



**American
Stroke
Association.**
*A division of the
American Heart Association.*

WHAT'S AT THE HEART OF MY CRYPTOGENIC STROKE?

A Patient Guide to Understanding
Strokes of Unknown Cause



Medtronic

Supports the American Stroke
Association's Cryptogenic Stroke Initiative.

Having a stroke of unknown cause, or cryptogenic stroke, may be frustrating and overwhelming. In this guide, we will provide you with information and resources that can help you and your loved ones find answers around cryptogenic stroke. With a proper diagnostic work-up and collaboration with your physician, you can take part in finding the cause of your stroke or other stroke risk factors and help prevent another one from occurring.



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WHAT IS A STROKE?

Stroke, a disease that affects the blood flow of arteries leading to and within the brain, is the No. 5 cause of death and a leading cause of disability in the United States.¹

Stroke is the No. 5 cause of death

A stroke occurs when a blood vessel that carries oxygen and nutrients to the brain is blocked by a clot, or the vessel ruptures. When either of these events happen, part of the brain cannot get the blood and oxygen it needs, and as a result, brain cells subsequently die.

There are two types of strokes: hemorrhagic or ischemic. An ischemic stroke occurs as a result of an obstruction within a blood vessel supplying blood to the brain. It accounts for the significant majority of all stroke cases. A hemorrhagic stroke occurs when a weakened blood vessel ruptures and spills blood into brain tissue.

When brain cells die during a stroke, the abilities controlled by that area of the brain are lost. These abilities may include speech, movement, and memory. The way a stroke affects you depends on where the stroke occurs in the brain and how much of the brain is damaged.

WHAT IS A CRYPTOGENIC STROKE?

In most cases, a stroke is caused by a blood clot that blocks the flow of blood to the brain. In some instances, despite testing, the cause of a stroke cannot be determined. In this case, the stroke of unknown cause is called a "cryptogenic stroke."

Your doctor may also refer to your cryptogenic stroke as an "embolic stroke of unknown source" (ESUS). An embolic stroke is one caused by a blood clot that starts somewhere other than the brain and breaks loose and travels through the blood to the brain. About half of cryptogenic strokes are ESUS strokes.²

It's estimated that about 1 in 3 ischemic strokes are cryptogenic.

It's estimated that about 1 in 3 (35%) ischemic strokes are cryptogenic.² Some studies suggest that the incidence of cryptogenic stroke is higher in African-Americans (two times more likely) and Hispanics (46% more likely).³

CRYPTOGENIC STROKE: WHAT DOES THIS MEAN TO ME?

Because approximately 1 in 4 stroke survivors will likely have another stroke,¹ finding the cause of the stroke or risk factors that were previously unknown will help your physician develop a plan personalized for you to prevent another stroke. During your hospital stay and follow up care, you will want to discuss with your physician the ways to best treat and prevent another stroke. Some of these discussions may include diagnostic testing, blood work ups, and new lifestyle changes.

Tip: Talk to your doctor to determine the best treatment plan for your stroke.

POSSIBLE CAUSES OF YOUR STROKE

- **Atrial Fibrillation**, also known as AF or AFib, is an irregular and often very fast heart rhythm. About 5.2 million Americans are living with AFib in the U.S.¹ AFib occurs when the upper chambers of the heart, or atria, beat rapidly and irregularly. This causes blood to pump inefficiently to the rest of the body, which can cause symptoms like heart palpitations, fatigue, and shortness of breath. When someone has AFib, the blood is not moving through the heart the way it should be, and blood clots can form within the left atria. A blood clot can then travel out of the heart to the brain causing a stroke.

AFib increases the risk of stroke more than five times.

AFib increases the risk of stroke more than five times,¹ but often goes undetected since it can be asymptomatic and may occur infrequently.

If your doctor thinks you may have AFib, they will order heart monitoring to look for heart arrhythmias. If AFib is found, your physician will most likely prescribe anti-clotting medications (anticoagulants) that can help reduce your risk of another stroke. To better understand whether you have AFib that can increase your risk of having another stroke, be sure to ask your doctor about long-term heart-rhythm monitoring.

- Patent Foramen Ovale (PFO)** is a hole in the heart that never closed after birth. Patent foramen ovale is seen in about 25% of adults.^{4,5} During fetal development, this hole allows blood to circulate while the lungs are still growing. Within a few months of birth, the hole seals completely in about 75% of the population. When the hole doesn't close, the individual has PFO. For the vast majority of the millions of people with a PFO, it is not a problem, even though blood is leaking from the right atrium to the left. However, problems can arise when that blood contains a blood clot, which can potentially travel out of the heart to the brain and cause a stroke. PFO is present in 40% of adults with cryptogenic stroke.⁴ Depending on your age, the severity of your PFO or other factors, your physician may recommend surgery to close the PFO.
- Hypercoagulable states** or thrombophilic conditions are disorders where a person's blood has an increased tendency to form blood clots. Blood clotting disorders can be either passed down from your family or acquired during one's lifetime. In one study, 1 in 7 stroke patients tested positive for one of the inherited thrombophilias.⁶ Of note, this condition is rare, but it can be dangerous.⁷ Thrombophilia can be a cause of stroke — if the blood clots too quickly, then a blood clot can form. If the clot travels to the brain and blocks off a blood vessel, it can cause a stroke. Routine testing for the inherited thrombophilias may not be done unless the cause of stroke is unknown (especially in young persons), and a cause is being investigated.
- Aortic Arch Atheroma** is a build-up of fatty plaque within the aorta. There are some people who develop fatty plaques (which contain cholesterol and other substances from the blood) in a large artery called the aorta. The aorta is an artery attached to the heart that supplies a large amount of blood to the body. The specific part of the aorta that comes off the heart is an area called the aortic arch — it is the largest artery in the body. When a person develops fatty plaque within the aortic arch, a piece of the plaque can loosen and float into the blood. If this happens, the plaque can be circulated through the blood to the brain, blocking a blood vessel which can cause a stroke. Most people do not know when there is plaque build-up within their aorta. A history of smoking, high blood pressure and high LDL (bad) cholesterol, and diabetes makes people more likely to develop plaque within a blood vessel, all of which are risk factors for both stroke and heart disease.

- **Other potential causes of cryptogenic stroke** are more rare and may include cancer, infections (such as endocarditis, an infection of the heart's inner lining), and dissection (a tear in the wall of an artery).

Tip: A cryptogenic stroke can be caused by many different things. It's important to talk with your doctors to make sure that you or your loved one are empowered with proper understanding of the possible cause.

AFTER YOUR STROKE

The American Stroke Association made recommendations in 2021 for what is commonly called “the stroke work-up.” The stroke work-up includes tests that should be conducted while the stroke patient is still hospitalized. While some patients may continue to have the cause of their stroke unknown, a cause or secondary stroke risk factors may be revealed with further testing.

To properly determine the cause of your stroke and look for other potential stroke risk factors, your doctor may conduct one or more of the following tests as part of the stroke work-up:

- A brain **Computed Tomography (brain CT)** scan uses x-rays to take clear, detailed pictures of your brain. A brain CT can show bleeding in the brain or damage to brain cells from a stroke.
- **Magnetic Resonance Imaging (MRI)** uses magnets and radio waves to create a picture of the organs and structures in your body. This test can detect changes in brain tissue and damage to brain cells from a stroke. An MRI may be used instead of, or in addition to, a CT scan to diagnose a stroke or to provide more information about its cause.
- Blood tests that check for blood glucose levels, blood and platelet counts, electrolyte levels and renal tests, and cardiac ischemia, among other health factors.
 - A **blood glucose test** measures the amount of glucose (sugar) in your blood. Low blood glucose levels may cause symptoms similar to those of a stroke.
 - An **A1C test** measures your average blood glucose control for the past two to three months.

- A **platelet count** measures the number of platelets in your blood. Blood platelets are cell fragments that help your blood clot. Abnormal platelet levels may be a sign of a bleeding disorder (not enough clotting) or a thrombotic disorder (too much clotting).
 - **Activated Partial Thromboplastin Time (aPTT or APTT)** measures the time it takes your blood to clot.
 - **Prothrombin Time (PT)** measures how long it takes blood to clot. It also is used to check whether medicine to prevent blood clots is working.
 - **International Normalized Ratio (INR)** tests how well your blood can form clots. Since a clot in the vessel of the brain is a common cause of stroke, this test will help your physician determine if you need anti-clotting medication.
 - **A fasting or non-fasting lipid profile** is used to check your cholesterol levels.
- **Oxygen saturation** – Your red blood cells carry oxygen through your arteries to all of your internal organs. They must carry enough oxygen to keep you alive. Normally, when red blood cells pass through the lungs, 95-100% of them are loaded with oxygen. If you have a medical condition, your oxygen saturation might be lower than 95%. An oxygen saturation test is painless and is measured by using a clip that fits on your finger.
 - **Heart rhythm monitoring** may be administered in-hospital or at home to help identify the cause of the stroke and guide stroke prevention strategies. A heart rhythm device records heart rhythm over both short and long periods of time. Heart rhythm monitoring is ordered if your physician suspects AFib as a possible cause or risk factor for having another stroke. The following 3 pages provide more information on the types of heart rhythm monitoring.
 - An **echocardiogram** (not to be confused with an electrocardiogram) is a test that uses high frequency sound waves (ultrasound) to make pictures of your heart. The test is also called echocardiography or diagnostic cardiac ultrasound. This painless test can help to diagnose PFO, endocarditis, heart valve problems, or other potential causes of cryptogenic stroke. Transthoracic echocardiography (TTE) is the most common type of echocardiogram.

- **Transesophageal echocardiography (TEE)** is another test that produces pictures of your heart using ultrasound. Unlike a standard echocardiogram, the echo transducer that produces the sound waves for TEE is attached to a thin tube that passes through your mouth, down your throat and into your esophagus. TEE is used when doctors need a more detailed picture of the heart than a standard echocardiogram can give them.

TYPES OF HEART RHYTHM MONITORING

In all patients who have a suspected stroke, an electrocardiogram (ECG) should be performed in the hospital to look for AFib or other cardiac conditions. If you've had a cryptogenic stroke and an ECG or other external heart monitor did not give your doctor enough information, American Heart Association and American Stroke Association guidelines recommend an insertable heart monitor or mobile outpatient telemetry to help determine if you have AFib.^{2,8} Your physician prescribes these diagnostic or treatment options. These devices are not for everyone, but can be helpful in finding AFib in those who don't have symptoms or have infrequent episodes. Please talk to your doctor to see which option is right for you.



Electrocardiogram (ECG) – A machine that records the heart's electrical activity. An ECG shows how fast the heart is beating and allows the medical professional to verify if the heart rhythm is steady or irregular. An ECG can help detect heart problems, such as AFib, or a previous heart attack that may have led to a stroke. Typically, this is given in a hospital or clinic setting. External patches are applied to the chest with wires connecting to a large, portable ECG device.

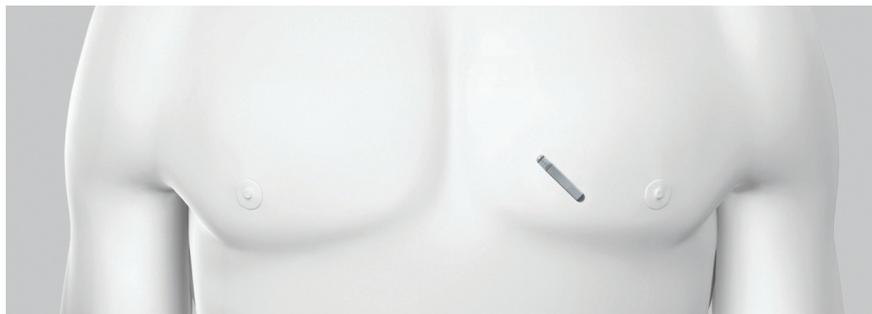


Mobile Continuous Outpatient Telemetry (MCOT) – An external monitor that is worn for up to 30 days. The unit has wires attached to the chest along with a unit (transponder) that is worn on the belt. This device allows the patient to activate heart rhythm recording if he/she experiences symptoms.

Tip: Follow your physician's instructions during the heart monitoring process. They will improve the chances of determining whether you have an irregular heartbeat that could potentially cause another stroke.



Holter Monitor – An external heart monitor worn either in the hospital or at home to help detect any heart rhythm abnormalities. During the 24-48 hour monitoring period, the device records the heartbeat and rhythm. Typically, a Holter device is a small unit (roughly the size of a deck of cards) that is secured on a belt. Attached to the device are wires and patches that are placed on the skin. A wireless Holter monitor may be worn up to several weeks.



Insertable Cardiac Monitor (ICM, also sometimes called an implantable loop recorder) – A small heart monitoring device that is placed just under the skin, above the heart, during a minimally invasive procedure. The ICM is about one-third the size of a AAA battery, and the latest devices continuously monitor the heart for up to 4.5 years.

PLANNING YOUR DISCHARGE

Many stroke survivors are able to return home and resume many of the activities they did before their stroke. However, some patients may need to go to a rehabilitation or nursing center for assistance. Below are some tips to help caregivers and patients prepare for discharge:

- Schedule an appointment with your primary care professional as soon as possible, ideally within 1-3 weeks after discharge from the hospital or inpatient rehabilitation.⁹
- Prepare a list of questions to take to the next doctor's visit.
- Start a daily medication list. Include the drug name, purpose of drug, dosage, possible side effects, and who prescribed each drug. If you're concerned about the drugs prescribed, ask the doctors to work together to make sure that all drugs are taken appropriately. Take this list with you to all doctor's appointments.
- Consider mobility needs at home, including the need for adaptive equipment to enable moving around more easily.

QUESTIONS TO ASK YOUR DOCTOR

- 01 *What caused my stroke?*
- 02 *What happens if the cause of my stroke is not identified?*
- 03 *Are there ways to determine the cause of my stroke or additional factors that may put me at increased risk of having another stroke?*
- 04 *What tests or diagnostics can be done, such as long-term heart rhythm monitoring, echocardiography, or genetic tests, to find the cause of my stroke or additional risk factors that could cause another stroke?*
- 05 *How is cryptogenic stroke treated?
(Treatment may vary per patient)*
- 06 *Is cryptogenic stroke typically hereditary?*
- 07 *For patients who received a home heart-monitoring device (either insertable or external):
What is the purpose of my monitoring device?
How long can I wear it?
How will it impact my daily activities?*
- 08 *What can I do to minimize my risk of having another stroke?*
- 09 *What should I share with my primary care physician or neurologist about my cryptogenic stroke once I am recovering at home?*

Tip: Ask your health care providers to work together to help find the cause of your stroke or other potential stroke risk factors. When cardiologists, neurologists, primary care physicians and other health care professionals work together, it ensures that you will receive the most thorough care and interventions to help prevent another stroke and improve outcomes.

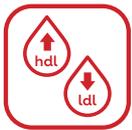
MINIMIZING YOUR RISK OF ANOTHER STROKE

While the cause of your stroke may not yet be determined, it is important to follow your physician's medical advice and take your medications. If you receive a heart monitoring device, you will also want to follow any heart monitoring regimens prescribed. Additionally, you may reduce your risk factors for stroke by following a healthy lifestyle. Here are seven behaviors the American Heart Association has identified, called Life's Simple 7[®], to help you minimize the risk of another stroke.



1. **Manage Blood Pressure**

High blood pressure is a major risk factor for heart disease and stroke. When your blood pressure stays within healthy ranges, you reduce the strain on your heart, arteries, and kidneys, which helps keep you healthier longer. You can manage high blood pressure by taking prescribed medication from your physician and managing your sodium.



2. **Control Cholesterol**

High cholesterol contributes to the development of fatty plaque, which can clog arteries and lead to heart disease and stroke. When you control your cholesterol, you are reducing potential plaque and blockages that could occur.



3. **Reduce Blood Sugar**

Most of the food we eat is turned into glucose (or blood sugar) that our bodies use for energy. When your body does not process glucose properly and your blood sugar is too high, diabetes can develop. Over time, diabetes can cause damage to your heart, kidneys, eyes, and nerves. Healthy eating is key to managing blood sugar levels.



4. **Get Active**

Living an active life is one of the most rewarding gifts you can give yourself and those you love. Simply put, daily physical activity increases the length and quality of your life. Stroke survivors are encouraged to exercise or be active at least 10 minutes, 4 times a week or have more vigorous activity for a least 20 minutes, twice a week. Stroke survivors who tend to sit for long periods of time or are not able to exercise by themselves are encouraged to find help exercising in a safe manner. Your doctor may recommend a formal program that can help with making, and keeping, needed lifestyle changes.²



5. **Eat Better**

A healthy diet is one of your best weapons for fighting cardiovascular disease. When you focus on heart healthy meals and snacks, you improve your chances for feeling good and staying healthy – for life!



6. **Lose Weight**

When you shed extra fat and unnecessary pounds, you reduce the burden on your heart, lungs, blood vessels, and more. An active lifestyle can help, lowering your blood pressure, cholesterol, and blood sugar and elevating your mood as well.



7. **Stop Smoking**

Cigarette smokers have a higher risk of developing cardiovascular disease. If you smoke, quitting is the best thing you can do for your health.

Learn more about Life's Simple 7® at heart.org/mylifecheck

Tip: Most recurrent strokes can be prevented. Taking steps to manage the cause of your stroke can reduce the risk of another event.

BEING PREPARED: SIGNS AND SYMPTOMS OF A STROKE

Once you have had a stroke, you are at a greater risk for another stroke. F.A.S.T. is an easy way to remember the sudden signs of stroke. Learning the signs and symptoms of strokes and getting to a hospital quickly will give you the best chance of having a positive outcome after a stroke. When you spot the signs, you'll know when you need to call 911 for help. F.A.S.T. stands for:



Face Drooping

Does one side of the face droop or does it feel numb? Ask the person to smile. Is the person's smile uneven?



Arm Weakness

Is one arm weak or numb? Ask the person to raise both arms. Does one arm drift downward?



Speech Difficulty

Is speech slurred? Is the person unable to speak or hard to understand? Ask the person to repeat a simple sentence, like "The sky is blue." Is the sentence repeated correctly?



Time to call 911

If someone shows any of these symptoms, even if the symptoms go away, call 911 and get the person to the hospital immediately. Check the time so you'll know when the first symptoms appeared.

It is important to have a conversation with your friends and family so they are aware of the signs and symptoms of stroke. Getting the family involved and ready to respond can make a big difference if another stroke occurs.

To learn other potential signs of a stroke, go to: [stroke.org/warningsigns](https://www.stroke.org/warningsigns).

ASA STROKE RESOURCES

- Call 1-888-4-STROKE (1-888-478-7653) or visit us at: stroke.org/unknownstroke to learn more about cryptogenic stroke.
- Find a list of local support groups at stroke.org/strokegroup.
- The American Stroke Association Support Network is dedicated to patients and their caregivers, family, and friends. The Support Network provides a place for patients, families, and caregivers to give and receive support, improve their own health, and impact the lives of others. To learn more and register for free, go to: stroke.org/supportnetwork.
- Call the American Stroke Association’s “Warmline” at 1-888-4-STROKE (1-888-478-7653) to speak with others who have similar stroke experiences. Join our facebook.com/americanstroke & twitter.com/american_stroke communities.
- Sign up for *Stroke Connection*, a free monthly e-newsletter for stroke survivors and caregivers: strokeconnection.org.
- Visit stroke.org.

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