including joint contractures and pressure sores

- Fractures
- Malnutrition
- Muscle spasticity
- Reduced ability to function or care for self
- Reduced social interactions
- Side effects of medications

When to Contact a Medical Professional

Stroke is a medical emergency that requires immediate treatment. Call your local emergency number (such as 911) if someone has symptoms of a stroke.

Prevention

To help prevent a stroke:

- Avoid fatty foods. Follow a healthy, low-fat diet.
- Do not drink more than 1 to 2 alcoholic drinks a day.
- Exercise regularly: 30 minutes a day if you are not overweight; 60 - 90 minutes a day if you are overweight.
- Get your blood pressure checked every 1 - 2 years, especially if high blood pressure runs in your family.
- Have your cholesterol checked. If you are at high risk for stroke, your LDL "bad" cholesterol should be lower than 100 mg/dL. Your doctor may recommend that you try to reduce your LDL cholesterol to 70 mg/dL. Follow your doctor's treatment recommendations if you have high blood pressure, diabetes, high cholesterol, and heart disease.
- Quit smoking.
- Aspirin therapy (81mg a day or 100mg every other day) is recommended for stroke prevention in women under 65 as long as the benefits outweigh the risks. It should be considered for women over age 65 only if their blood pressure is controlled and the benefit is greater than the risk of gastrointestinal bleeding and brain hemorrhage. Ask your doctor if aspirin is right for you.
- Your doctor may also recommend aspirin therapy or another blood thinner if you have had a transient ischemic attack (TIA) or stroke in the past or if you currently have:
 - Congestive heart failure
 - Irregular heart beat (such as atrial fibrillation)
 - Mechanical heart valve
 - Other risk factors for stroke

- A type of surgery called carotid endarterectomy may help prevent new strokes from occurring in persons with large blockages in their neck arteries.