

Hemorrhagic

stroke

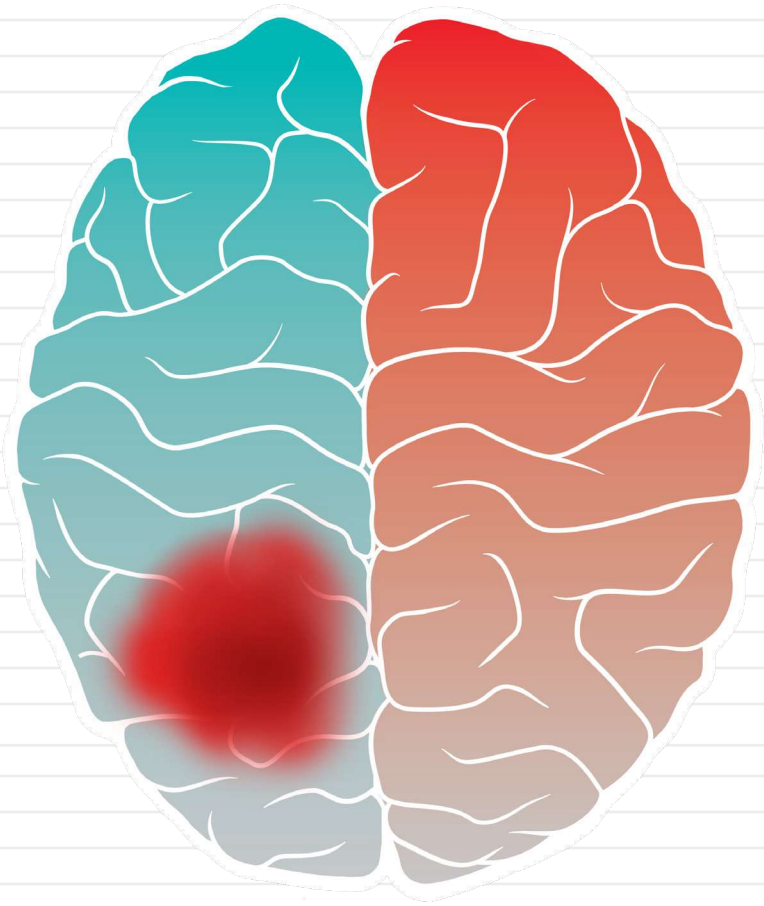


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What is a Hemorrhagic Stroke?

A hemorrhagic stroke is a serious medical condition that occurs when blood from damaged or ruptured blood vessels seeps into or around the brain.

Intracranial bleeding not only disrupts oxygen supply to the brain, it upsets the chemical balance that brain cells need to function. The resulting blood clot (hematoma) can cause swelling of the brain (edema) and an increase in intracranial pressure, which can cause further oxygen deprivation.

A hemorrhagic stroke is one of three major stroke types. All three of these can cause lasting brain damage, long-term disability, and even death. However, early treatment can have a significant effect on outcomes. Therefore, it is critical to contact emergency services at the first sign of stroke.

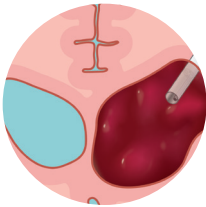
Types of Hemorrhagic Stroke



- **Intracerebral Hemorrhage (ICH)**, the most common type of hemorrhagic stroke, occurs when a blood vessel in the brain leaks or ruptures (tears), allowing blood to seep into surrounding tissue. ICH has many causes, but is most often the result of chronic high blood pressure.



- **Subarachnoid Hemorrhage (SAH)** occurs when an artery located on the outer surface of the brain ruptures, allowing blood to leak into the fluid-filled space between the brain and the skull. The cause is often a ruptured cerebral aneurysm, a weakened area on an artery that bulges, fills with blood, and bursts open. The first sign of SAH is typically a severe headache that comes on suddenly with no known cause.



- **Intraventricular Hemorrhage (IVH)** involves bleeding into or around the ventricles, the chambers in the brain that contain the cerebrospinal fluid that surrounds and envelopes the brain and spinal cord.

Symptoms of Hemorrhagic Stroke

All three types of hemorrhagic stroke (intracerebral, subarachnoid, and intraventricular) can cause serious, sometimes fatal, complications. Hemorrhagic stroke symptoms can vary from person to person depending on the location and size of the bleed. **Symptoms typically appear suddenly and require immediate medical attention.**

They can include:

- Sudden, severe headache
- Problems seeing in one or both eyes
- Dilated pupil(s)
- Pain above or behind the eye
- Nausea and/or vomiting
- Stiff neck
- Sensitivity to light
- Seizures
- Loss of consciousness
- Paralysis or numbness of the face, arm, or leg

How a Hemorrhagic Stroke May Affect the Brain

The brain is the most complex part of the human body. This three-pound organ serves as the center of intelligence, a sense interpreter, initiator of body movement, and a behavior regulator. The brain is divided into various regions, chief of which are the **cerebrum** (the largest part), the **cerebellum** (located below the cerebrum), and the **brain stem**, which connects the brain to the spinal cord. Each region controls specific brain functions. Regardless of type, a hemorrhagic stroke in any one of these areas can put the functions controlled by cells in that area at risk.

The cerebrum is divided into two nearly identical halves called hemispheres (left and right), with each hemisphere consisting of four lobes (**frontal, temporal, parietal, and occipital**). Areas within each lobe control different mental and/or physical functions. For example, a bleed in an area located in the left frontal lobe can cause a person to lose the ability to transform thoughts into words. Nearly all the nerve signals that travel from the brain to the body (and the body to the brain) are controlled and processed by opposite sides of the brain. Damage to the left hemisphere primarily affects the right side of the body and vice versa. A hemorrhage in the left half of the brain, for example, can leave a person's right side paralyzed.

Areas of the brain and specific functions they control include:

Cerebellum

- Balance
- Coordination

Brain Stem

- Breathing
- Heart rate

Cerebrum

Frontal Lobe (front of the brain)

- Problem solving
- Behavior
- Body movement
- Reasoning

Temporal Lobe (sides of the brain)

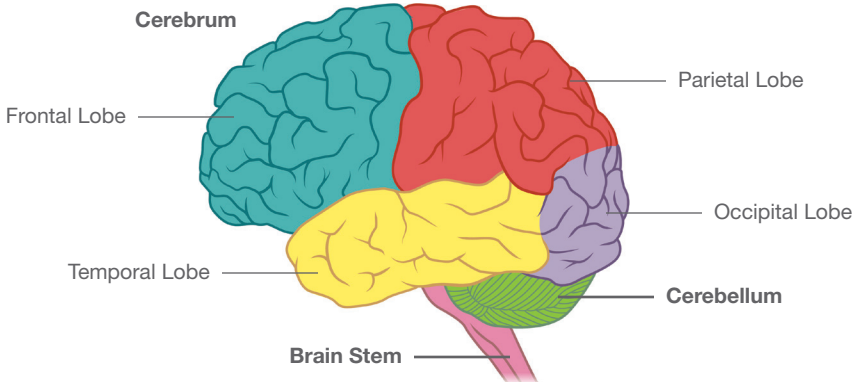
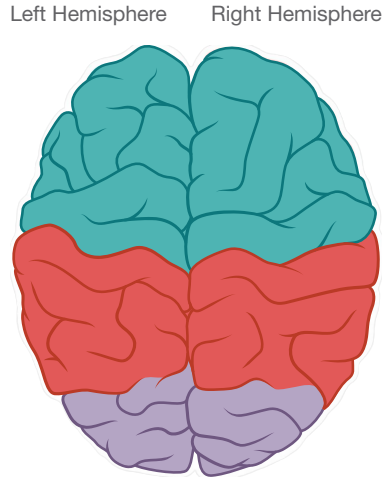
- Hearing
- Memory

Parietal Lobe (middle of the brain)

- Sense of temperature, taste, and touch
- Body orientation
- Ability to read and do math

Occipital Lobe (back of the brain)

- Vision



What is a Brain Aneurysm?

A brain aneurysm occurs when a weakened section of a blood vessel's wall bulges and fills with blood. Vessel walls can weaken as a result of high blood pressure, disease, injury, or an abnormality present at birth. Aneurysms, which can form anywhere in the brain, can put pressure on nerves or surrounding tissue. Some aneurysms leak or rupture, allowing blood to seep directly into the brain (intracerebral hemorrhage) or into the space between the brain and the skull (subarachnoid hemorrhage).

Aneurysms can occur in anyone at any age, but they are most common in adults between the ages of 30 and 60. Also, they are more common in women than in men. Scientific papers indicate that between 2 and 3 percent of Americans may have a brain aneurysm in their lifetime. It's important to note that not all aneurysms require treatment. Physicians often choose to monitor rather than treat unruptured aneurysms that do not show symptoms.

Types of Aneurysm



- A **saccular aneurysm**, the most common type of aneurysm, is a rounded, blood-filled sac. It is sometimes called a “berry aneurysm” due to its appearance. It is more commonly found on arteries at the base of the brain.



- A **fusiform aneurysm** expands in all directions in the affected section of the artery.



- A **mycotic aneurysm** is caused by an infection in the blood vessel wall. It is most commonly associated with endocarditis, which is an infection of the inner tissue of the heart.

1. Chalouhi N, et al. The case for family screening of intracranial aneurysms. *Neurosurg Focus*. 2011;31(6):EB.

2. Stijntje A, Bor E, Rinkel GJE, van Norden J, Wermer MJH. Long-term, serial screening for intracranial aneurysms in individuals with a family history of aneurysmal subarachnoid hemorrhage: a cohort study. *Lancet Neurol*. 2014;13:385-392.

Dangers of an Aneurysm Rupture

- **Rebleeding:** Ruptured aneurysms may rupture again before the initial injury is treated, leading to further bleeding into the brain, and causing more damage or even death.
- **Change in Sodium Level:** A hemorrhage can alter sodium levels, causing brain cells to fill with water. This can cause swelling of the brain (edema) and can result in permanent brain damage.
- **Hydrocephalus:** Excess cerebrospinal fluid builds up in spaces or ventricles within the brain. This buildup can cause pressure that can lead to permanent brain damage or even death.
- **Vasospasm:** This complication results in the narrowing of an artery due to a tightening of its muscular walls. Vasospasm is most frequently seen after subarachnoid hemorrhage and can cause further stroke due to a lack of adequate blood flow through an affected artery.
- **Seizures:** Aneurysm bleeding can cause seizures during or after the time of bleed. While most seizures are easy to spot, some can only be detected by advanced brain testing. Untreated seizures or those that do not respond to treatment can cause brain damage.

Screening for Brain Aneurysms

People who run a higher than average risk of having an aneurysm are commonly screened by routine brain imaging tests, such as magnetic resonance angiography (MRA) or computed tomography angiography (CTA).¹ Individuals who have a family history of brain aneurysms and subarachnoid hemorrhage (SAH) may be candidates for long-term, serial screening.²

Repeated screening is advised for anyone who has two or more first-degree relatives (i.e., child, sibling, parent) who have experienced a ruptured aneurysm. The prevalence of brain aneurysms is 2.3% in the general population, 4% in people with one affected first-degree relative, and 8% in people with two first-degree relatives.¹

An individual who has been diagnosed with an aneurysm or has a family history of aneurysms is advised to make healthy lifestyle choices. For example, an individual who stops smoking may reduce the risk of an existing aneurysm getting larger and/or the formation of a new aneurysm.²

Contact your healthcare provider if you think you might be a candidate for screening.

How is a Hemorrhagic Stroke Diagnosed?

Your doctor may:

- **Ask** you or your family member about your risk factors, such as high blood pressure, smoking, heart disease, and a personal or family history of stroke.
- **Ask** about your signs and symptoms and when they began.
- **Conduct** a physical examination to assess your mental alertness and your coordination and balance. He or she may check for numbness or weakness in your face, arms, and legs, trouble speaking and seeing clearly, and confusion.

Your doctor may order one or more of the following tests:

- **Computed Tomography (CT)** involves the use of a special x-ray scanner and a computer to create many two-dimensional images, or “slices” of the brain that can be stacked to create a detailed picture. A similar process, called computed tomography angiography (CTA), involves the injection of a special dye, called contrast, via an IV into the bloodstream just prior to scanning. The dye allows doctors to see the blood and blood vessels within the brain tissue.
- **Magnetic Resonance Imaging (MRI)** uses computer-generated radio waves and a magnetic field to create two- and three-dimensional detailed images of the brain. Like a CTA, MRA (Magnetic Resonance Angiogram) can provide detailed images of brain vessels but can accomplish this with or without the use of contrast.
- **Cerebral Angiography** involves an injection of contrast dye into the neck and brain arteries. The dye is injected via a catheter, a long tube-like device that is inserted into a leg or arm artery and slowly threaded through the body up to the neck. The dye helps create a detailed image of the arteries on an x-ray in two or three dimensions.
- **Cerebrospinal Fluid (CSF) Analysis (Spinal Tap)** measures chemicals in the fluid that cushions the brain and spinal cord. Most often a small amount of cerebrospinal fluid is collected by inserting a thin needle into the spinal cord in the area of the lower back. Additional testing may be needed if test samples indicate bleeding around the brain.

Hemorrhagic Stroke Risk Factors

Hemorrhagic stroke can affect anyone, regardless of age, sex, or ethnicity. However, some individuals are at a higher risk than others due to a combination of factors that include inherited traits, lifestyle behaviors, and medical conditions.

Some risk factors can be changed, for example: smoking, diet choices, and physical activity levels. Other risk factors, such as age, sex, and family history, cannot be changed. The more risk factors a person has, the more likely they are to have a hemorrhagic stroke. Regular medical checkups can help identify personal risk factors and lead to healthier choices.

Whether individual risk factors are within a person's control or not, the heart and brain are best served by healthy lifestyle choices.

Risk Factors

- **Genetic Connective Tissue Disorders** (ex: Ehlers-Danlos Syndrome): These inherited disorders affect skin, joints, and blood vessel walls.
- **Polycystic Kidney Disease:** This is an inherited disease that results in fluid-filled sacs in the kidneys that can increase blood pressure.
- **Brain Arteriovenous Malformation (AVM):** A brain AVM is a tangle of abnormal blood vessels that connects arteries and veins.
- **Family History:** A person who has a relative (child, sibling or parent) who has had an aneurysm is at an increased risk for aneurysms.
- **Cholesterol Levels:** Too much cholesterol (low-density lipoprotein) in the blood is associated with an increased risk of stroke.
- **High Blood Pressure (Hypertension):** High blood pressure can damage and weaken arteries, making aneurysms more likely to form and ultimately rupture. It is important to check blood pressure levels on a regular basis, especially because there are often no symptoms.
- **Smoking:** Smoking damages blood vessels, raises blood pressure, and may reduce the amount of oxygen that reaches the body's tissues.
- **Alcohol:** Excessive alcohol consumption is associated with an increased risk of intracerebral hemorrhage (ICH).
- **Illegal Drug Use:** Cocaine and amphetamines can raise blood pressure to dangerous levels.
- **Age:** Aneurysms are most commonly found in adults over the age of 40.
- **Less Common Causes:** Bleeding disorders, blood thinning medication, cerebral cavernous malformations (blood vessels that do not form correctly in the brain), rupture of a vessel from an ischemic stroke, trauma, and brain tumors.

Intracerebral Hemorrhage Treatment

Intracerebral hemorrhage (ICH) is a serious medical condition associated with a high risk of disability and death. It is important to contact emergency services immediately in order to determine the cause of the bleeding and begin medical treatment.

Physicians will consider a variety of factors, including the cause of a bleed, when determining the best treatment plan.

Treatment options may include the following:

Medical Management

Medical Management can include, but is not limited to, the management of:

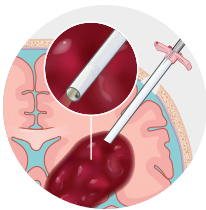
- Breathing
- Blood pressure
- Intracranial pressure
- Medication to control seizures
- Blood glucose
- Temperature
- Nutrients/fluids

Surgery



- **Decompressive Craniectomy** is when a piece of skull is removed in order to relieve pressure on the swollen brain.

Craniectomy with evacuation is when a piece of skull is removed so that a neurosurgeon can eliminate pooled blood from the affected area.



- **Endoscope-Assisted Minimally Invasive Surgery** employs the use of a neuroendoscope (small camera) and a very thin metal cannula (tube) to remove clot. The entire procedure is performed through a small tube, called a sheath, about the size of a pen. The sheath is placed into the hematoma using neuronavigation through a

dime-sized hole in the skull. The cannula, inside the endoscope, is then placed inside the sheath to aspirate (suck out) the blood. The endoscope allows the surgeon to see the hematoma, surrounding brain tissue, and vessels during the operation.

- **Stereotactic Aspiration**, also considered minimally invasive, involves the insertion of a catheter (placement of which is determined by image guidance) into the hematoma to suck out (aspirate) blood. The catheter can then be used to deliver small doses of a thrombolytic agent (i.e. tPA or TNK) over the course of several days to clear remaining clot.

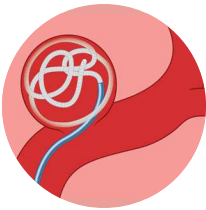
Subarachnoid Hemorrhage Treatment

A subarachnoid hemorrhage occurs when a blood vessel on the brain's outer surface ruptures and bleeds into the thin fluid-filled space that surrounds the brain. The cause is often a ruptured cerebral aneurysm, a weakened area on an artery that bulges, fills with blood, and bursts open. A bleeding aneurysm is considered a medical emergency and immediate treatment may be necessary.

Physicians will consider a variety of factors, including the cause and location of a bleed, when determining the best treatment plan.

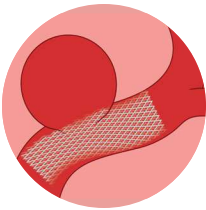
Options may include the following:

Endovascular Treatment

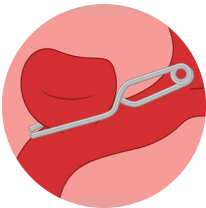


- **Endovascular Coiling** is a common endovascular procedure used to treat both unruptured and ruptured brain aneurysms. A minimally invasive treatment, embolization blocks blood flow to problem areas. To reach an aneurysm, a catheter (tube) is inserted through an incision in the femoral artery at the groin or radial artery at the wrist and guided towards

the brain. Fluoroscopy (a type of x-ray) is used to track the catheter through the arteries. Once in position, soft platinum metal coils are pushed through the tube and released into the aneurysm. The tiny coils physically occlude the space and induce clotting to cut off blood flow to the affected site. Intracranial stents may also be used in combination with endovascular coiling (stent-assisted coiling).



- **Flow Diversion Devices** are flexible mesh tubes (stents) placed within affected vessels. Stents work to redirect blood flow away from aneurysms.



- **Surgical Clipping** is an open surgical procedure in which blood flow to an aneurysm is cut off by placing a small clip at its base.

Other SAH Treatment

Other treatments for a ruptured aneurysm aim to control symptoms and reduce complications.

These treatments include:

- **Antiseizure Drugs** (anticonvulsants): These drugs, commonly used in neurosurgical procedures, may help prevent seizures related to a ruptured aneurysm.
- **Calcium Channel-blocking Drugs:** Risk of stroke by vasospasm can be reduced with calcium channel-blocking drugs.
- **Shunt:** An external ventricular drain may be surgically inserted into the brain to measure intracranial pressure and/or treat hydrocephalus (the build-up of cerebrospinal fluid).

Post-Stroke Rehabilitation

Stroke is the leading cause of death for Americans and the number one cause of serious long-term disability in the US and worldwide. Of the nearly 800,000 people who experience stroke each year, approximately two-thirds require rehabilitation services.

Stroke-related injuries typically fall into the following categories:

- Paralysis or problems controlling movement
- Sensory disturbances
- Problems using or understanding language
- Problems with thinking and memory
- Emotional disturbances

Patients often engage in rehabilitation to relearn mental and/or physical activities, such as talking and walking. Individuals can relearn skills because the brain is highly adaptable and, with proper training, can be “rewired” to take on functions damaged by stroke. Patients also may learn to cope with a particular disability by learning new ways to perform certain tasks, such as buttoning a shirt or using a keyboard with one hand.

Rehabilitation is one of the most important phases of recovery, and repetitive practice can yield positive outcomes.

It is common for rehabilitation to start in the hospital within 48 hours following stroke. Once stable, patients are encouraged to exercise. Even limited movement, such as changing positions while lying in bed, is important to recovery. Over time, a variety of therapists may work with patients to help them build strength and perform more complex and demanding tasks. Regaining skills to carry out the basic activities of daily living (i.e., bathing, going to the bathroom) is considered the first stage towards achieving independence, a primary goal of rehabilitation.

Upon discharge from the hospital, many patients continue rehabilitation efforts on an inpatient or outpatient basis. Other options include nursing facilities and home-based programs. Hospital staff typically meet with patients and their families to determine the appropriate next step.

Inpatient Rehabilitation

Inpatient facilities may be freestanding or part of the hospital. The average length of stay is usually 2 to 3 weeks and patients engage in an intensive physical, occupational, and speech rehabilitation program 5–6 days a week for at least 3 hours each day.

Outpatient Rehabilitation

Outpatient facilities are often part of a larger hospital complex and provide access to physicians and the full range of therapists specializing in stroke rehabilitation. Patients participate in several hours of coordinated therapy sessions, often 3 days a week, and return home each night.

Long-Term Care Facility

Long-term care facilities provide long-term basic nursing care and assistance for people in need of help with everyday activities.

Skilled Nursing Facility (SNF)

Skilled nursing facilities offer a level of rehabilitation services that exceeds that of traditional nursing homes. However, skilled nursing facilities typically offer fewer hours of therapy compared to inpatient and outpatient rehabilitation units.

Home Health Rehabilitation

Home rehabilitation allows patients to receive therapy in the comfort of their own homes, where they learn strategies to navigate their actual living spaces. This option is best suited for people who engage in one type of therapy.

No matter the setting, rehabilitation specialists work with each patient to determine an appropriate treatment plan. Programs typically address issues such as mobility, communication, social interactions, and activities of daily living.

Patients typically work on the following skills:

- **Self-care:** feeding, grooming, bathing, toileting, and dressing
- **Mobility:** transferring from chair to bed/bed to chair, strengthening muscles, balancing, walking, and operating a wheelchair independently
- **Speaking:** communication and language therapy
- **Cognition:** problem solving and memory recall
- **Social:** interpersonal skills
- **Work:** housecleaning and cooking, driving, and improving physical and emotional stamina to help you go back to work

Post-stroke rehabilitation often involves the following specialists:

- **Physician:** manages and coordinates a patient's general health and long-term care.
- **Physiatrist:** specializes in physical medicine and rehabilitation.
- **Neurologist:** leads acute-care stroke teams, directs patient care during hospitalization, and sometimes participates in the long-term rehabilitation team.
- **Rehabilitation Nurse:** helps patients manage health conditions that affect stroke and adjust to life after stroke.
- **Physical Therapist:** helps patients with movement and balance; suggests exercises to strengthen muscles for walking, standing, and other physical activities.
- **Occupational Therapist:** teaches strategies to manage daily activities, such as eating, bathing, dressing, writing, or cooking.
- **Speech-Language Pathologist:** helps patients re-learn language skills (talking, reading, and writing); shares strategies to help with swallowing problems.
- **Dietitian:** teaches survivors about healthy eating and special diets.
- **Social Worker:** helps survivors make decisions about rehabilitation programs, living arrangements, insurance, and home support services.
- **Neuropsychologist:** diagnoses and treats survivors with their thinking, memory and cognitive changes.
- **Case Manager:** helps survivors facilitate follow-up to acute care, coordinate care from multiple health care professionals, and link local services.
- **Recreational Therapist:** teaches strategies to improve thinking and/or movement skills needed to join in recreational activities.
- **Vocational Therapist:** provides career counseling to people who need help returning to the workforce.

Rehabilitation can be a slow and frustrating endeavor, lasting for a period of months or years. However, it is extremely valuable, so a positive outlook is essential.

Rehabilitation Using Virtual Reality

An effective rehabilitation program can help patients achieve improved cognitive and/or physical function. To be considered effective, therapy must be performed with more intensity and frequency over longer periods of time. Patients who engage in this more intense, more frequent therapy tend to have better outcomes.¹

However, it's not uncommon for stroke survivors to prematurely abandon prescribed physical therapy due to a lack of motivation caused by depression or, more simply, dissatisfaction with conventional rehabilitation methods.¹

For patients who may be anxious to see improvement, progress can be painfully slow to develop and difficult to visualize. Furthermore, traditional feedback mechanisms may miss minor yet significant milestones, and often offer very little in the way of incitement, especially compared to the amount of effort involved on the part of the patient. Together, these factors can chip away at a patient's willingness to participate in a conventional program.

Neurorehabilitation Technology

Extensive research shows that neurorehabilitation technology can dramatically enhance neuroplasticity and drive the relearning of skills affected by stroke, better than conventional therapy alone.¹ Neuroplasticity is the brain's ability to form and reorganize neural pathways, both functionally and physically in response to new learning or physical therapy following an injury to brain cells.²

Research also shows that pathway strength is related to the amount of time patients dedicate to therapy with functional goals in mind.² Therefore, more time can result in stronger connections, leading to a faster reorganization of the brain.

Virtual Reality Technology

Virtual Reality (VR), a hardware and software technology, has the potential to engage patients in rehabilitation effectively, which, in turn, can motivate them to follow their prescribed course of therapy.^{1,3} VR transports users to a virtual world, allowing individuals to view their bodies as virtual images (avatars) engaged in activities not often feasible in the actual world.³ VR has been shown to induce neuroplasticity, improve range of motion, and enhance cognitive skills.^{1,3}

1. Perez-Marcos, et al. Increasing upper limb training intensity in chronic stroke using embodied virtual reality: a pilot study. *J Neuroeng Rehabil.* 2017;14:119.

2. Kleim JA, Jones TA. Principles of experience-dependent neural plasticity: implications for rehabilitation after brain damage. *J Speech Lang Hear Res.* 2008;51:S225-S249.

3. Proffitt R, Lange B. Considerations in the efficacy and effectiveness of virtual reality interventions for stroke rehabilitation: moving the field forward. *Phys Ther.* 2015;95(3):441-448. doi:10.2522/ptj.20130571.

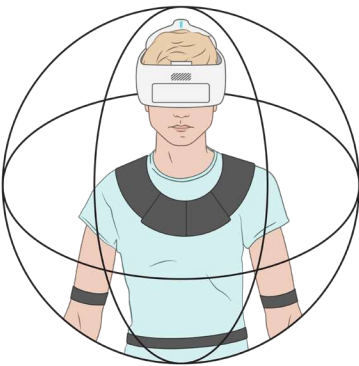
One example with VR technology, the affected side of a patient's avatar can be programmed to mirror the actions of the unimpaired side during bi-lateral (two-sided) movement.¹ During a VR therapy session, a patient with an affected left arm might view that arm function similarly to the unaffected arm. The brain is then triggered to create new neural pathways upon observing both arms functioning normally in the virtual world.¹

The virtual world itself can be programmed with functional and engaging games that help patients relearn activities of daily living, as well as offer reward-driven cognitive puzzles. The motor tasks and cognitive puzzles can be adjusted to support each patient's recovery state so that their complexity increases in step with individual progress.³

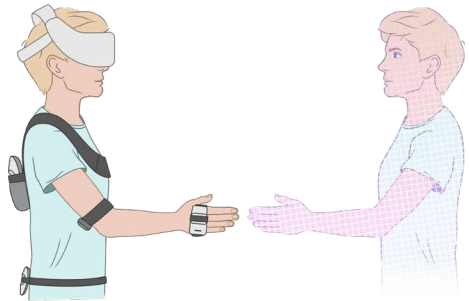
Benefits of virtual reality can include:

- A full presence, virtual avatar that mirrors every move in real time. This helps the patient's brain accept the avatar as the patient's actual body.^{1,3}
- Employment of popular video game elements such as variability, rewards, and progress tracking. This helps maximize patient enjoyment and engagement.³
- A rehabilitation environment that patients perceive as encouraging and efficient¹
- Activities tailored to each patient's individual needs
- Documentation of session-to-session progress³

VR allows you to:



See the virtual world everywhere you look (full immersion).



View your body as a virtual image (avatar) engaged in activities that would not be feasible in the actual world.

Memory and Stroke

Memory is the ability to collect, store, and retrieve information. Far from a simple function, memory is a complex system of processes that work in and across various parts of the brain. Damage to any of these areas due to stroke will likely impair some aspect of a person's memory.

Damage to brain cells that control verbal memory, for example, may affect the ability to recall words, names, and stories. Similarly, damage to visual and spatial memory may make it difficult to remember faces, shapes, routes, etc. Stroke can interfere with the ability to learn new information or cause people to repeat themselves unnecessarily and confuse facts. They might recall an event, but forget specifics or mix up the details.

More than half of stroke survivors will develop cognitive impairment within the first year after their stroke.¹

While memory can improve spontaneously, a variety of rehabilitation methods may aid in individual recovery. Typical methods include coping strategies, remediation-oriented therapies (e.g., virtual reality or computer-based programs), and medications for issues such as anxiety or sleeping problems. Additionally, efforts to prevent further strokes (through exercise, healthy eating habits, and social activity) can have a positive impact on current memory and overall brain health.

Coping Strategies

- Keep notepads handy to write messages, lists, etc.
- Display key information and schedules on a bulletin board
- Use a single location for keys, glasses, wallets, etc.
- Label rooms, food for expiration dates, pill boxes, etc.
- Make a photo book of significant people and places
- Join a support group

1. Spreij L, Visser-Meily JMA, van Heughten CM, et al. Novel insights into the rehabilitation of memory post acquired brain injury: a systematic review. *Front Hum Neurosci*. 2014;8:993.

Healthy Habits

- Stay connected to other people: visit friends and family or participate in social activities and community programs
- Keep your mind active. Volunteer, pursue a hobby, read, play games, teach or take a class, etc.
- Be physically active through regular exercise, household chores, or other activities
- Limit use of alcohol and don't smoke
- Get enough sleep, generally 7–8 hours each night
- Eat a healthy diet — limit solid fats, sugar, and salt
- Manage chronic health problems like high blood pressure, high cholesterol, and depression
- Get regular health screenings

When to Seek Help

People who have a sudden loss of memory or become very confused should get medical help right away. Make an appointment to see a doctor if you notice these symptoms:

- Having memory or concentration problems that concern you
- Asking the same question or repeating the same story over and over
- Becoming lost in familiar places
- Not being able to follow directions
- Getting confused about time, people, and places
- Not taking care of yourself — eating poorly, not bathing, or being unsafe



Stroke and Aphasia

Stroke often causes communication problems as a result of damage to the brain's language centers. Problems can range from trouble finding the right words to the inability to speak or understand speech. The type of communication disorder that develops depends on which language center was affected and the extent of the damage.

For most people, damage to one or more areas on the left side of the brain produces a disorder called aphasia, which interferes with a person's ability to express or understand language, as well as read or write. Survivors with damage to the front left of the brain may understand others and know what they want to say, but use "choppy" or non-fluent speech. Those with damage to the back left of the brain often speak at a normal rate and rhythm, yet use incorrect or made-up words. They also typically have difficulty understanding what people say.

Types of Aphasia

- **Expressive aphasia** (Broca's aphasia): A person may understand speech, yet have difficulty expressing ideas.
- **Receptive aphasia** (Wernicke's aphasia): A person hears a voice or sees print, but cannot make sense of the words. A person may produce fluent, connected speech; however, it has no meaning and sounds like a "word salad" to the listener.
- **Anomic aphasia** or **anomia**: A person has difficulty using the right names for objects, people, places, or events. This is the least severe form of aphasia.
- **Global aphasia**: A person cannot speak or understand speech, nor read or write. It is caused by widespread damage to the language centers of the brain, and is the most severe type of aphasia.

Treatment and Recovery

The most common treatment is speech-language therapy. Survivors work with speech pathologists who conduct extensive exercises in which individuals read, write, follow directions, and repeat what they hear.

Through therapy, aphasia patients can learn to...

- Restore their language abilities as much as possible
- Use remaining language abilities
- Use other ways to communicate, such as gestures, pictures, or electronic devices

Caregiver and Family Support Tips

Family involvement is a critical component of aphasia treatment because it allows family members to learn the best way to communicate with their loved one.

- Participate in therapy sessions
- Simplify language by using short, uncomplicated sentences
- Maintain a natural conversational manner appropriate for an adult
- Minimize distractions, such as a loud radio or TV
- Include the person with aphasia in conversations
- Ask for and value the opinion of the person with aphasia, especially regarding family matters
- Encourage any type of communication, whether it is speech, gestures, pointing, or drawing
- Avoid correcting the person's speech
- Allow the person plenty of time to talk
- Help the person become involved in activities outside the home
- Seek out support groups to connect with others who share similar experiences



Depression After Stroke

A stroke survivor's emotional health can boost or block their recovery efforts. Unfortunately, many survivors are too overwhelmed by negative feelings to focus on rehabilitation. Feelings of fear, sadness, and anger, while not pleasant, are a natural response to such a life-changing event.

In some cases, however, the mental and physical effects of stroke can have a more serious and lasting impact. Brain damage, for example, can cause changes in personality, behavior, and judgment. Survivors may have difficulty controlling emotions or difficulty expressing emotions appropriately. These problems, in addition to physical challenges, can lead to feelings of anxiety, frustration, and depression.

One of the most common emotional disorders experienced by stroke survivors is clinical depression, a sense of hopelessness that interferes with a person's ability to function.

The factors that contribute to depression vary from person to person. Problems can surface as a person starts to grieve for their former life or as they become increasingly aware of their daily challenges. Many patients have emotional reactions to their physical issues, loss of friends, reduced activities, or poorer health. As their insight into their condition grows, they are more likely to become irritable, anxious, or easily frustrated.

Signs of Depression

- Persistent sad, anxious, or "empty" mood
- Feelings of hopelessness or pessimism
- Feelings of irritability, frustration, or restlessness
- Changes in sleeping habits, such as sleeping poorly or sleeping more than usual
- Loss of interest in usual activities, such as favorite hobbies, time with family, or outings with friends
- Increased use of alcohol, drugs, or tobacco
- Decrease or increase of appetite, independent of hunger
- Strong feelings of sadness, despair, or hopelessness
- Thoughts of suicide
- Lack of concentration or motivation



Overcoming Depression

It is important to know that depression can be treated. Choosing the right treatment plan should be based on a person's individual needs and medical situation under a providers care.

Effective treatment options may include:

- Psychotherapy (also called “talk therapy” or “counseling”)
- Medication
- Support groups

Once you begin treatment, you should slowly start to feel better. Take it easy on yourself for the moment. Try engaging in activities you used to enjoy. They can lift your spirits even if you don't feel like performing them. Other things that can help:

- Engage in some physical activity – even a small amount can boost your mood
- Maintain a regular bedtime and wake-up time
- Eat regular, healthy meals
- Do what you can as you can. Decide what must get done and what can wait.
- Connect with others and talk with those you trust about your feelings
- Postpone important life decisions until you feel better
- Avoid alcohol, nicotine, or drugs, including medications not prescribed for you

If you or someone you love is experiencing signs of depression, don't hesitate to seek help from your healthcare provider.

Helping a Loved One

- Offer support, understanding, patience, and encouragement
- Invite them out for walks, outings, and other activities
- Help them stick to their treatment plan, such as setting reminders to take their medications
- Make sure they have transportation to therapy appointments
- Remind them that, with time and treatment, the depression will lift

**If you or someone you love is experiencing signs of depression,
don't hesitate to seek help from your healthcare provider**

Self-Esteem and Stroke

Self-esteem is the way individuals think and feel about themselves. While some of what people think and feel is a matter of personality, self-esteem is also affected by daily experiences. When a stroke happens, it is not uncommon for survivors to criticize themselves and doubt their self-worth.

Following a stroke, the health of a person's self-esteem depends on several factors, including the extent of injury and its effect on a person's day-to-day activities. Survivors who grapple with low self-esteem may isolate themselves, opting for safe and familiar routines.

Social isolation and loneliness are linked to poorer health, depression, and increased risk of early death.

In contrast, survivors with healthy self-esteem may be more willing to take chances and interact with people. Research shows that having a variety of social relationships may help reduce stress and heart-related risks, improve the ability to fight off germs, and foster a more positive outlook on life.

Individuals can build self-esteem by nurturing themselves, practicing positive self-talk, and performing self-affirming exercises. It may help to join a local or online support group to connect with people who are going through similar experiences.

Self-Affirming Activities

Make a list of...

- At least five of your strengths: e.g., persistence, courage, friendliness, creativity
- At least five things you admire about yourself: e.g., the way you have raised your children, your good relationship with a sibling, or your spirituality
- 10 things you can do that make you feel good about yourself
- 10 ways you can “treat” or reward yourself that don't include food and that don't cost anything, such as taking a walk, window-shopping, people watching, gazing at a beautiful object (e.g., flowers or night sky), or chatting with a friend
- 10 things you can do to help someone else

Tips to Improve Self-Esteem

- **Pay attention to and respect your own needs and wants.**
- **Eat well.** Cook healthy meals and make good choices when dining out.
- **Exercise.** Moving your body can help you feel better and improve self-esteem. Consult your doctor about making exercise a regular part of your day.
- **Get something done that you have been putting off.** Clean out that drawer. Wash that window. Write that letter.
- **Spend time with people who make you feel good about yourself.** Avoid people who treat you badly.
- **Make meals a special time.** Turn off the television, etc. Set the table, even when eating alone. Light a candle or put flowers on the table. When you eat with others, encourage discussion of pleasant topics.
- **Do things that make use of your own special talents and abilities.**
- **Take advantage of opportunities to learn something new or improve your skills.** Take a class or go to a seminar.
- **Give yourself rewards**—you are a great person.
- **Make your living space a place that honors the person you are and attractive for you.**
- **Do something nice for another person.** Smile, say a few kind words to someone, send a card to an acquaintance, or volunteer for a worthy organization.
- **Find ways to treat yourself well every day.** Write about these moments in a daily journal.



Stroke and Relationships

Individuals who experience the debilitating effects of stroke often require a level of care that dramatically changes the lives of their loved ones in addition to their own.

This is especially true for spouses and significant others, many of whom take on their partner's share of responsibilities following a stroke. The full brunt of financial obligations, children's issues, household duties, caregiving, and more often rests squarely on a partner's shoulders. Such arrangements can last a matter of days to years depending on the extent of a person's injuries.

Many partners are surprised by the amount of time and energy they dedicate to caregiving.

Unfortunately, the role's physical and emotional demands often go unnoticed by extended family and friends, leaving caregivers without enough outside support. As a result, these relationships can become more strained.

Perhaps most distressing is the strain placed on the couple. The harmful effects of stroke can alter the survivor as a person and a partner. It is not unusual for a survivor to have new personality traits, anxieties, and/or lack of self-control. These issues are compounded in cases in which one partner is forced to assume a parental role for the sake of a loved one's safety. The resulting shift from an equal to an unequal partnership can create hurt feelings and resentment on both sides.

Care for the Caregiver

With so much responsibility, primary caregivers typically find little time for their own interests. However, personal neglect is dangerous because it can increase the risk of serious illness. For this reason, it is important to give friends and family an accurate account of home life, and to ask for help. Taking regular breaks from caregiving responsibilities is critical to preserving one's health and happiness.

Caregivers may want to consider the following tips:

- Exercise, eat healthy, and visit your doctor regularly
- Maintain personal interests, hobbies, and friendships
- Ask friends and family for help
- Join a local or online support group
- Organize your caregiving routine and build your skills
- Don't try to be the perfect caregiver. Set reasonable expectations to lower stress
- Try relaxation methods, such as mindfulness, meditation, or yoga, to help reduce stress

Meditation

Meditation is a way to relax and renew the mind, body, and spirit. Meditation has been proven to be an essential benefit for stroke recovery. Just 20-30 minutes a day can help reduce depression, fatigue, stress, and tiredness. It also can help improve attention, information processing, and emotional regulation.

Basic Steps:

1. Settle into a relaxed and comfortable position.
2. Exhale completely, leaving a slight pause at the end.
3. Allow the body to naturally inhale. Mentally say “one” while you inhale. Allow a slight pause before exhaling again.
4. As you exhale, release all tension. At the same time, mentally say a single syllable word that holds either neutral or positive connotations (words like love, joy, fresh, etc.).
5. Continue the cycle in a slow, relaxed manner. Repeat for three to five minutes every day — or choose a shorter duration of one minute and work your way up over time.
6. Slowly and gently bring your attention back to the present.
7. Take a few minutes before you return to the rest of your day.

Understanding Grief

A profound feeling of loss is a common reaction to stroke and its harmful effects. Survivors who experience severe disabilities, such as partial paralysis, vision loss, or chronic pain, frequently suffer emotional distress in response to their changed lives.

With loss comes grief, a normal response to intense and painful emotions. The grieving process, often described as an emotional rollercoaster, can be divided into stages to help survivors better anticipate and understand strong feelings they might face.

Each stage — **denial, anger, bargaining, depression, and acceptance** — is associated with a particular mindset that influences how a person interprets the world around them.

**It is important to remember that grieving is personal;
there is no right or wrong way to grieve.**

The stages are meant to serve as a guide and confirm that intense feelings are normal. People should not expect to pass through the stages in a precise order, nor should they expect to pass through all five. It is not uncommon for people to skip entire stages, repeat stages, or experience additional emotions. There is no right or wrong way to grieve.



Stages of Recovery

- **Denial** allows individuals to suspend reality by refusing to accept the truth about an intolerable event. Like a shield, denial protects the mind from bearing the full weight of a painful situation all at once, giving people more time to adjust.
- **Anger** and frustration may be among the most difficult emotions to manage after certain strokes. Damage to the brain's frontal lobes, areas that help plan and control behavior, may cause survivors to behave impulsively and experience emotions with more intensity.
- **Bargaining** is characterized as a period when people try to rewrite the past. Survivors imagine a time before the stroke and search for ways to change the current reality. They tend to focus on what they or others could have done to avoid the stroke altogether — if only they had recognized symptoms sooner, headed to the hospital earlier, gone to a different hospital, etc.
- **Depression** is a natural response to challenges that may follow a stroke, such as physical limitations, loss of independence, or poorer health. Signs of depression include feeling down most of the day, changes in sleeping habits, loss of interest in activities, change in appetite, and strong feelings of despair.
- **Acceptance** of one's situation is generally marked by a sense of inner peace or calm. Over time, painful emotions are likely to be offset by a growing number of positive feelings. New priorities and relationships often develop during this phase.

Ways to Help Your Loved One Grieve

- **Be patient.** Remember that your loved one has suffered a life changing event.
- **Give your loved one support.** Respect your loved one's need for space
- **Give your loved one tasks that they are able to do.** Praise your loved one.
- **Encourage your loved one to express feelings when ready.** Let them know that their feelings are okay.
- **Suggest attending a support group.**

Ways to Help Yourself Grieve

- **Allow yourself time to grieve.** Don't blame yourself for feelings that come up.
- **Plan time each day to take care of yourself.** Do activities that are fun and relaxing.
- **Write in a journal.** Make notes about your thoughts and feelings.
- **Try to keep your previous friendships and hobbies.** Ask others for help so you have time for yourself.
- **Join a caregiver support group.** Talking to other caregivers is often helpful.

If you or someone you love has questions or concerns about your emotional well-being, please talk to your doctor or contact a mental health professional.

Finding Support

Surviving stroke can be a difficult journey that no one should face alone. Beyond friends and family, survivors often talk to therapists and/or join support groups for additional guidance.

Support groups are meetings for survivors and those whose lives have been affected by stroke. Among their many benefits, support groups give people the opportunity to be with others who have similar stroke experiences.

While many groups meet in person, others connect participants via phone or online. Contact your local hospital or community center to inquire about groups in your area. You can also do an online search.

Support groups can:

- Help you feel better, more hopeful, and not so alone
- Give you a chance to talk about feelings and work through them
- Find local resources
- Help you deal with practical problems

Choosing a Support Group

When you are ready to join a support group, you might ask yourself the following questions: Will I be comfortable talking about personal issues (or hearing about other people's issues)? What do I want to share with the group? What do I hope to gain from the experience?

Collect information from multiple groups and compare the pros and cons of each.

Consider the following:

- How large is the group?
- Who attends (survivors, family members, age range)?
- How long are the meetings? How often does the group meet?
- How long has the group been together?
- Who leads the meetings — a professional or a survivor?
- Is the main purpose to share feelings, or do people also offer tips to solve common problems? If I go, can I just sit and listen?

Moving Forward

Accepting life as a survivor is an important part of recovery. Individuals are more likely to engage with family, friends, and community, which can improve the quality of their daily lives.

Activities to Consider

Connect with family and friends

- Video chat or call your friends and family members
- Play cards or other games with friends
- Go to the theater, a movie, or a sporting event
- Try different restaurants
- Join a group interested in a hobby like knitting, hiking, birdwatching, painting, or wood carving
- Reconnect with old friends through your high school or college alumni associations

Learn something new

- Visit local museums
- Take a cooking, art, dance, language, or computer class
- Form or join a book or film club
- Try yoga, tai chi, or another new physical activity

Become more active in your community

- Visit a senior center and take part in its events and activities
- Serve meals or organize clothing donations for people in need
- Volunteer at a school, library, hospital, animal shelter, or place of worship
- Organize a park clean-up through your local recreation center, or community association
- Join a local theater troupe or community choral group
- Rediscover a favorite childhood pastime or teach it to a new generation — embroidery, photography, building models, etc.
- Garden or do yard work; help with a community garden project

Get out and get moving

- Join a sports club, like a bowling club or a bocce league
- Take an exercise class or do exercises at home. Consult your doctor about making exercise a regular part of your day
- Garden (indoors or out) or do yard work

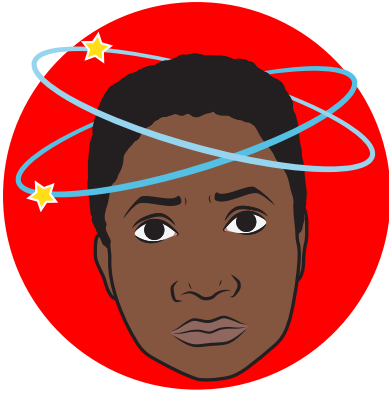
Adopt healthy stress-relieving habits

- Read a good book, magazine, or newspaper
- Practice gratitude and mindfulness
- Cook your favorite healthy meal
- Enjoy the little things, such as a cup of coffee at sunrise

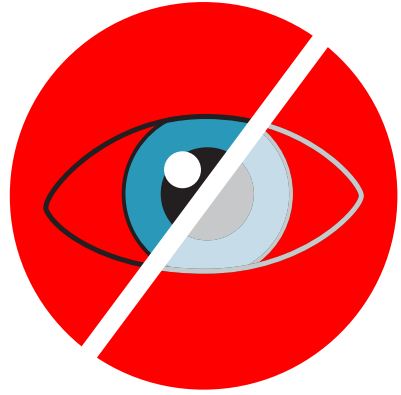
The amount of time a person can devote to hobbies varies. Something that fits one person well could be too much for another. Start by incorporating one or two new things into your daily schedule and see how you feel. There is always room for more. Remember that engaging in activities you enjoy should be fun, not stressful.

BE FAST

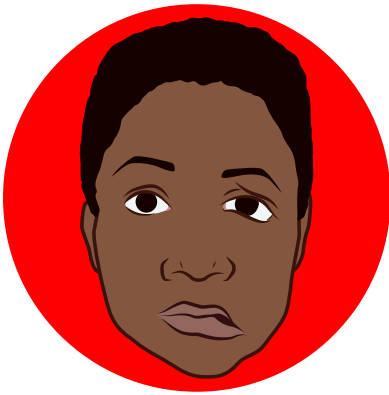
Time is Brain. Call 911 at the first sign of stroke.



B BALANCE



E EYES



F FACE
drooping



A ARM
weakness



SPEECH
difficulty



TIME
to call 911

Sources

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**Professor & Chief, Cerebrovascular/Neurointerventional Surgery
Northwestern University Medicine**

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National Institute of Neurological Disorders and Stroke

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National Heart, Lungs, and Blood Institute

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