

# Hemorrhagic Stroke

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

Approximately 10% of the 795,000 strokes per year in the United States are intracerebral hemorrhages. Per the Minnesota Stroke Registry data, intracerebral hemorrhages are responsible for nearly 10% of stroke cases entered. 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.

### Triage & Management

- Stroke code activation if meets activation criteria
  - Otherwise, contact stroke 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 for recommendations for target BP. Work with your Primary or Comprehensive Stroke Center partners to include BP parameters within your protocols.
  - Medication titration to ensure continuous smooth & sustained control of BP, avoiding peaks and large variability in SBP, can be beneficial. (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 than 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)  $\geq 220$  mm Hg, avoid lowering more than 40 mm Hg in the first 6 hours.<sup>5</sup>

## Coagulopathy Reversal for Patients with ICH on anticoagulation

- **Discontinue anticoagulation therapy immediately**
- Rapid reversal should be performed as soon as possible (Class 1)

### Vitamin K Antagonists

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

Source: AHA Clinical Update Slide Set (PPTX)- <https://professional.heart.org/en/science-news/2022-guideline-for-the-management-of-patients-with-spontaneous-intracerebral-hemorrhage>

## Transfer & Other Treatment Considerations

- **Arrange rapid transport to neurosurgery capable center**
- **Considerations for admitting locally:**
  - *Family/patient wishes- consider comfort cares: age, size of infarct, prognosis*
    - Encourage neurology 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 aneurysmal subarachnoid hemorrhage
  - 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)

### References:

1. 2022 Guideline for the Management of Patients With Spontaneous Intracerebral Hemorrhage: A Guideline From the American Heart Association/American Stroke Association. *Stroke*.2022;53:e282-e361
2. Steiner, Thorsten, MD, MME; Weitz, Jeffrey, MD; Veltkamp, Roland, MD (2017). Anticoagulant-Associated Intracranial Hemorrhage in the Era of Reversal Agents. *Stroke*.2017;48:1432-1437
3. 2017 ACC Expert Consensus Decision Pathway on Management of Bleeding in Patients on Oral Anticoagulants: A Report of the American College of Cardiology Task Force on Expert Consensus Decision Pathways. *J Am Coll Cardiol* 2017; Dec1
4. Guideline for Reversal of Antithrombotics in Intracranial Hemorrhage. A Statement for Healthcare Professionals from the Neurocritical Care Society and Society of Critical Care Medicine. (2015). *Spring Science+Business Media New York* 20155. Divani, A. A., Liu, X., Petersen, A., Lattanzi, S., Anderson, C. S., Ziai, W., ... & Di Napoli, M. (2020). The magnitude of blood pressure reduction predicts poor in-hospital outcome in acute intracerebral hemorrhage. *Neurocritical care*, 33(2), 389-398.

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## Appendix A:

### Top Things to Know: 2022 Guideline for the Management of Patients With Spontaneous Intracerebral Hemorrhage

1. ICHs are the deadliest form of acute stroke with early mortality ranging between 30%-40%.
2. Approximately 10% of the 795,000 strokes per year in the United States are intracerebral hemorrhages or ICHs. They are defined as a brain injury attributable to acute blood extravasation into the brain parenchyma (brain tissue) from a ruptured cerebral blood vessel.
3. ICH disproportionately affects lower-resourced populations in the U.S. and internationally.
4. ICH can occur in adults at any age, but the incidence increases with age. Another growing source of ICH is the more widespread use of anticoagulants.
5. ICHs, like other forms of stroke, occur as the consequence of a defined set of vascular pathologies. This guideline emphasizes the importance of, and approaches to, identifying markers of both microvascular and macrovascular hemorrhage etiologies.
6. Small vessel disease with arteriolosclerosis and cerebral amyloid angiopathy are the main causes of ICH. The main risk factor for ICH is uncontrolled hypertension.
7. The organization of healthcare systems is increasingly recognized as a key component of optimal stroke care. This guideline recommends development of regional systems that provide initial intracerebral hemorrhage (ICH) care and the capacity, when appropriate, for rapid transfer to facilities with neurocritical care and neurosurgical capabilities.
8. Hematoma expansion (HE) is associated with worse ICH outcome. There are now a range of neuroimaging markers that, along with clinical markers such as time since stroke onset and use of antithrombotic agents, help to predict the risk of HE. These neuroimaging markers include signs detectable by non-contrast computed tomography (NCCT) - the most widely used neuroimaging modality for ICH.
9. When implementing acute blood pressure (BP) lowering following mild-to-moderate ICH, treatment regimens that limit BP variability and achieve smooth, sustained BP control appear to reduce HE and yield better functional outcome.
10. ICH while anticoagulated has extremely high mortality and morbidity. This guideline provides updated recommendations for acute reversal of anticoagulation following ICH, highlighting use of prothrombin complex concentrate for reversal of vitamin K antagonists such as warfarin, idarucizumab for reversal of the thrombin inhibitor dabigatran, and andexanet for reversal of factor Xa inhibitors such as rivaroxaban, apixaban, and edoxaban.
11. Several in-hospital therapies that have historically been used to treat ICH patients appear to confer either no benefit or harm. For emergency or critical care treatment of ICH, prophylactic corticosteroids or continuous hyperosmolar therapy appear to have no benefit for outcome, while use of platelet transfusions outside the setting of emergency surgery or severe thrombocytopenia appears to worsen outcome. Similar considerations apply to some prophylactic treatments historically used to prevent medical complications following ICH. Use of graduated knee- or thigh-high compression stockings alone are not effective prophylactic therapy for prevention of deep vein thrombosis, and prophylactic

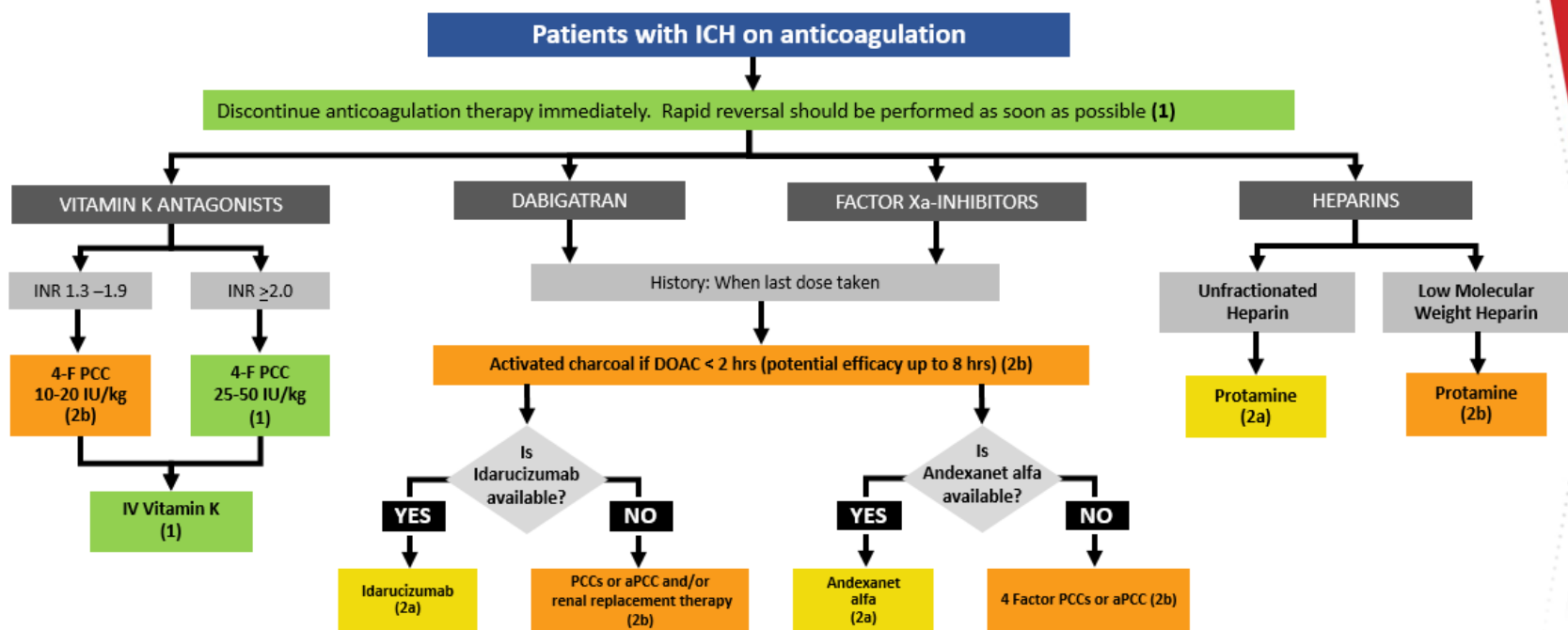
antiseizure medications in the absence of evidence for seizures do not improve long-term seizure control or functional outcome.

12. Minimally invasive approaches for evacuation of supratentorial intracerebral and intraventricular hemorrhages (compared to medical management alone) have demonstrated reductions in mortality. The clinical trial evidence for improvement of functional outcome with these procedures is neutral, however. For patients with cerebellar hemorrhage, indications for immediate surgical evacuation with or without external ventricular drain (EVD) to reduce mortality now include larger volume (>15mL) in addition to previously recommended indications of neurologic deterioration, brainstem compression, and hydrocephalus.
13. The decision of when and how to limit life-sustaining treatments following ICH remains complex and highly dependent on individual preference. This guideline emphasizes that the decision to assign do-not-attempt-resuscitation status is entirely distinct from the decision to limit other medical and surgical interventions and should not be used to do so. On the other hand, the decision to implement an intervention should be shared between the medical provider and patient or surrogate and should reflect the patient's wishes as best as can be discerned. Baseline severity scales can be useful to provide an overall measure of hemorrhage severity but should not be used as the sole basis for limiting life-sustaining treatments.
14. Rehabilitation and recovery are important determinants of ICH outcome and quality of life. This guideline recommends use of coordinated multidisciplinary inpatient team care with early assessment of discharge planning and a goal of early supported discharge for mild-to-moderate ICH. Implementation of rehabilitation activities such as stretching and functional task training may be considered 24-48 hours after moderate ICH; however early aggressive mobilization within the first 24 hours following ICH appears to worsen 14-day mortality. Multiple randomized trials did not confirm an earlier suggestion that fluoxetine might improve functional recovery after ICH. Fluoxetine reduced depression in these trials but also increased the incidence of fractures.
15. A key and sometimes overlooked member of the ICH care team is the patient's home caregiver. This guideline recommends psychosocial education, practical support, and training for the caregiver to improve the patient's balance, activity level, and overall quality of life

Greenberg SM, Ziai WC, Cordonnier C, Dowlathshahi D, Francis B, Goldstein JN, Hemphill JC 3rd, Johnson R, Keigher KM, Mack WJ, Mocco J, Newton EJ, Ruff IM, Sansing LH, Schulman S, Selim MH, Sheth KN, Sprigg N, Sunnerhagen KS; on behalf of the American Heart Association/American Stroke Association. 2022 Guideline for the management of patients with spontaneous intracerebral hemorrhage: a guideline from the American Heart Association/American Stroke Association [published online ahead of print May 17, 2022]. *Stroke*. doi: 10.1161/STR.0000000000000407

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

## Hemostasis & Coagulopathy Management of Anticoagulant-Related Hemorrhage



**Abbreviations:** 4-F PCC indicates four-factor prothrombin complex concentrate; aPCC, activated prothrombin complex concentrate; DOAC, direct oral anticoagulant; ICH, intracerebral hemorrhage; and INR, international normalized ratio.

Greenberg, S. M. 2022 AHA/ASA . Guideline for the Management of Patients with Spontaneous Intracerebral Hemorrhage. *Circulation*.

