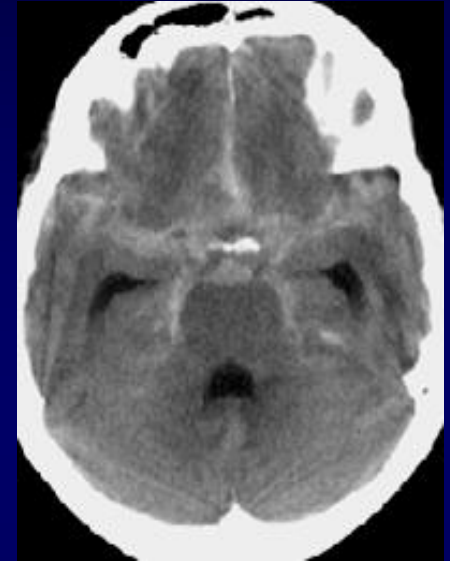


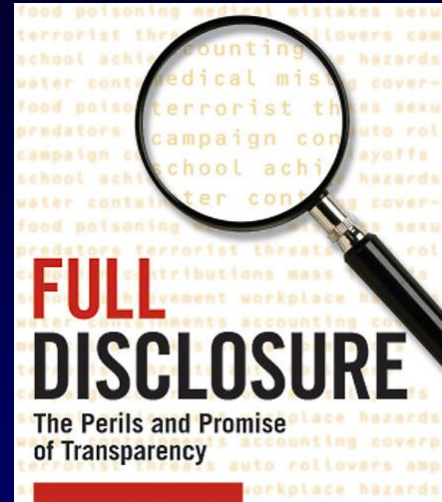
# 2009 AHA SAH Guidelines: An Update



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# Disclosure

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# Definitions of Classes

- **Class I:** Conditions for which there is evidence for and/or general agreement that the procedure or treatment is useful and effective
- **Class II:** Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment
  - **Class IIa:** the weight of evidence or opinion is in favor of the procedure or treatment
  - **Class IIb:** usefulness/efficacy is less well established by evidence or opinion
- **Class III:** Conditions for which there is evidence and/or general agreement that the procedure or treatment is not useful/effective and in some cases may be harmful

# Definitions of Levels of Evidence

- *Level A* - Data derived from multiple randomized clinical trials
- *Level B* - Data derived from a single randomized trial or nonrandomized studies
- *Level C* - Consensus opinion of experts

# Prevention of SAH

- Treatment of high blood pressure with antihypertensive medication is **strongly** recommended to prevent ischemic stroke, **intracerebral hemorrhage, and cardiac, renal, and other end-organ injury**
  - (Class I, Level A)
- Cessation of smoking is reasonable
  - (Class IIa, Level B)

# Prevention

- Screening of certain high-risk populations for unruptured aneurysms is of uncertain value
  - (Class IIb, Level B)
- ~~In patients with acceptable surgical risk clipping of unruptured aneurysms > 5-7 mm is recommended~~
- Advances in noninvasive imaging may be used for screening, but catheter angiography remains the gold standard when it is clinically imperative to know if an aneurysm exists.

# Natural History and Outcome

- The severity of the initial bleed should be determined rapidly because it is the most useful indicator of outcome after aneurysmal SAH, **(Class I, Level B)**.
- Urgent evaluation and treatment of patients with suspected SAH are therefore recommended **(Class I, Level B)**.
- In the triage of patients for aneurysm repair, factors that may be considered in determining the risk of rebleeding include severity of the initial bleed, interval to admission, blood pressure, gender, aneurysm characteristics, hydrocephalus, early angiography, and the presence of a ventricular drain **(Class IIb, Level B)**

# Manifestations and Diagnosis

- **A high level of suspicion for SAH should exist** in patients with acute onset of severe headache (Class I, Level B)
- CT scanning for suspected SAH should be performed (Class I, Level B), and lumbar puncture for analysis of CSF is strongly recommended when the CT scan is negative (Class I, Level B)
- Selective cerebral angiography should be performed (Class I, Level B)
- MRA and CTA may be considered when conventional angiography cannot be performed in a timely fashion (Class IIb, Level B)

# Emergency Evaluation and Preoperative Care

- The degree of neurological impairment using an accepted SAH grading system can be useful for prognosis and triage (Class IIa, Level B)
- A standardized ED management protocol for the evaluation of patients with headaches and other symptoms of potential SAH currently does not exist and should probably be developed (Class IIa, Level C)

# Medical Measures to Prevent Rebleeding

- Blood pressure should be monitored and controlled **(Class I, Level B)**.
- Bedrest alone is not enough to prevent rebleeding after SAH **(Class IIb, Level B)**
- Antifibrinolytic therapy to prevent rebleeding may be considered in certain clinical situations, e.g., in patients with a low risk of vasospasm and/or a beneficial effect of delaying surgery **(Class IIb, Level B)**
- ~~Use of intraluminal coils or balloons is experimental~~

# Surgical/Endovascular Treatment of Ruptured Aneurysms

- Surgical clipping **or endovascular coiling** should be performed to reduce the rate of rebleeding after aneurysmal SAH (**Class I, Level B**).
- Wrapped or coated aneurysms and incompletely clipped or coiled aneurysms have an increased risk of rehemorrhage. Complete obliteration of the aneurysm is recommended whenever possible (**Class I, Level B**).

# Surgical/Endovascular Treatment of Ruptured Aneurysms

- For patients with ruptured aneurysms judged by an experienced team of cerebrovascular surgeons and endovascular practitioners to be technically amenable to both endovascular coiling and neurosurgical clipping, endovascular coiling can be beneficial (**Class I, Level B**). Nevertheless, it is reasonable to consider individual characteristics of the patient and the aneurysm in deciding the best means of repair (**Class IIa, Level B**).
- Early aneurysm treatment is reasonable and is probably indicated in the majority of cases (**Class IIa, Level B**).

# Hospital Characteristics and Systems of Care

- Early referral to high-volume centers that have both experienced cerebrovascular surgeons and endovascular specialists is reasonable (**Class IIa, Level B**)

# Anesthetic Management

- Minimizing the degree and duration of intra-operative hypotension during aneurysm surgery is probably indicated (**Class IIa, Level B**).
- There are insufficient data on pharmacological strategies and induced hypertension during temporary vessel occlusion to make specific recommendations, **but there are instances when their use may be considered reasonable (Class IIb, Level C)**
- Induced hypothermia during aneurysm surgery may be a reasonable option in some cases but is not routinely recommended (**Class III, Level B**)

# Management of Cerebral Vasospasm

- Oral nimodipine is indicated (**Class I, Level A**).
- The value of other calcium antagonists, whether administered orally or intravenously, remains uncertain.
- Treatment of cerebral vasospasm begins with early management of the ruptured aneurysm, and in most cases, maintaining normal circulating blood volume and avoiding hypovolemia are probably indicated (**Class IIa, Level B**)
- ~~Intracisternal fibrinolysis and antioxidant and anti-inflammatory agents are of uncertain value~~

# Management of Cerebral Vasospasm

- One reasonable approach to symptomatic cerebral vasospasm is volume expansion, induction of hypertension, and hemodilution (triple-H therapy). **(Class IIa, Level B)**. ~~Patients receiving this therapy should be closely monitoring in an ICU setting~~
- Alternatively, cerebral angioplasty and/or selective intraarterial vasodilator therapy may be reasonable ~~is recommended in patients for whom conventional therapy has failed~~ after, together with, or in the place of triple-H therapy, depending on the clinical scenario **(Class IIb, Level B)**

# Management of Hydrocephalus

- Temporary or permanent CSF diversion is recommended in symptomatic patients with chronic hydrocephalus after SAH (**Class I, Level B**)
- Ventriculostomy can be beneficial in patients with ventriculomegaly and diminished level of consciousness after acute SAH (**Class IIa, Level B**)

# Management of Seizures

- The administration of prophylactic anticonvulsants ~~is recommended~~ may be **considered** in the immediate posthemorrhagic period (**Class IIb, Level B**)
- The routine long-term use of anticonvulsants is not recommended (**Class III, Level of Evidence B**) but may be considered for patients with risk factors such as prior seizure, parenchymal hematoma, infarct, or middle cerebral artery aneurysms (**Class IIb, Level B**)

# Management of Hyponatremia

- Administration of large volumes of hypotonic fluids and intravascular volume contraction should generally be avoided after SAH (**Class I, Level B**).
- Monitoring volume status in certain patients with recent SAH using some combination of central venous pressure, pulmonary artery wedge pressure, fluid balance, and body weight is reasonable, as is treatment of volume contraction with isotonic fluids (**Class IIa, Level B**).

# Management of Hyponatremia

- ~~Hypotonic fluids should be avoided, fluid restriction should not be instituted to treat hyponatremia~~
- The use of fludrocortisone acetate and hypertonic saline is reasonable for correcting hyponatremia (**Class IIa, Level B**)
- In some instances, it may be reasonable to reduce fluid administration to maintain a euvolemic state (**Class IIb, Level B**)

# What's missing

- Critical Care
- Steroids
- Magnesium
- Statins
- Which intra-arterial dilator
- Clazosentan
- Prophylactic angioplasty
- Nicardipine implants
- Removal of subarachnoid blood