How to Diagnose a Stroke

Expert Reviewed

Most strokes occur when the blood supply to part of the brain is cut off or reduced, which deprives neurons and other tissues of oxygen and nutrients.[1] Within minutes, brain cells begin to die without enough oxygen, leading to brain damage, physical impairment and sometimes death. Each year in the U.S., there are almost 800,000 strokes and they are the fourth leading cause of death.[2] Knowing the physical signs of a stroke can get medical help on their way quicker and potentially save a life. Confirming a stroke at the hospital with various tests is necessary in order to get the most appropriate treatment.

Part 1 Identifying the Physical Signs of a Stroke

1 **Know when to see a doctor or call 9-1-1.** You need to seek **immediate** medical attention if you notice any of the following signs or symptoms of a stroke in people around you, or if you experience them yourself — even if they fluctuate or disappear.[3] Call or have someone else call 9-1-1 (or your local emergency number) immediately and don't wait to see if the symptoms get better or go away. Even if they do, you will still need to be evaluated by a doctor.

- Every minute counts because the longer a stroke goes untreated, the greater the likelihood of permanent brain damage and disability.
- A good acronym to remember if you suspect someone around you is having a stroke is "FAST," which stands for:
  - **F**ace. Ask the person to smile and see if one side of the face drops.
  - **A**rms. Ask the person to raise both arms and see if one arm doesn't move or drifts downward.
  - **S**peech. Ask the person to repeat a simple phrase and see if their speech is slurred or odd sounding.
  - **T**ime. If you observe any of these signs, don't waste time and call paramedics immediately.

2 **Listen for trouble speaking.** The speech centers of the brain are often affected by strokes, so one the most noticeable signs is trouble speaking or a complete inability to verbally communicate.[4] The stroke victim may slur their words, stutter, speak gibberish or be unable to utter a sound. A look of panic often flashes on the person's face when they realize something is seriously wrong.

- If a person near you has suddenly fallen silent and has a panicky or confused look on their face, ask them what's wrong and how they're feeling.
- Make sure the person isn't drunk, as that condition can sometimes mimic a stroke.

3 **Watch for signs of confusion.** Another common sign of a stroke, and also related to damage to the communication centers of the brain, is confusion and difficulty understanding a conversation.[5] The stroke victim may have a blank look on their face or be frowning as you speak to them. This is why asking a person if they're having a stroke is rarely fruitful — they often can't understand you or they can't speak.

- Ask them simply questions that children can normally answer. In addition to asking them if they're okay, ask what day of the week it is or what their favorite color is. If they can't answer, they're suffering from some sort of brain injury.
- It's important to make note of when the suspicious signs and symptoms begin because that can give paramedics and doctors an idea of how long the brain cells have been without oxygen.

4 **Look for paralysis of the face.** Paralysis in the muscles of the face are a common consequence of strokes because the neurons / nerves that control the muscles get damaged.[6] It's particularly noticeable around the eyes and corners of the mouth on the same side of the face — you'll see the muscles and attached skin droop. If you suspect a person is experiencing a stroke, ask them to smile or stick out their tongue. If they can understand you, their

smile will look crooked and their tongue will deviate to one side.

- Paralysis from a stroke occurs on the same side of the face and body, either on the left or right side, not a mixture of both.
- Strokes in the right hemisphere of the brain affect the left side of the face / body, whereas strokes in the left hemisphere always affect the right side.[7]

5 **Notice if they have trouble walking or lifting things.** As hinted at above, paralysis of the legs and arms also occur with strokes, especially if the injury is in the left hemisphere of the brain — so right-sided paralysis is more common.[8] The paralyzed leg will look and act dead, usually internally rotating so the toes point towards the opposite foot. The paralyzed arm usually flexes at the elbow and wrist, looking like it's in a sling.

- Not surprisingly, walking is difficult and looks clumsy as the leg is dragged behind. Holding things with the affected hand is virtually impossible and the person is unable to write.
- Due to poor balance and coordination, falling and breaking a hip or fracturing the skull is a very real among people who have had or are experiencing a stroke. Keep the person calm and still, and try to keep them from walking or moving around as much as possible.
- If a person can't raise both hands over their head at the same time it's evidence of a stroke or other type of brain injury.
- Related to paralysis in the limbs and face (and usually occurring along with it) are numbness (pins and needles) and weakness.

6 **Ask if they have a splitting headache or visual problems.** Other common signs of a stroke that are more difficult to notice outwardly are a splitting headache and visual problems.[9] Headaches are often described as sudden and severe and sometimes accompanied by vomiting and dizziness. Vision may become blurred or blacked out in one or both eyes. Double vision isn't uncommon either.

- The headache associated with strokes can mimic a migraine. In fact, people who suffer from chronic migraines are at greater risk of having strokes.
- Like all the symptoms mentioned above, visual disturbance or even blindness is not always permanent in stroke victims. Signs and symptoms can quickly resolve themselves as the blockage in the brain disappears or if treatment such as blood thinners is given in a reasonable amount of time (within an hour).

Part 2 Getting a Medical Diagnosis

1 **Get a physical exam.** Once you're rushed to a hospital or emergency clinic, you'll get a physical exam in order to evaluate the type of stroke (ischemic or hemorrhagic) and the areas of your brain affected.[10] The doctor will give you a neurological assessment, take your blood pressure, listen to your heart and lungs, look into your eyes, ask about your family history, any medical problems including risk factors for stroke, inquire about what drugs you're taking (especially any blood thinners), and your as allergy history.

- After listening to your heart, your doctor will try to detect a whooshing sound (bruit) over the carotid arteries of your neck — it can indicate atherosclerosis (plaque build up) .
- Other conditions that can mimic the symptoms of a stroke include: a severe head injury (concussion), a brain tumor, epilepsy or a severe drug reaction.

2 **Have your blood looked at.** While in the emergency department, a sample of your blood will be taken and analyzed in the lab to see how well it clots, if your blood sugar (glucose) is too high or low, whether you have an infection and if electrolytes are out of balance.[11] All these factors may affect how you'll be treated / managed in the hospital.

- Thick blood that clots quicker can make an ischemic stroke worse.
- Two tests done in the lab to check for clotting ability are called the PT and PTT tests.
- Low blood glucose levels (hypoglycemia) may mimic symptoms similar to those of a stroke.
- High blood glucose levels (hyperglycemia) are common with diabetes and increase the risk of stroke because too much sugar in the blood is toxic and damaging to blood vessels.

3 **Get a computerized tomography (CT) scan.** CT scans use a series of x-rays to create a detailed image of your brain, which is great for showing blockages, bleeding, tissue death, tumors, infections, congenital deformities and other conditions.[12] Even if the physical signs of a stroke are obvious, CT scans need to be carried out to determine if the stroke is caused by a vessel blockage (ischemic) or burst vessel (hemorrhagic), as well as what part of the brain is affected most.[13]

- Everyone with a suspected stroke should receive a CT scan within an hour of the event.

4 **Get magnetic resonance imaging (MRI) done if necessary.** An MRI uses a strong magnetic field and radio waves to produce 3-D images of the brain and it too can show the location and extent of the brain injury caused by a stroke. However, the image produced by MRI is typically sharper and more detailed than an image from a CT scan, so it's often the preferred diagnostic tool to diagnose small, deep injuries within the brain.[14]

- An MRI is sometimes done in conjunction with a CT scan, but it depends on the results of the CT scan and what the neurologist decides.
- For people with more complex symptoms related to a stroke, where the extent or location of the damage is unknown, MRI is often more appropriate.[15]
- Injected dye can also be used with an MRI to better highlight blood vessels and is called an MRI angiography or venography.

5 **Further explore the carotid arteries.** To further investigate the carotid arteries of your neck for any blockage or bleeding, a carotid duplex ultrasound is performed. With this test, the doctor uses an ultrasound device on your neck that sends out sound waves to create detailed images of the inside of your carotid arteries, including the flow of the blood within the vessel.[16] It can show the fatty deposits and plaque build up of atherosclerosis the best.

- Getting a carotid ultrasound is especially important if your doctor detected a bruit in your neck with their stethoscope during the physical exam.
- When carotid ultrasound is deemed important, it should done within 48 hours of the event for best results.[17]
- Related to a carotid ultrasound is a cerebral angiogram, where dye is injected into your carotid and vertebral arteries from a long, thin catheter. X-rays of the neck are then taken to look for blockages or bleeds.

6 **Ask about tests for your heart.** Because blockages in your brain can originate from your heart (called emboli), your heart should be checked out also. Aside from a general chest x-ray, the two main tests to check heart function and get detailed images of it are an electrocardiogram (EKG or ECG for short) and an echocardiogram (also called a 2-d echo or Cardiac echo).[18] An electrocardiogram is a test that shows the pattern of electrical activity in your heart, whereas an echocardiogram uses sound waves to create detailed pictures of your heart.

- An EKG basically shows how fast your heart is beating and its rhythm (steady or irregular). It also records the strength and timing of electrical signals as they pass through each part of your heart.[19]
- An EKG uses 12 electrical leads attached to your chest, arms and legs to record the signals.
- An echocardiogram can find the source of clots in your heart that traveled to your brain and got stuck.
- Ultrasound probes can be placed on your chest (called a trans-thoracic echocardiogram or TTE), or deep in your throat (trans-esophageal echocardiogram or TEE).

Tips

- About 85% of strokes are classified as ischemic — when the arteries in your brain blocked. The other 15% are hemorrhagic and caused by a leaking or ruptured blood vessel in the had.
- A transient ischemic attack (TIA) is a "mini stroke" which causes temporary and typically more mild symptoms. It is defined as a "transient episode of neurological dysfunction caused by a focal brain, spinal cord, or retinal ischaemia, without acute infarction."[20]
- The main risk factors for stroke include: advancing age, obesity, high blood pressure, heart disease, atherosclerosis, high blood cholesterol, diabetes, being inactive, sleep apnea, cigarette smoking, binge drinking, use of illicit drugs, and use of some prescription drugs (such as the birth control pill).[21]

Sources and Citations

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