DEPARTMENT OF HEALTH
STROKE PROGRAM

Hemorrhagic Stroke

CONSIDERATIONS FOR MANAGEMENT OF NON TRAUMATIC INTRACEREBRAL AND SUBARACHNOID HEMORRHAGES IN THE ED

Approximately 13% (per ASA) of the 795,000 strokes per year in the United States are hemorrhagic strokes. Per the Minnesota Stroke Registry data, intracerebral hemorrhages are responsible for nearly 10% of stroke cases entered. Brain Aneurysm Foundation indicates ruptured brain aneurysms account for 3-5% of all new strokes. Regardless of stroke type it is important to remember that *TIME IS BRAIN!*

The purpose of this document is to offer considerations for the management of hemorrhagic stroke patients including non-traumatic intracerebral and subarachnoid hemorrhages in the Emergency Department. It specifically provides guidance on the immediate clinical work up, neurology consultation, blood pressure management, coagulopathy reversal, disposition recommendations including considerations for admitting locally, and other treatments for this patient population. It is designed to promote quality and consistency in practice across stroke hospitals throughout the Minnesota Stroke System.

Terminology to Know

Intracranial hemorrhage – an encompassing term that includes any form of bleeding in various locations within the skull, such as epidural, subdural, intracerebral and subarachnoid hemorrhages. There are numerous causes for intracranial hemorrhages, including but not limited to trauma, tumor, coagulopathy, hypertension, and ruptured aneurysms.

- Intracerebral hemorrhage (ICH) – bleeding into the brain tissue and a type of hemorrhagic stroke
- Subarachnoid hemorrhage (SAH)
  - aSAH – aneurysmal subarachnoid hemorrhage caused by a ruptured aneurysm; a type of hemorrhagic stroke with bleeding into the subarachnoid space that surrounds the brain tissue
  - tSAH – traumatic subarachnoid hemorrhage. Trauma is the most common cause of subarachnoid hemorrhage. TSAH is not a hemorrhagic stroke and is managed differently than aSAH.

Triage and Management

- Stroke code activation if meets activation criteria
- Apply Ottawa SAH Rule if severe headache present:

Ottawa SAH Rule

For alert patients >15 y of age with new severe nontraumatic headache reaching maximum intensity within 1 h. Patients require additional investigation for SAH if they meet any of the following criteria:

- Age ≥40 y
- Neck pain or stiffness
- Witnessed loss of consciousness
- Onset during exertion
- Thunderclap headache (instantly peaking pain)
- Limited neck flexion on examination

- **Contact stroke/telestroke partner expert as soon as possible**. Provide neurological exam findings, BP, medical history, medications, code status (if available)
- The use of standardized order sets and protocols for prevention of complications is well established in the literature for all types of stroke events.
  - Stabilize- adequate airway and ventilation
  - Stat Imaging- non-contrast head CT
  - IV start
  - Stat labs- glucose, CBC, BMP, PT, PTT, INR, consider troponin, inflammatory markers, specific tests for DOACs (if on DOAC)
    - Recommended to treat hypoglycemia 40-60 mg/d to reduce mortality
  - Focused neurologic exam- (e.g., NIHSS, GCS) Frequent neurological assessments should be performed to assess change in status, neurological exam, or level of consciousness.
  - Vital signs & BP control- *contact neurology/telestroke partner for recommendations for target BP.* Work with your Primary or Comprehensive Stroke Center partners to include BP parameters within your protocols.
- Elevated BP is common and linked to greater hematoma expansion, neurological worsening, and death and dependency after ICH. It is critical to treat BP and decrease variation in BP fluctuations.
- In adults with acute spontaneous ICH requiring acute BP lowering, careful titration to ensure smooth, nonlabile, and sustained control of BP, avoiding peaks, and large variability in SBP, can be beneficial for improving functional outcomes. (COR 2a)
- For adult patients with acute spontaneous ICH who present with SBP between 150 and 220 mm Hg, it can be beneficial to immediately lower SBP to 130 < 140 mm Hg for at least 7 days after ICH to improve functional outcomes but stop antihypertensive medications if SBP < 130 mm Hg. (Cor 2A)

- For adult patients with acute spontaneous ICH who present with SBP > 220 mm Hg, SBP should not be lowered below 130 mm HG to reduce adverse events (COR 2A).
- Initiating treatment within 2 hours of ICH onset and reaching target within 1 hour can be beneficial to reduce the risk of hematoma expansion (2a)
    - Labetalol 10-20 mg IVP over 1-2 minutes, may repeat every 10 mins for a max of 300mg
    - Nicardipine 5mg/hr IV infusion- titrate by increasing 2.5mg/hr every 5 mins to max of 15mg/hr
    - Clevidipine 1-2mg/hr IV- titrate by doubling the dose every 2-5 min until desired BP reached; maximum 21 mg/hr

- For intracerebral hemorrhage patients, there is an increased risk of poor outcome for those with SBP reduction greater than 40 mm Hg. Rather that solely aiming for a SBP level, consider initial hematoma volume, baseline SBP level and magnitude of early SBP reduction. For those presenting with systolic blood pressure (SBP) ≥220 mm Hg, avoid lowering more than 40 mm Hg in the first 6 hours.[5]

  For aneurysmal subarachnoid hemorrhage patients
    - There is currently insufficient evidence to support a recommended blood pressure target. This does not mean that blood pressure reduction prior to aneurysm treatment would not be helpful. *Consult with neurology/telestroke partner to establish target.*

Coagulopathy Reversal for Patients with Hemorrhagic Stroke

Rapid reversal should be performed as soon as possible (Class 1). **Consult with neurology/telestroke partner for reversal plan.**

Vitamin K Antagonists

- INR 1.3-1.9
    - 4-F PCC 10-20 IU/kg (Class 2b)
    - IV Vitamin K (Class 1)
- INR ≥ 2.0
    - 4-F PCC 25-50 IU/kg (Class1)
    - IV Vitamin K (Class 1)

Dabigatran

- History of when last dose taken
- Activated charcoal if DOAC < 2 hours (potential efficacy up to 8 hours) (Class 2b)
- Is Idarucizumab available?
    - Yes: Idarucizumab (Class 2a)
    - No: PCCs or aPCC and/or renal replacement therapy (Class 2b)

Factor Xa-Inhibitors

- History of when last dose taken

- Activated charcoal if DOAC < 2 hours (potential efficacy up to 8 hours) (Class 2b)
- Is andexanet alfa available?
  - Yes: Andexanet alpha (Class 2a)
  - No: 4 Factor PCC or aPCC (Class 2b)

Heparins

- Unfractionated Heparin
  - Protamine (Class 2a)
- Low Molecular Weight Heparin
  - Protamine (Class 2a)

Transfer and Other Treatment Considerations

- **Arrange rapid transport to neurosurgery capable center**
- **Considerations for admitting locally***:*
  - *Family/patient wishes- consider comfort cares: age, size of infarct/hemorrhage, prognosis*
    - Encourage neurology/telestroke partners to participate in active discussion with patient/family regarding prognosis
- Other treatments/considerations:
  - Seizure precautions, HOB 30 degrees, NPO (until screening)
  - Seizure prophylaxis is not recommended for intracerebral hemorrhage, but it is reasonable for known/suspected high-risk aneurysmal subarachnoid hemorrhage patients
  - Nausea management: Zofran- preferred
  - Consult neurology for:
    - Seizure management: lorazepam (Ativan), levetiracetam (Keppra)
      - phenytoin (Dilantin) and fosphenytoin (Cerebyx) are avoided, when possible, as they have been linked to poorer cognitive outcomes
- ICP management: mannitol or hypertonic saline (prophylactic hyperosmolar therapy has not been shown to be of benefit)

- Top 10 Things to Know: 2022 Guideline for the Management of Patients with Spontaneous Intracerebral Hemorrhage.
- Top Things to Know: 2023 Guideline for the Management of Patients with Aneurysmal Subarachnoid Hemorrhage

References

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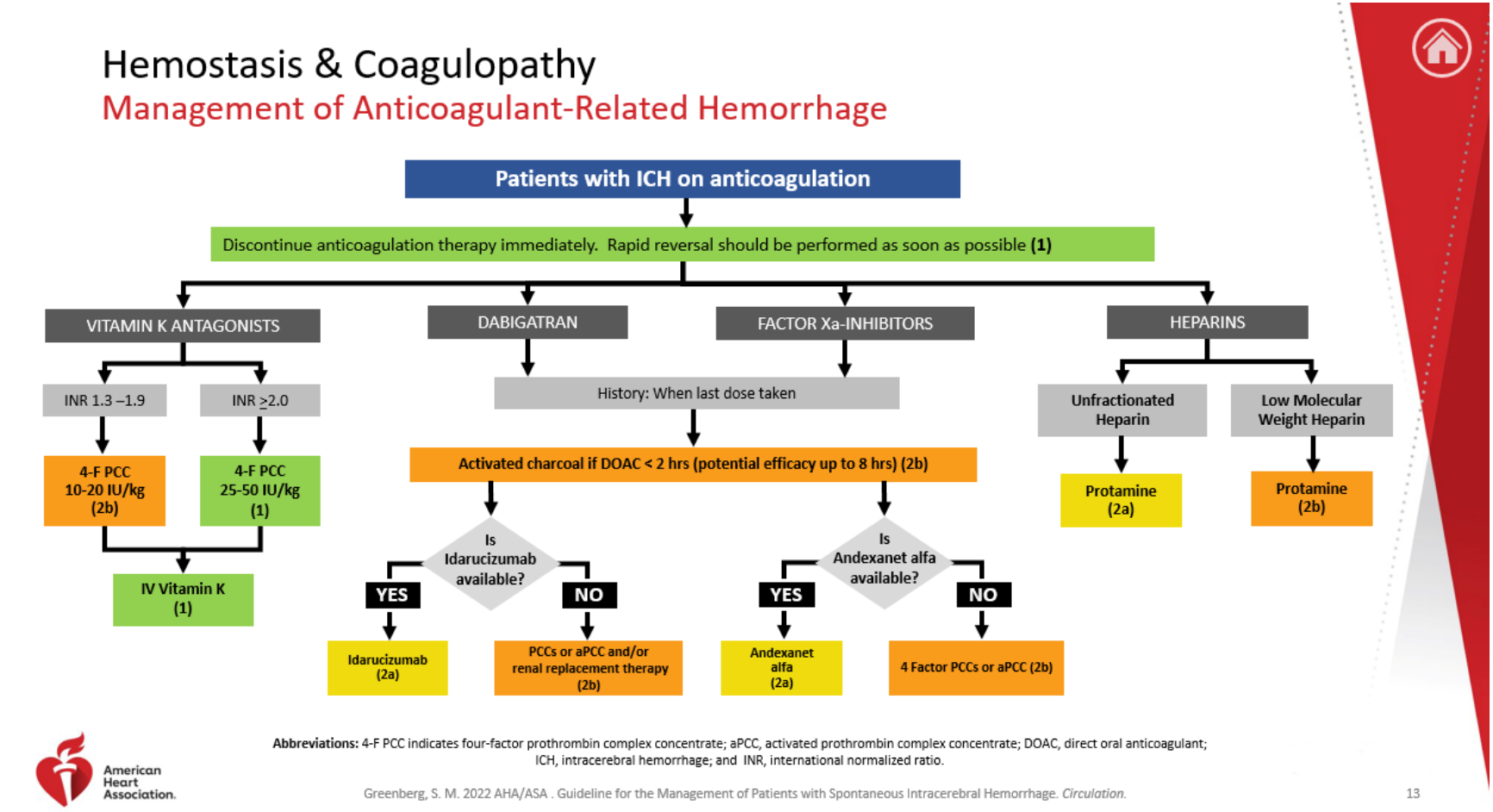
Appendix: 2022 Guideline for the Management of Patients With Spontaneous Intracerebral Hemorrhage: A Guideline From the American Heart Association/American Stroke Association



https://www.ahajournals.org/doi/10.1161/STR.0000000000000407