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Patient education: Stroke symptoms and diagnosis (Beyond the Basics)

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STROKE OVERVIEW — Stroke is the term doctors use when a part of the brain dies because it goes without blood for too long. There are two main types of stroke: ischemic stroke, which caused by a blockage in a blood vessel in the brain, and hemorrhagic stroke, which is caused by bleeding in the brain or surrounding area. (See ["Etiology, classification, and epidemiology of stroke"](#).)

In the United States, approximately 750,000 strokes happen each year, most of which are caused by a blockage in a blood vessel. Strokes can cause long-lasting disability or even death. However, early treatment and preventive measures can reduce the brain damage that occurs because of stroke.

The symptoms of a stroke usually begin suddenly but sometimes develop over hours or days, depending upon the type of stroke. In both ischemic and hemorrhagic stroke, one or more areas of the brain can be damaged. Depending upon the area affected, a person may lose the ability to move one side of the body, the ability to speak, or a number of other functions.

The damage from a stroke may be temporary or permanent. A person's long term outcome depends upon how much of the brain is damaged, how quickly treatment begins, and several other factors.

TYPES OF STROKE — There are two main types of stroke: ischemic and hemorrhagic

Ischemic stroke — Ischemic strokes are caused by a blockage (clog) in one of the blood vessels that supply oxygen and other important nutrients to the brain. If the artery remains blocked for more than a few minutes, and enough blood can't get through, the brain can become damaged. The majority of strokes are ischemic.

There are two main subtypes of ischemic stroke, thrombotic and embolic.

Thrombotic stroke — A thrombotic stroke results from a problem within an artery (blood vessel) that supplies blood to the brain. This is most likely to occur in arteries that are clogged with fatty deposits, called plaques. Plaques partially block the artery, and can rupture and bleed, forming a blood clot. This blood clot ("thrombus") can further clog or completely block the artery, which then slows or prevents blood flow to the area of brain fed by that artery. Blood clotting disorders can also cause clots to form within arteries in some people.

Embolic stroke — An embolic stroke occurs when a blood clot or other particle travels from another part of the body (often the heart) through the bloodstream to the brain where it lodges in a smaller blood vessel. The blood clot or particle, called an "embolus," then blocks blood flow to that area of the brain, reducing the amount of oxygen and nutrients that reach that area. One of the most common causes of embolic strokes is an irregular heart rhythm called "atrial fibrillation." Emboli can also originate in the aorta and in the arteries within the neck and head and travel further along within arteries within the brain. (See ["Patient education: Atrial fibrillation \(Beyond the Basics\)"](#) and ["Patient education: The antiphospholipid syndrome \(Beyond the Basics\)"](#).)

Transient ischemic attack (TIA) — Transient ischemic attacks are episodes in which a person has signs or symptoms of a stroke (eg, numbness; inability to speak) that last for a short time, but without any sign of stroke on brain scans such as MRI or CT. Symptoms of a TIA usually last between a few minutes and a few hours. A person may have one or many TIAs. People recover completely from the symptoms of a TIA.

A TIA is a warning sign that a person is at high risk for a stroke; immediate treatment can decrease or eliminate this risk. It is important to get help right away if you think you may be having a TIA or a stroke.

Hemorrhagic stroke — Hemorrhagic strokes occur when blood vessels in the brain leak or rupture (break), causing bleeding in or around the brain. "Hemorrhage" is the medical term for bleeding. This can lead to pressure within the head, which can cause damage to the brain. Also, blood is irritating to the brain tissue, and can cause it to swell.

There are two main subtypes of hemorrhagic stroke, intracerebral and subarachnoid.

Intracerebral hemorrhage — In an intracerebral hemorrhage (ICH), bleeding occurs within the brain. This damages the brain as blood collects and puts pressure on the surrounding tissue. Some common causes of ICH include:

- High blood pressure
- Injury
- Bleeding disorders
- Deformities in blood vessels, such as an aneurysm (a weakening in the lining of the blood vessel)

Subarachnoid hemorrhage — Subarachnoid hemorrhage occurs when a blood vessel on the surface of the brain ruptures. The blood builds up and causes pressure in the "subarachnoid" space, which is between two layers of the tissue covering the brain. The most common symptom of a subarachnoid hemorrhage is a severe headache called "thunderclap headache," which many patients describe as the worst headache of their life. (See ["Patient education: Headache causes and diagnosis in adults \(Beyond the Basics\)"](#).)

STROKE RISK FACTORS — There are a number of risk factors for stroke; some of these factors increase the risk of one type of stroke (hemorrhagic or ischemic), while others increase the risk of both types.

Ischemic stroke risk factors include the following:

- Age older than 40 years
- Heart disease
- High blood pressure
- Smoking
- Diabetes
- High blood cholesterol levels
- Illegal drug use
- Recent childbirth

- Previous history of transient ischemic attack
- Inactive lifestyle and lack of exercise
- Obesity
- Current or past history of blood clots
- Family history of cardiac disease and/or stroke

Hemorrhagic stroke risk factors include the following:

- High blood pressure
- Smoking
- Illegal drug use (especially cocaine and "crystal meth")
- Use of warfarin or other blood thinning medicines

Risk factors can increase the risk of stroke, but strokes can happen in people who don't know that they are at risk. In some cases, the stroke may be due to problems with the blood vessels in the brain or the blood itself. For example:

- A hemorrhagic stroke can occur if a person has an aneurysm (a weakness in a blood vessel wall), even if this has never caused symptoms in the past.
- An ischemic stroke may occur in a healthy person who takes certain medications (for example, estrogen replacement therapy increases the risk of blood clots).

Occasionally, strokes occur in people who have no risk factors.

STROKE SYMPTOMS — Signs and symptoms of stroke often develop suddenly and then may temporarily improve or slowly worsen, depending upon the type of stroke and area of the brain affected.

Classic symptoms — Knowing the signs and symptoms of a stroke can be lifesaving. Classic stroke symptoms can be recalled with the acronym **FAST** ([figure 1](#)). Each letter in the word stands for one of the things you should watch for:

- Face – Sudden weakness or droopiness of the face, or problems with vision
- Arm – Sudden weakness or numbness of one or both arms
- Speech – Difficulty speaking, slurred speech, or garbled speech
- Time – Time is very important in stroke treatment. The sooner treatment begins, the better the chances are for recovery. Therefore, call an ambulance (dial 9-1-1 in the US and Canada) right away.

Signs and symptoms of a stroke may be similar to other conditions; the only way to know for sure is to be seen as soon as possible by an experienced doctor or nurse.

When to call for emergency medical assistance — A stroke is a medical emergency. If you think you or someone around you may be having a stroke, call 9-1-1 immediately. Do not try to drive yourself to the hospital. (See ["Initial assessment and management of acute stroke"](#).)

Emergency medical services (EMS) workers will respond as quickly as possible, and will take you to a hospital that can care for people during and after a stroke. For a person having a stroke, every minute is important. It is important to call 9-1-1 in this situation because:

- From the moment EMS workers arrive, they can begin evaluating and treating you. If you drive yourself to the hospital or have someone else drive you, treatment cannot begin until after you arrive in the emergency department.

- If a dangerous complication of a stroke (eg, a seizure or loss of consciousness) occurs on the way to the hospital, EMS workers may be able to treat the problem immediately.

STROKE DIAGNOSIS — Anyone who has signs or symptoms of a stroke needs immediate medical attention in an emergency department or hospital. Most clinics and medical offices do not have the ability to perform the tests needed to diagnose stroke, or the ability to provide the specialized treatment(s) needed to limit damage to the brain. (See "[Overview of the evaluation of stroke](#)" and "[Initial assessment and management of acute stroke](#)".)

Blood tests and brain imaging — After doing a physical exam and reviewing the patient's history, the doctor or nurse usually orders blood tests and an imaging test (eg, CT scan or MRI scan) of the brain and the surrounding blood vessels in the neck and head that supply the brain with blood. The imaging allows the doctor or nurse to see the area of the brain affected by the stroke, as well as to confirm the type of stroke (ischemic or hemorrhagic). Other tests may be done as well.

Occasionally, a catheter must be inserted through a blood vessel in the groin and threaded up to the blood vessels of the neck, where dye is injected to highlight any areas of blockage.

Heart testing — An electrocardiogram (ECG) is performed in most people who are thought to be having a stroke. Because many people with ischemic strokes also have coronary artery disease, there may be a lack of blood flow (called "ischemia") in the heart during the stroke. In some cases, the person may not be able to tell the clinician that he or she feels chest pain. The ECG will help the clinician to diagnose and treat any heart problems as quickly as possible.

Other heart testing may also be recommended, such as an echocardiogram. This test uses sound waves to examine the heart and the aorta (the main artery that supplies the whole body). In some people with embolic strokes, the heart or the aorta is the source of the blood clot that led to the stroke. As an example, a heart rhythm problem called atrial fibrillation is a high-risk condition for blood clot formation and ischemic stroke. Some people have occasional episodes of atrial fibrillation but are not aware of it, and it may not show up on routine heart tests such as the ECG. Therefore, doctors often use continuous cardiac monitoring to look for atrial fibrillation and other heart rhythm problems for the first day or two when patients are in the hospital for a stroke. In some cases, patients will need to wear a small portable cardiac monitor for a period of time after the stroke to see if they have episodes of atrial fibrillation. (See "[Patient education: Atrial fibrillation \(Beyond the Basics\)](#)".)

STROKE TREATMENT — The treatment of a stroke depends upon the type of stroke, the time that has passed since the first symptoms occurred, and the patient's other medical problems. Information about treatment is provided separately. (See "[Patient education: Hemorrhagic stroke treatment \(Beyond the Basics\)](#)" and "[Patient education: Ischemic stroke treatment \(Beyond the Basics\)](#)".)

OUTCOME AFTER STROKE — The effects of a stroke can be temporary or permanent, and a person may lose function partially or completely. The medical team caring for the patient can give guidance to family members regarding the risk of long term disability or death. However, the outcome can vary greatly from person to person, and it is not always possible to predict what will happen.

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

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

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

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

[Patient education: Hemorrhagic stroke \(The Basics\)](#)

[Patient education: Stroke \(The Basics\)](#)

[Patient education: Subarachnoid hemorrhage \(The Basics\)](#)

[Patient education: Transient ischemic attack \(The Basics\)](#)

[Patient education: Arteriovenous malformations in the brain \(The Basics\)](#)

[Patient education: High blood pressure emergencies \(The Basics\)](#)

[Patient education: Aphasia \(The Basics\)](#)

[Patient education: Recovery after stroke \(The Basics\)](#)

[Patient education: Prosthetic valves \(The Basics\)](#)

[Patient education: Aortic dissection \(The Basics\)](#)

[Patient education: Medicines for atrial fibrillation \(The Basics\)](#)

[Patient education: Patent foramen ovale \(The Basics\)](#)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

[Patient education: Atrial fibrillation \(Beyond the Basics\)](#)

[Patient education: The antiphospholipid syndrome \(Beyond the Basics\)](#)

[Patient education: Headache causes and diagnosis in adults \(Beyond the Basics\)](#)

[Patient education: Hemorrhagic stroke treatment \(Beyond the Basics\)](#)

[Patient education: Ischemic stroke treatment \(Beyond the Basics\)](#)

Professional level information — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

[Antiplatelet therapy for secondary prevention of stroke](#)

[Atrial fibrillation: Anticoagulant therapy to prevent embolization](#)

[Cardiac complications of stroke](#)

[Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy \(CADASIL\)](#)

[Cerebrovascular disorders complicating pregnancy](#)

[Clinical diagnosis of stroke subtypes](#)

[Clinical manifestations and diagnosis of aneurysmal subarachnoid hemorrhage](#)

[Cryptogenic stroke](#)

[Decompressive hemicraniectomy for malignant middle cerebral artery territory infarction](#)

[Definition, etiology, and clinical manifestations of transient ischemic attack](#)

[Differential diagnosis of transient ischemic attack and stroke](#)

[Etiology, classification, and epidemiology of stroke](#)

[Etiology, clinical features, and diagnosis of cerebral venous thrombosis](#)

[Reperfusion therapy for acute ischemic stroke](#)

[Headache, migraine, and stroke](#)

[Initial assessment and management of acute stroke](#)

[Initial evaluation and management of transient ischemic attack and minor ischemic stroke](#)

[Spontaneous intracerebral hemorrhage: Pathogenesis, clinical features, and diagnosis](#)
[Spontaneous intracerebral hemorrhage: Treatment and prognosis](#)
[Intracranial large artery atherosclerosis](#)
[Intravenous fibrinolytic \(thrombolytic\) therapy in acute ischemic stroke: Therapeutic use](#)
[Lacunar infarcts](#)
[Medical complications of stroke](#)
[Overview of secondary prevention of ischemic stroke](#)
[Neuroimaging of acute ischemic stroke](#)
[Overview of the evaluation of stroke](#)
[Posterior circulation cerebrovascular syndromes](#)
[Secondary prevention for specific causes of ischemic stroke and transient ischemic attack](#)
[Treatment of aneurysmal subarachnoid hemorrhage](#)

The following organizations also provide reliable health information.

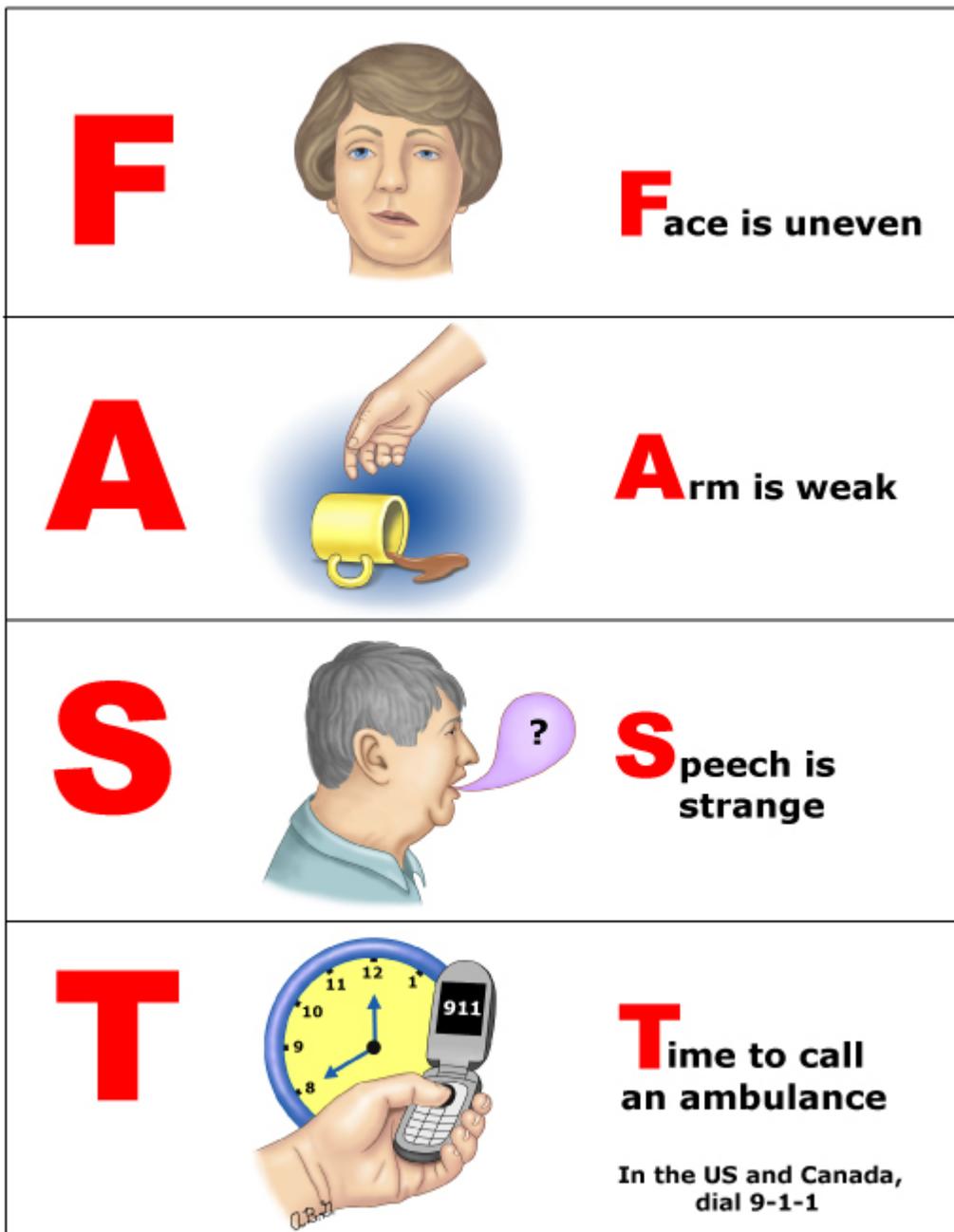
- National Library of Medicine
(www.nlm.nih.gov/medlineplus/healthtopics.html)
- National Institute of Neurological Disorders and Stroke
(www.ninds.nih.gov/disorders/stroke/stroke.htm)
- American Stroke Association
(www.strokeassociation.org)

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GRAPHICS

Signs of stroke



The letters in the word "fast" help you remember the signs of stroke. If a person shows any of these signs, call an ambulance right away. In the US and Canada, dial 9-1-1.

Graphic 73487 Version 3.0

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