

Subarachnoid Hemorrhage (SAH)

(A type of Hemorrhagic Stroke)

A Guide for Patients and Families in the
Neurosurgery Intensive Care Unit



Department of Neurosurgery

Introduction

A team of doctors and nurses at The University of Michigan Neurosurgery Intensive Care Unit (Neuro ICU) wrote this booklet for patients who have had a Subarachnoid Hemorrhage (SAH) and for the family members and friends who care about them. The purpose of this booklet is to give answers to questions about the illness and treatment of SAH and about what you can expect during your stay in the Neuro ICU. If you have any additional questions, please ask a Neurosurgery team member.

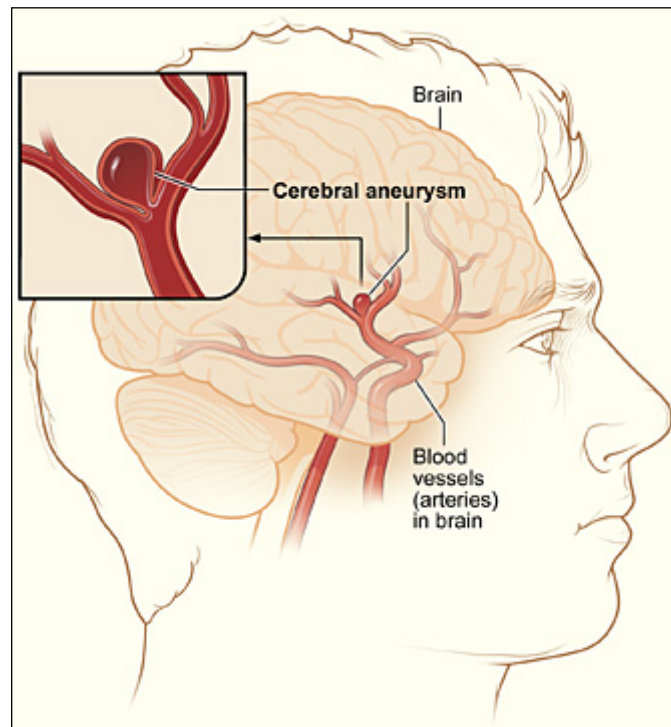


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What is SAH?

A Subarachnoid (sub-uh-`rack noid) Hemorrhage (SAH) occurs when a blood vessel either on or inside the brain suddenly begins to leak blood. This blood settles into a space between the surface of the brain and the skull called the subarachnoid space. The leaked blood may also settle into other areas of the brain, but it is the blood in this subarachnoid space that causes SAH's unique problems and risks.

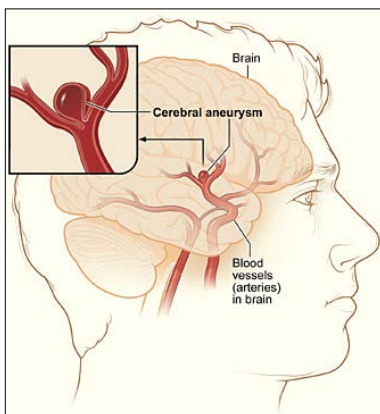
In most cases, by the time you have reached the hospital, a blood clot has already stopped the leaking. The location and amount of bleeding is different from person to person, and this is why people have very different symptoms. Some people feel as if they have had “the worst headache of my life” and nothing else. Others may have more symptoms such as:

- Dizziness
- Weakness
- Speech Changes
- Nausea
- Vomiting
- Confusion
- Drowsiness (sleepiness)
- Loss of consciousness

The strength of the symptoms depends on the amount and location of the hemorrhage (leak) but it does not necessarily predict your outcome.

What causes SAH?

80% of SAH cases are caused by a ruptured brain aneurysm.

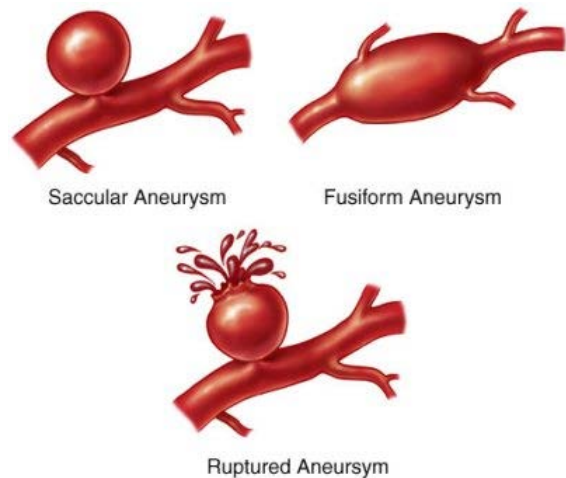


An aneurysm is a weak area in the wall of brain artery that bulges out like a balloon, usually in the shape of a berry or a blister. The bulge may stretch and cause the vessel's wall to get thinner and thinner until it breaks. This is called a rupture.

An injury, infection or an inherited tendency may start an aneurysm that grows silently over time.

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There are two types of aneurysms: a saccular aneurysm and a fusiform aneurysm. The differing shapes may affect treatment choices.



Scientists suspect that up to 15 million Americans (about five out of every 100) may have brain aneurysms. About 30,000 people per year experience an aneurysm rupture.

Other conditions in which blood vessels in the brain become strained also increase the risk for SAH. These include:

- High blood pressure
- A strong blow to the head from an accident or fall
- Rare, genetic conditions
- Arteriovenous malformation (in 5% of cases)

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Arteriovenous malformation (AVM) is a condition that occurs when blood vessels are connected in an abnormal way. Scientists believe that AVM's develop during fetal or infant growth and go undetected until symptoms develop later in life.

What are the risk factors for SAH?

Family history: Close relatives of people who have had an SAH have a higher risk of having one too. Up to 15 % of people who have bleeding from an aneurysm have a first- or second-degree relative who also has an aneurysm. (First-degree relatives are siblings, parents or children. Second-degree relatives are grandparents, aunts, uncles or grandchildren.)

Even though family history is important, other factors can also lead to rupture.

- **Age and gender** – Most (55%) SAH victims are women. The risk for having an SAH increases with age. Fewer than 10% of SAH cases occur before the age of 41.
- **Having other diseases** – people with polycystic kidneys, connective tissue disorders, neurofibromatosis and other rare diseases have an increased risk.

- **Cigarette smoking** - increases the risk of an aneurysm rupture. Smokers are three times more likely to have an SAH than non-smokers.
- **Alcohol use** - It is unclear if alcohol use increases the risk of developing an aneurysm, but moderate to heavy drinking is considered a risk factor for the rupture of an aneurysm if present. Similarly, drug use, particularly cocaine, may increase the risk of rupture.
- **High Blood Pressure** - several studies found that having high blood pressure increases the risk for developing an aneurysm and for rupture of existing aneurysms.

At this time, a routine screening test to discover brain aneurysms does not exist. If a person has a family history of two or more first-degree relatives with aneurysms, doctors may recommend a 15-20 minute, non-invasive scan called Magnetic Resonance Angiography (MRA).

Treating SAH at the University of Michigan

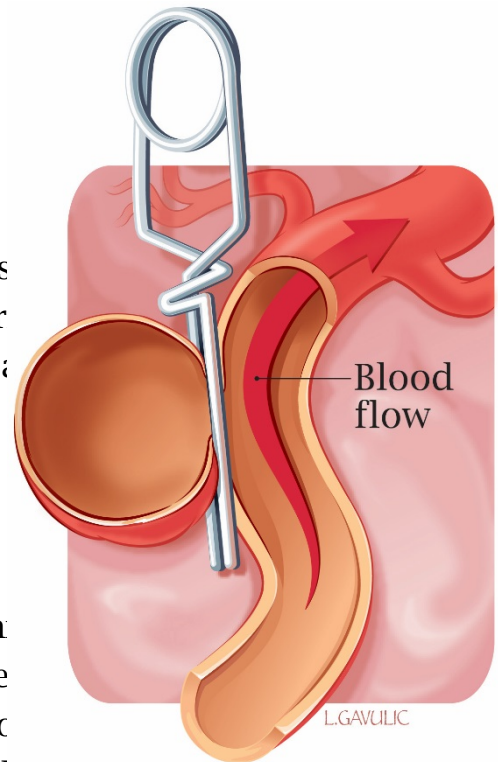
The first goal of treatment is to prevent another bleed. The U-M Neuro ICU team is highly experienced in caring for patients with SAH. If an aneurysm or AVM has ruptured or leaked once, it is almost certain to do so again. Four to 10% of patients with subarachnoid hemorrhages bleed again within the first 24 hours, and 20-25% may bleed again within the first two weeks.

There are two main ways to minimize these risks:

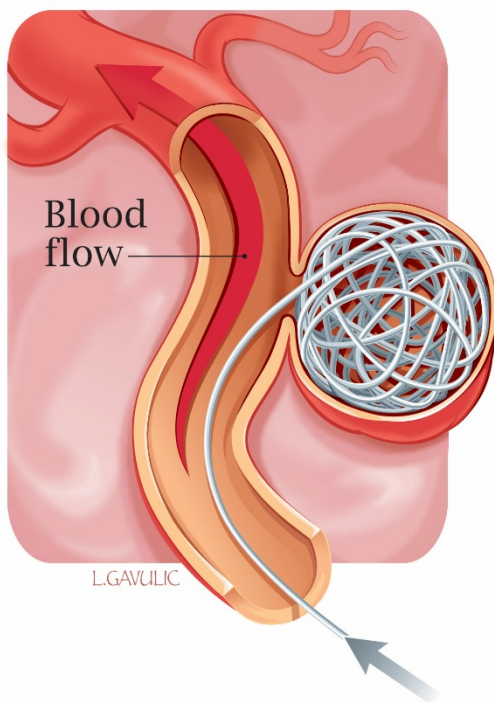
1. **Reduce the artery strain** by reducing blood pressure. Lowering blood pressure cuts down the force of the blood moving within the artery. When the artery wall has weakened to a breaking point, the first priority of treatment is to reduce blood pressure and the things that elevate it. Your bedside Registered Nurse (RN) will watch your blood pressure closely and give you drugs to keep it at a safe level. The nurse will also make sure that your environment has minimal stress levels. Reducing stimulation, keeping the room quiet, and lowering the lighting, will help keep your blood pressure low. These “SAH Precautions” are very important. Please do not be surprised if our team has to limit the numbers and behaviors of visitors. We want you to recover in a peaceful, therapeutic place.

2. **Secure the Bleeding Site by repairing the leaking artery.** The shape and location of the ruptured aneurysm determines the type of repair. Your doctor may use one these methods:

A. **Aneurysm Clipping** is done with brain surgery. During the operation, the neurosurgeon applies a small metal clip to base of the aneurysm. The clip cuts off the blood flow into the weakened area, and this causes the aneurysm to form a clot and shrivel. The clip is **MRI compatible**; its made from a type of metal that does not react to MRI magnets, so it can be scanned safely.



B. **Aneurysm Coiling** is done with a method called Endovascular Therapy. The surgeon or radiologist inserts a very thin, flexible tube catheter into



flexible tube catheter into artery, usually in the groin, and threads it through the arteries until it reaches the aneurysm. At the tip of this catheter is a tiny platinum coil that is then deposited into the pocket of the aneurysm. The doctor keeps repeating this process until the aneurysm is filled with the coils. These coils reduce the blood flow and cause a clot to form that seals the aneurysm from inside.

The U-M neurosurgeons are experts in all types of repair. Please feel free to ask them any question you may have.

Reducing possible side-effects

Having loose blood on or within the brain can cause some serious side-effects. The brain reacts to the SAH with irritation and swelling that may increase the risk of seizures. Also, the normal circulation of fluid within the brain may become disrupted, and the trapped fluid can cause dangerous pressure to build up within the skull. Your care will include ways to reduce the risks of side effects. These include:

- Taking anti-seizure medications.
- Keeping the head of the bed at 30 degrees to reduce swelling.
- Constantly checking your brain function. Your doctors and nurses will do frequent “neuro checks” during the day and night; they will ask you to answer simple questions and demonstrate movement and strength. These frequent, repetitious activities may seem irritating, but the information they provide is very valuable in heading off side-effects and loss of function.

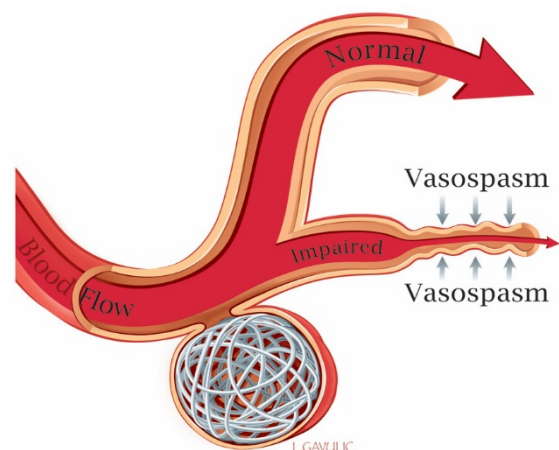
Family members: you know the patient best of all, and we welcome your input about any changes you may see in the behavior or responses of your loved one.

Preventing a secondary stroke from Cerebral Vasospasm

After you have overcome the initial high-risk stage of SAH treatment, there is still another high-risk period to work through. During this phase, you may experience **Cerebral Vasospasm**, a development that carries the danger of a secondary stroke.

Cerebral Vasospasm is a condition where the artery's walls react to the original bleeding and tighten up. This tightening narrows the space inside the artery and reduces the amount of blood that can flow through it. This is similar to what happens when someone steps on a garden hose.

This reduced blood flow can cause a drop in the oxygen and nourishment that the artery is able to deliver to brain tissues. Loss of this critical blood flow might cause a new (secondary) stroke. Even though vasospasm is a temporary event, it can cause lasting damages.



Doctors still do not know the exact cause of vasospasm. It tends to occur 4-10 days after the original SAH, but the risk period may extend to 21 days.

Doctors believe that about one-half to two-thirds of SAH patients have some degree of vasospasm, but only about one-third of patients have a severe enough case to cause symptoms. Early signs may be:

- Drowsiness
- Confusion
- Changes in speech
- Changes in strength
- Headaches that become more severe
- Other symptoms, unique to individual patients

The risk of vasospasm seems to be related to the amount of bleeding within the subarachnoid space.

Our approach for reducing the risks of vasospasm is to give preventative medicines from the beginning of your stay. Once the aneurysm has been repaired, we will allow the blood pressure to climb. We closely monitor every patient during the high-risk period and will order a Cat Scan (CT) of the head or an Angiogram if there is any change to your condition.

Vasospasm with symptoms is usually treated with **Cerebral Angioplasty**. With this method a neurosurgeon or radiologist inserts a special tube (catheter) into the narrowed part of the artery. At the end of this tube is a tiny, soft-but-tough balloon, which is inflated to widen the artery. Sometimes the surgeon uses the catheter to deliver artery relaxing drugs directly at the site of the narrowing.

After these treatments, your nurse will help maintain the improved blood flow by giving drugs and fluids to more forcefully drive blood through the affected arteries.

To reduce the risks caused by cerebral vasospasm, patients may remain in the ICU for a prolonged period. This allows the medical team to closely monitor for any vasospasm symptoms and to quickly diagnose and treat the condition if it occurs.

What you need to know about your hospital stay

How long will it last?

Most patients with SAH stay in the hospital for several weeks. Every case is unique and depends on the size and location of the hemorrhage (bleed). Sometimes the stay lasts longer in order to allow our team to observe you closely for vasospasm or other possible problems. In this ICU, the length-of-stay for a patient with SAH ranges from 6-16 days; with 12-14 days being the most common length. Having a long hospital stay brings up additional care issues:

The dangers of being bed bound

The human body is meant for a life lived upright and on the move. Because SAH patients must stay in bed (at least in the early stages of therapy) they are at high risk for developing several serious conditions:

- Dangerous blood clot formation
 - To reduce this risk patients wear inflatable calf wraps (“SCD’s”) while they are in bed or a chair. This therapy helps to improve blood flow by simulating the action that active muscles have on blood vessels. Patients also receive drugs to prevent clots.
- Pneumonia
 - To fight back against pneumonia, you’ll be exercising your lungs by doing deep breathing with an inhalation meter called the “Incentive Spirometer.”
 - To further ensure best lung inflation, the nurses may vibrate your chest walls by clapping on them with their hands or with an air powered “thumper” to shake loose any accumulating secretions.
- Even something as ordinary as constipation may become dangerous in a patient who is bed-bound. This is because “bearing down” is one of the actions that produces strain on the brain’s arteries. Stool softening medications and early use of laxatives help to lessen straining.

How can family and friends help patients achieve the best outcomes?

SAH is a sudden, life-changing event that affects an entire family. Still, while in the hospital, it’s very important for everyone to keep focused on the needs of the patient. The actions of family and friends are key factors in reducing brain damage and having the best possible outcome. Here are some guidelines for family and friends:

Minimize stressful stimulation

Over-stimulation may further strain an aneurysm. The pain, confusion, and anxiety caused by the SAH can increase with noise, high activity and unnecessary demands. The goal is to make the patient feel peaceful and secure. Our staff may limit the numbers and behaviors of visitors to make sure we maintain a peaceful and therapeutic setting.

Be at your best through a possibly long ordeal

The strength of family members is an asset for the patient. Responding to the patient's on-going needs during this stay is an important role, and families find that they can provide stronger support by pacing themselves and taking steps to prevent burnout. These steps include eating well, getting enough sleep, asking others for help and allowing some time away from the hospital. Saving your own strength can definitely be an act of love.

Be an ally in caring for your loved one

Every aspect of Neuro ICU care is based on solid research and past success. To achieve the best possible outcome the patient must follow every detail of the treatment plan. Caregivers are key to ensuring that their loved one is taking part in all necessary therapies, even when it's not always easy. Please help us be sure the patient is:

- Doing deep breathing exercises
- Following restrictions in bed positioning
- Wearing the inflatable calf wraps
- Following fluid restrictions (if needed)
- Following any other instructions from the medical team

Preserve life outside the hospital

SAH is a sudden event that deeply shakes a family's world. While your attention is focused on your sick loved one, life beyond the hospital room still moves forward. Responsibilities outside the hospital continue to demand attention, and taking care of your house, caring for children, and staying connected with work are not acts of disloyalty. In fact, spending some of your time keeping things in balance is necessary to preserving the life your loved one most wants to rejoin.

Your partnership with the Neuro ICU

What is the best way to keep informed about a patient's clinical status?

The bedside RN is very well-informed and can answer a great number of your questions. If your question needs a response from a doctor, the RN can page the doctor and arrange a more direct discussion. Your doctor will get back to you as soon as possible. But please understand that with the great demands on a doctor's time and attention, "as soon as possible" may not always be right away. The University of Michigan Health System is committed to keeping patients and families well informed, and you can be confident that every effort will be made to keep the wait short.

What resources are available to support patients and families?

Social Workers are staff members that help families cope with emotional or social difficulties related to the hospital stay. Social workers also assist with counseling, general information, and referrals to community agencies.

Discharge Planners arrange for continuing therapy and nursing needs after the patient leaves the hospital. They also may arrange placement in rehabilitation or extended care facilities if needed.

The UMHS Guest Assistance Program (GAP) provides financial assistance for transportation, parking, meals, and lodging for family members who qualify.

Nurse Practitioners help coordinate the overall management of the patient. They are a rich source for information about medical care after the ICU stage.

The Brain Aneurysm Family Support Group features U-M nurses, therapists and staff leading presentations and discussions about the recovery process. The group meets quarterly and offers opportunities for sharing experiences and receiving supportive advice about the SAH experience.

Spiritual Care providers respond around the clock to patients and families who need spiritual counseling, anointing, emergency baptism, crisis intervention and other supportive measures.

The Unit Clerk, located by the main NICU entrance, is another important ally and a good source for coordinating visits around bedside procedures. The clerks also provide directions, and make other arrangements.

The Unit Host is on the unit during day and early evening hours. The Host works to promote comfort and meet many of the practical needs of patients and families beyond those mentioned above.

The Bedside Registered Nurse remains your best, first contact. The RN will help put you in touch with any of the supportive resources listed above.

What happens after leaving the Neuro Intensive Care Unit?

Based on your daily progress and signs that the risks of vasospasm have passed, your doctor will decide when you are able to leave the Neuro ICU and move to the Neuro General Care floor. This setting will be familiar in many ways. The same doctors will be overseeing your care, and the nursing staff are all neuroscience specialists. In this more relaxed setting, the focus of care will be shifting away from battling against possible damages and toward returning to the activities of daily living.

Before you leave the hospital, your nurse will give you more details about the follow-up care and lifestyle changes you may need. One of the most important things you will need to know is how to recognize and act upon any signs of another SAH.

How do you know if you or another family member is having SAH?

Very often, the key phrase associated with SAH's is "The worst headache of my life". Even without pain, **any** of the following symptoms may indicate a stroke or an SAH. Call 911 immediately!

- Sudden numbness or weakness of the face, arm or leg, especially on one side of the body
- Sudden confusion, trouble speaking or understanding
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, loss of balance or coordination
- Sudden, severe headache with no known cause

If you have one or more of these symptoms, lasting more than a few minutes, don't delay! Immediately call 9-1-1 or the emergency medical service (EMS) number so an ambulance (ideally with advanced life support) can quickly be sent for you.

Remember, not all the warning signs occur in every stroke or SAH. Don't ignore these signs, even if they go away!

If you are with someone who has any of these signs **call 9-1-1 or EMS immediately**. Expect the person to protest — denial is common, but don't take "no" for an answer. Insist on taking prompt action. Also check the time. The medical staff will ask you when the first warning sign or symptom started.

In closing...the idea is not to close

We hope that this booklet has provided you with some useful answers, but please feel free to ask us additional questions as they come up. We pride ourselves in being a place that provides knowledge as well as care.

Feel free to use the lines below for noting anything you might want to ask about later.

Knowledge does not insure that difficult events have perfect results, but it can help reduce the unnecessary pain caused by mystery and confusion.

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