

## Strokes in Children

A stroke is a brain injury caused by lack of blood flow in a brain artery. A stroke can result from abnormal blood clots, heart problems, changes in blood vessels or injury to blood vessels. Sometimes strokes lead to bleeding in the brain. Strokes can happen to people of any age. Strokes in children can be difficult to diagnose because other neurologic problems have similar symptoms.

### Kinds of Strokes

There are two types of strokes, ischemic (iss-KEEM-ick) stroke and hemorrhagic (hem-or-AJ-ick) stroke. Either of these types of strokes results in brain injury.

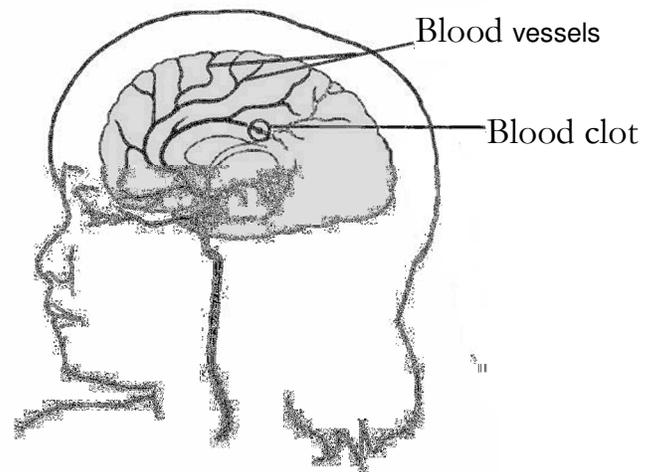
**Ischemic stroke** can be caused by a blood clot or by abnormal blood flow. Blood clots can form in the heart or in blood vessels. If the clot travels to a blood vessel in the brain, it can block blood flow. This can lead to brain injury. It is important we determine the cause of an ischemic stroke so we can offer the appropriate treatment.

**Hemorrhagic stroke** is caused by injury to a blood vessel. Sometimes, when we see a hemorrhagic stroke, we find a blood vessel abnormality such as an aneurysm (AN-yer-izm).

### Signs and Symptoms

It is important to know that different strokes can cause different signs and symptoms. When a child is having a stroke, you may see one or more of these signs come on suddenly:

- Cannot move one side of the body or one limb
- May have a seizure
- A bad headache (“worst headache of child’s life”)
- May not be aware of what is going on around him
- Cannot understand simple ideas or instructions
- May have trouble speaking or swallowing
- May have a change in vision



**Picture 1** A blood clot in the brain can cause an ischemic stroke.

## When to Call the Doctor

If you suspect your child could be having a stroke, call 911 and have the child taken to the emergency room. If emergency transport services are not available, take your child to the nearest hospital emergency room yourself.

## Diagnosis

A stroke is diagnosed by considering the child's clinical history, neurological exam and the results of certain tests. Tests that may be done include CT scan (computed tomography). Usually, this test is done first because it is quick and readily available. The MRI (magnetic resonance imaging) is more sensitive to small changes in the brain and in blood vessels. It gives a better picture but takes more time, and in many cases, the child needs to be sedated. Both the CT scan and the MRI take a picture of the child's brain.

MRA (magnetic resonance angiogram), CT angiography, MRV (magnetic resonance venography) and angiogram are tests that we use to look at the blood vessels in the brain. We perform different imaging tests, depending on the type of stroke and the child's clinical history.

## Causes of Stroke

It can be difficult to figure out why a child had a stroke. However, it is important to try to find the cause so we can decide on an appropriate treatment and try to reduce the risk of future strokes.

### Common causes of ischemic stroke are:

- Blood clots from the heart - Blood clots can form in the heart or pass through a hole in the heart and travel to the brain. This can occur if there is congenital heart disease, problems in the heart valves or infection in the heart. We treat this condition by correcting the heart problem (if possible) and by giving antibiotics or blood thinners if needed.
- Sickle cell disease (SCD) - We do not know why some children with SCD have strokes, but we have methods of determining stroke risk (such as transcranial Doppler). We also have treatments such as blood transfusion for high-risk children. Refer to the Helping Hand, *Sickle Cell Disease and Stroke*, HH-I-222.
- Trauma - An event that injures large vessels and can cause a tear in the lining of the vessel. Then a clot forms.
- Infection
- Abnormal blood vessels
- Certain genetic disorders that can make bleeding more likely

## Causes of Stroke, continued

### Common causes of hemorrhagic stroke are:

- Abnormal blood vessels of the brain
- Loss of blood clotting factors
- Lack of the kind of blood cells that stop bleeding
- Tumors
- Bleeding disorders such as hemophilia
- Infection
- Premature birth - The child's blood vessels are fragile and/or immature.
- Injury

## What to Expect after Diagnosis and Immediate Treatment

- When the cause of stroke is not known, we often perform additional testing which may include blood tests, further brain imaging, an echocardiogram (looking at the heart) or a spinal tap (lumbar puncture). We also may involve other medical specialists to help with the evaluation.
- Your child's vital signs will be taken and neurological checks will be done to monitor his or her progress.
- Your child will be watched closely for any other problems such as seizures, increased pressure in the brain and another stroke occurring.
- If we find the cause of the stroke, there may be specific treatment for the cause. Right after a stroke, some children need treatment to improve oxygen and blood supply to the brain. If blood flow to the brain is blocked, medicines may be used to open the blockage.

## Follow Up with the Health Care Team

Our multi-disciplinary stroke team includes pediatric specialists in the areas of Neurology, Hematology, Neuroradiology, Neuropsychology, Occupational Therapy, Physical Therapy, Speech Therapy and other medical specialists as needed. We will address all diagnostic and treatment issues relevant to your child's care. When your child leaves the hospital, follow up in our Pediatric Stroke Clinic will be arranged.

- Follow-up will be arranged with the Stroke Team after discharge from the hospital. There may be other appointments for rehabilitation therapy as well as the Stroke Team appointment.
- When your child is seen in Stroke Clinic, we will look for signs of another stroke and adjust medicines if needed. We will watch for spasticity and changes in behavior and thinking skills and will direct him or her toward therapy.
- Further testing will be arranged as needed.

## **Long-Term Treatment**

Treatment depends on the causes of the stroke. Drugs that may be used include blood thinners and other medicines that prevent clots. In a few cases, surgery might be needed

Your child may need intensive therapy right after the stroke. When your child is stable, he or she might be transferred to the rehabilitation medicine service for further therapy. During rehabilitation, a combination of medicines and therapies will be used to help with recovery. If you have any questions, be sure to ask your child's doctor or nurse.

## **Pediatric Stroke Resources:**

Pediatric Stroke Network: [www. Pediatricstrokenetwork.com](http://www.Pediatricstrokenetwork.com)

Hemikids: [www.hemikids.org](http://www.hemikids.org)

Children's Hemiplegia and Stroke Association: [www.chasa.org](http://www.chasa.org)

Sickle Cell disease Association of America: [www.sicklecelldisease.org](http://www.sicklecelldisease.org)