

SUBARACHNOID HEMORRHAGE (SAH)

WHAT IS A SUBARACHNOID HEMORRHAGE?

A subarachnoid hemorrhage is bleeding that occurs in the subarachnoid space surrounding the brain. This is the space between the arachnoid mater and the pia mater and is filled with cerebral spinal fluid and large blood vessels.

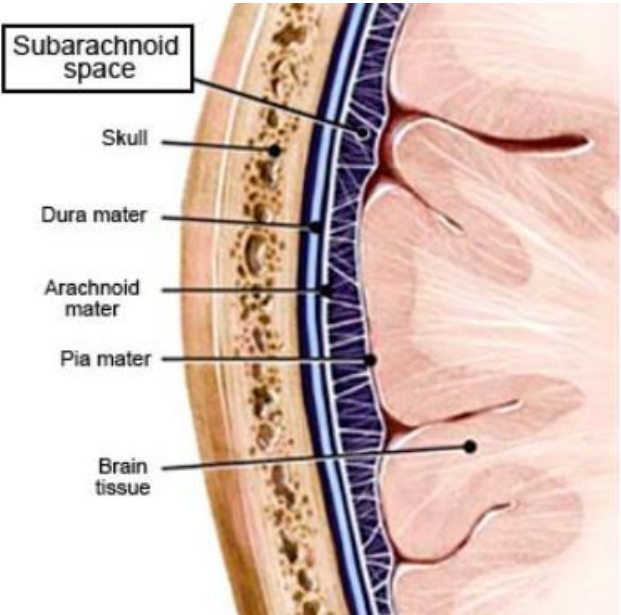
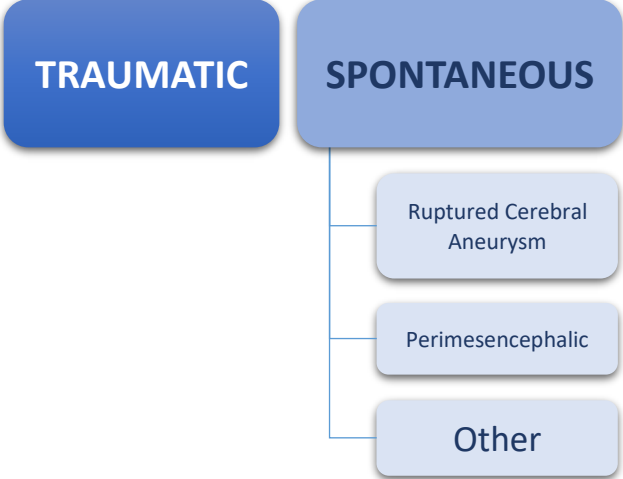


Image taken from <https://www.augustahealth.org/spine/spine-glossary/spine-glossary-subarachnoid-space>

CAUSES OF SAH



TRAUMATIC

A traumatic SAH is more common than a spontaneous SAH. It occurs frequently alongside a traumatic brain injury and usually does not require surgery.

SPONTANEOUS

- Ruptured cerebral aneurysm
 - ▶ A cerebral aneurysm is a weakness in a blood vessel in the brain that causes a balloon-like bulge. They are at risk of rupturing and bleeding which will cause a subarachnoid hemorrhage.

- Perimesencephalic
 - ▶ No aneurysm found on imaging
 - ▶ Overall, has an excellent prognosis with better outcomes compared to aneurysmal SAH.

- Other
 - ▶ Coagulopathies
 - ▶ Arteriovenous malformation (AVM): Abnormal connection between cerebral arteries and vein.

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RISK FACTORS

- ▶ Smoking
- ▶ Hypertension
- ▶ Alcohol abuse
- ▶ Drug use (particularly cocaine)
- ▶ More common \geq 50 yrs old
- ▶ Unruptured cerebral aneurysm
- ▶ History of previous SAH or aneurysm
- ▶ Family history of aneurysm
- ▶ More common in women
- ▶ More common in people of African or Hispanic descent
- ▶ Certain genetic syndromes (autosomal dominant polycystic kidney disease, Type IV Ehlers-Danlos syndrome)
- ▶ Presence of arteriovenous malformation
- ▶ Severe head trauma

CLINICAL FEATURES

- ▶ Sudden onset of severe headache often described as the “worst headache of my life” or “thunderclap”
- ▶ Warning or sentinel headache prior to the severe headache due to potential minor bleeding or leak from the aneurysm
- ▶ Altered level of consciousness can range from being alert to completely comatose
- ▶ Nausea and/or vomiting
- ▶ Neck stiffness
- ▶ Photophobia
- ▶ Focal neurological deficit
- ▶ Seizures

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DIAGNOSTICS

Several tests can be used for the diagnosis of a SAH and cerebral aneurysms. These will also help determine the size and location of an aneurysm and may help decide on treatment. They include:

Computed Tomography (CT) Head (non-contrast)

First diagnostic test – highly specific for SAH

CTA

CT head using contrast dye – may be used for diagnosis when available or pre-op evaluation at the neurosurgery center

Cerebral Angiogram

May be used for pre-op evaluation and/or treatment (gold standard)

Magnetic Resonance Imaging (MRI)

Uses strong magnetic fields and radio waves to obtain images

MRA

MRI using contrast dye

Lumbar puncture

Sometimes used when the CT head is normal, but there is still a strong suspicion of SAH

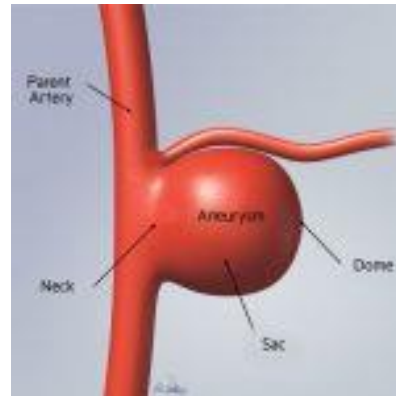


Image taken from: <https://bafound.org/about-brain-aneurysms/brain-aneurysm-basics/>

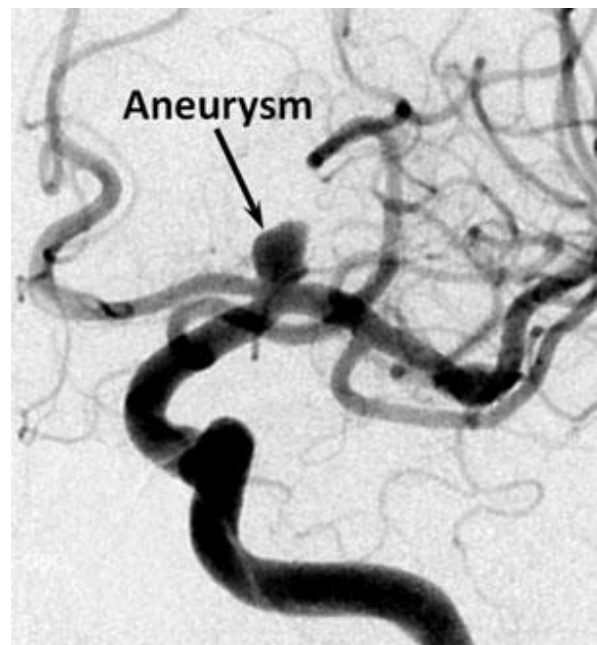


Image taken from: <https://med.nyu.edu/radiology/about-us/subspecialties/neuro-interventional/our-services/brain-aneurysm>

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TREATMENT AND MANAGEMENT

Depending on the cause, treatment may range from medical observation / management to surgery.

Cerebral Aneurysm

Ideally treated within 24-48 hours to secure the aneurysm and prevent the risk of re-bleed.

Surgical Clipping

Craniotomy where a surgical clip is positioned across the neck of the aneurysm. This will prevent blood from entering the aneurysm and will obliterate it.

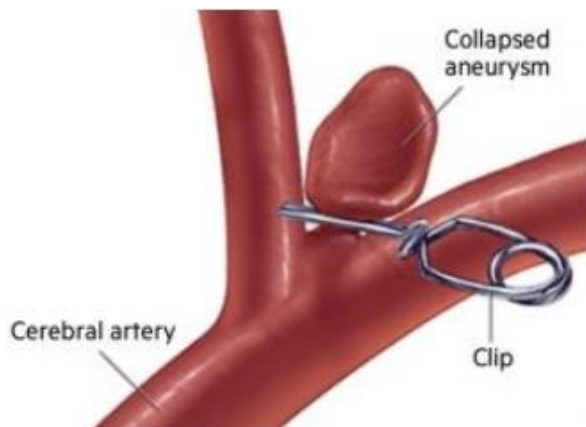


Image taken from <https://bafound.org/treatment/surgical-treatment-clipping/>

Endovascular Coiling (Embolization)

Access to the aneurysm through the femoral artery and placement of platinum coils into the aneurysm, which will cause it to thrombose. Stents may also be used.



Image taken from <https://bafound.org/treatment/endovascular-treatment/>

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POTENTIAL COMPLICATIONS OF CEREBRAL ANEURYSMS

Recurrent SAH

- ▶ Most common in the first 24 hours post initial hemorrhage
- ▶ Securing the aneurysm is crucial for prevention

Hydrocephalus

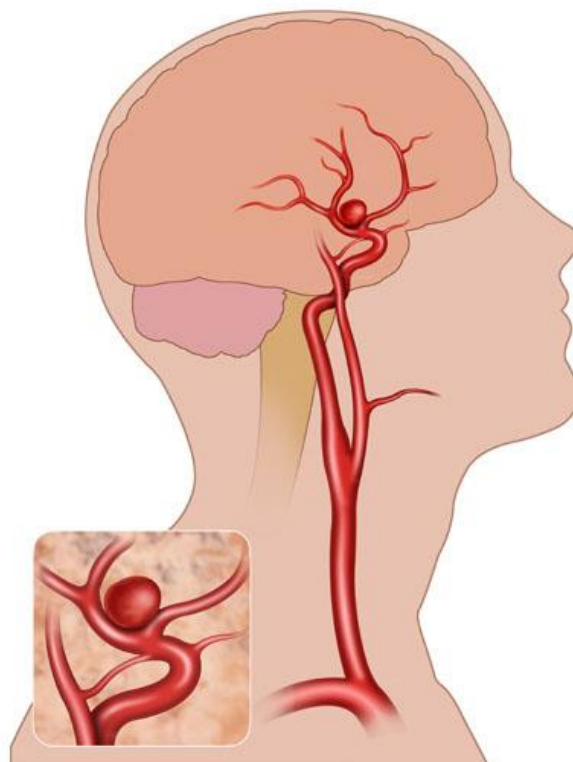
- ▶ Caused by subarachnoid blood products obstructing reabsorption of cerebrospinal fluid (CSF)

Cerebral Vasospasms

- ▶ Narrowing of cerebral blood vessels, which can cause cerebral ischemia and stroke
- ▶ Can develop between 4-14 days post initial bleed often peaking around day 7

Other

- ▶ Seizures
- ▶ Cerebral edema – increased risk 48-72 hrs post op
- ▶ Alteration in Na and H₂O balance



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NURSING ASSESSMENT AND CARE OF SAH

Neurological Assessment

An accurate and precise neurological assessment is fundamental. It provides a snapshot in time of the patient's neurological condition and establishes a baseline. Changes in a neurological assessment are often an indication of a complication. It is crucial to identify potential problems promptly so that treatment can be initiated as soon as possible.

The basic components of a neurological assessment include:

1. Level of consciousness (LOC) using the Glasgow Coma Scale
2. Pupillary response
3. Limb movement/strength
4. Vital signs

1. Level of Consciousness (LOC)

LOC is the most sensitive indicator of neurological condition

2. Pupillary Response

The pupil's response to light assesses the function of cranial nerve 2 (optic) and 3 (oculomotor). Differences in degrees of change in pupil size, or unequal response between the left and right pupils may be an indicator of change in intracranial conditions.

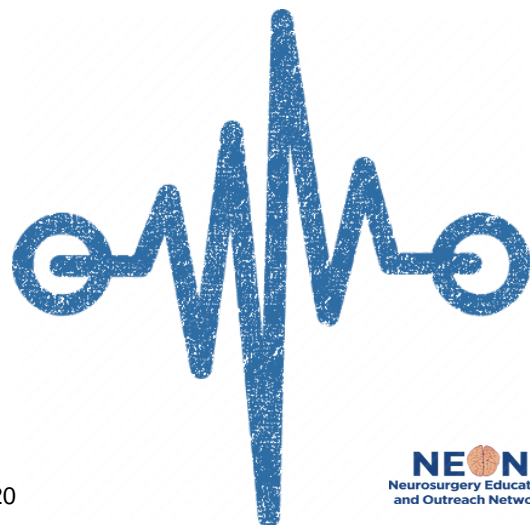
It is important to assess the patient's pupils at baseline in order to identify a change. Pupils should be assessed for size (without light stimulus), equality between left and right, and reaction to light. If pupils change from baseline or no pupillary constriction is observed, this may indicate a deterioration in a patient's condition. Follow-up by increasing the frequency of monitoring, informing the physician and/or calling the Critical Care Response Team (or equivalent).

3. Limb Movement / Strength

Limb muscle strength is tested to observe for any sign of asymmetry of strength and movement between limbs. Always document the best response of each limb separately.

4. Vital Signs

Changes in vital signs in a patient with neurological problems may be an indicator of neurological deterioration. Often, a change in vital signs related to a neurological deterioration is a late sign of deterioration.



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INCISIONAL / GROIN PUNCTURE SITE CARE

Depending on the procedure, the patient may have a craniotomy incision or groin puncture site.

- ▶ Monitor the incision every shift and notify the medical team of any redness, heat, increased pain, swelling or drainage.
 - Purulent drainage could indicate an infection.
 - Clear drainage, which may have a pink ring around it, could indicate a CSF leak.
 - If bleeding occurs apply pressure to the site and inform the medical team.
- ▶ Change the dressing according to the surgical team's specific instructions. Sometimes the incision will be left uncovered, if it is not draining.
- ▶ Swelling or bruising may appear around the wound or around the patient's eyes. This may continue for several weeks. Elevating the head of the bed will help to decrease the swelling around the wound and eyes.
- ▶ Do not rub the incision as it may interfere with the staples or the healing process.
- ▶ The staples are usually removed 7-14 days after the surgery.

PAIN MANAGEMENT

- ▶ Assess patient for pain and offer analgesia as ordered and as needed. Pain should decrease daily.
- ▶ Monitor for increase in intensity of headache and report to physician if the pain intensity increases.

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ACTIVITY LEVEL

The patient is encouraged to:

- ▶ Resume regular activities gradually over six weeks, including sexual activity.
- ▶ Start with short walks and slowly increase his or her daily activity.
- ▶ Try to limit visitors to avoid over-stimulation and allow rest.
- ▶ Take frequent rest periods as necessary. Let his or her body be the guide.

The patient should AVOID:

- ▶ Activities that require prolonged bending. When bending to pick something up, bend with his/her knees and reach for the object. The patient should not bend with the head going forward.
- ▶ Strenuous/heavy work or lifting anything heavy (weight limit specified by surgery team).
- ▶ Heavy exercises or any sports, especially if they could cause a blow or jolt to the head, until the follow-up appointment with the surgeon. For example, the patient should not to shovel snow or push a lawn mower.
- ▶ Driving (until they have been given a date to resume driving by their surgeon).
- ▶ Driving while they are taking opioids or sedating medications to manage their pain.
- ▶ Returning to work or school until they have been advised to do so by their surgeon.
- ▶ Flying until given clearance by their surgeon.
- ▶ Drinking alcohol, smoking or taking recreational drugs until advised by their surgeon.

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HYGIENE

- ▶ The patient may take a shower on the day specified by the surgeon and the dressing can be removed at that time. Do not let the water run directly on the incision. Do not scrub the incision. Clean the incision with a mild, scent free shampoo (baby shampoo is recommended). Pat the incision with a clean towel until it is dry.
- ▶ The patient cannot use hair products such as conditioners, hair sprays or gels until they talk to their surgeon at the follow-up appointment.
- ▶ The patient cannot dye or perm their hair until 3 months after the surgery.
- ▶ The patient should not use oils, lotions or creams on the incision unless prescribed by the neurosurgeon.
- ▶ The patient may wear a clean scarf or hat to cover the incision especially when going outdoors as it may be sensitive to sunlight.
- ▶ The patient cannot take a bath, swim, or use a hot tub or sauna for at least 14 days after surgery.
- ▶ The patient should not use a hairdryer until the staples are removed.

SLEEPING

- ▶ There are no restrictions for sleeping.
- ▶ Patients can sleep in any position that is comfortable for them.

EATING

- ▶ No specific dietary restrictions due to surgery.

BOWEL & BLADDER

- ▶ Monitor bowel movements closely in order to ensure regularity.
- ▶ Encourage high fibre diet and offer laxatives if needed to prevent straining and constipation.

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WHEN TO NOTIFY MEDICAL TEAM?

- ▶ Seizure activity (jerky movements of arms and/or legs, staring spell, getting confused, very drowsy, or loss of consciousness for a period of time)
- ▶ New or worse headache that does not get better with pain medication
- ▶ Double or blurry vision
- ▶ Chills or temperature of 38°C or 100°F or higher
- ▶ The incision becomes red, swollen and/or very painful
- ▶ Fluid or blood draining from the incision
- ▶ A new facial droop
- ▶ Decreased level of consciousness or confusion
- ▶ New or worsening dizziness, weakness, and/or difficulty speaking or walking
- ▶ Changes in behaviour
- ▶ Decreased use of arms or legs
- ▶ Unexplained nausea or vomiting
- ▶ Tingling or numbness in face, arms or legs
- ▶ Swelling or pain in leg(s) or calf/calves
- ▶ Shortness of breath, trouble breathing or new cough

FOLLOW UP

The patient will have a follow-up appointment with the neurosurgeon.

A CT scan or other imaging may be done before this appointment and the doctor will review the results of this scan at the appointment and discuss next steps.

Neurosurgery Education and Outreach Network **NEON**

The Neurosurgery and Education Outreach Network (NEON)

The Neurosurgery Education and Outreach Network (NEON) is comprised of Neurosurgical Nurse Educators (NNEs), Clinical Outreach Specialists/Advanced Practice Nurses, and Hospital Administrators dedicated to the neurosurgical nursing program implementation and on-going educational and clinical support of nursing staff in the neurosurgical centres and the non-neurosurgical referral centres.

As a neurosurgery education support program, NEON reports to the System Capabilities Working Group, a sub-group of the Provincial Neurosurgery Advisory Committee, which supports system-wide improvements for Ontario's neurosurgery services. NEON also works in collaboration with Critical Care Services Ontario (CCSO).

Disclosure Statement

The Neurosurgery Education and Outreach Network (NEON) and Critical Care Services Ontario (CCSO) have no financial interest or affiliation concerning material discussed in this presentation.

This booklet provides an overview of the nursing care required for adult patients with a subarachnoid hemorrhage to ensure consistency within and across organizations. It was developed by a sub-group of clinical neurosurgical nurse specialists and neurosurgical educators for nurses across Ontario. This presentation is not meant to be exhaustive and its contents are recommended, but not mandated for use. Nurses should use their clinical judgment and utilize other assessment parameters if determined necessary.

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