THE MOUNT SINAI HOSPITAL, NEW YORK STANDARD: (CHOOSE: POLICY, PROCEDURE, POLICY AND PROCEDURE, etc.)	SUBJECT NO. CSC-4
DEPARTMENT: NSICU SUBJECT: Intracranial Hemorrhage Management Protocol	

CROSS-REFERENCE:
CSC-2 Protocol for the Initial Evaluation and Management of Patients with Ischemic or Hemorrhagic Stroke
CSC-3 SAH (Non-Traumatic) Management Protocol

Original date of issue May 2007

Reviewed:							
Revised:	03/26/2014	12/17/2014	2/27/2015	3/27/2015	3/03/2017		

This protocol is meant as a guideline for management and can be superseded by clinical judgment

I. At initial presentation to the Emergency Department (ED)

On arrival:

- ABCs
- Review vitals and finger stick blood sugar
- History of present illness (ask for seizures at onset)
- Record time of witnessed symptom onset, or time last known well *and* time of discovery for unwitnessed or wake-up strokes
- **Activate Acute Stroke Page via 33333**
- **Past Medical and Surgical History**
- Assess for previous CVA (baseline functional status), HTN, dementia, liver disease, cancer, head trauma, seizures, CKD
    - History of tobacco, cocaine, amphetamines, OTC Meds
    - Is the patient on Coumadin, Heparin, LMWH, or antiplatelet (ASA or Plavix /Aggrenox, or other oral anticoagulants?
    - Does patient have dysfunctional platelets? (Renal failure)
    - Is the patient intrinsically coagulopathic? (Hemophilia, Von Willibrands, etc)

Exam:

- Perform focused physical exam with neurological examination
- Perform a dysphagia screen and refer to ST if further evaluation is required
  - Patients with dysphagia will remain NPO until ST evaluation has taken place, this includes all PO medications.
- Document ICH score within 6 hours of presentation

Labs:

- PT, PTT, INR
- Initial Type and Hold
- CBC with platelets
- Troponin I
- Chem7, LFTs
- Urine Toxicology screen
- 18 and 20 gauge peripheral IVs should be placed

Imaging

- Stat Stroke Protocol Head CT w/ CTA (r/o Spot sign)
  - Creatinine level is NOT necessary to give contrast for CTA unless there is a h/o CKD

After CT

- EKG
- Portable Chest X-ray
- VTE Prophylaxis: Intermittent pneumatic compression should be applied

CT findings

- Location of blood (deep, superficial, cerebellar, intra-ventricular)
- Volume of blood (A*B*C/2) method (performed by neurology)
- Presence of intraventricular blood or hydrocephalus
- Midline shift (measure at septum pellucidum)
- Evidence of trauma, contusion, SAH, AVM or underlying mass

Seizure Management

- Treat any patient with seizure with Ativan 0.1 mg/kg (max: 8 mg) & Fosphenytoin (or phenytoin equivalent) 20 mg/kg IV load or Levetiracetam (Keppra) 1 g /IV
- See status epilepticus protocol if patient continues to seize

Hypertension

- Target SBP = 140 mm Hg
- Blood pressure goal should be attained within 30 minutes of diagnostic CT of the head
- **IV antihypertensives:**
- First line: Nicardipine drip 5 to 15 mg/h
  - Alternative: Clevidipine Infusion

    - Initial Dose 1 to 2 mg/hr
    - Double the does every 90 seconds until desired blood pressure goal
    - Maximum dose 32 mg/hr for short term use
- Second line: Labetalol 5 to 20 mg bolus and infusion at 2 mg/min (maximum 300 mg/d)
- Avoid nitroprusside as this can raise ICP

Hypotension
- Maintain SBP > 90; begin with isotonic fluid before starting vasopressors
- Consider Neosynephrine or Phenylephrine 2–10 mg / kg / min

II. Coagulopathy, Anticoagulant and Antiplatelet Correction

Warfarin
Any patient with a history of recent warfarin use, regardless of INR or PT should immediately receive:
- Vitamin K 10 mg IV (10 mg in 10 ml IV push) over 10 minutes (monitor for hypotension / anaphylaxis) &
- Four-Factor PCC (Kcentra) (type "kcentra" into EPIC order window:
  - INR 2 to < 4 or unknown (25 Units/Kg), max dose 2500 Units
  - INR 4 to 6 (35 Units/Kg), max dose 3500 Units
  - INR >5 (50 Units/Kg), max dose 5000 Units
- Call blood bank and order STAT
- Alternatively 50 IU/kg of Prothrombin Complex Concentrate (1. Bebulin or 2. Profilnine)
- If PCC unavailable, 15-20 ml/kg of FFP
- Caution with pcc if patient with active thrombotic event (e.g. MI, STROKE, PE, DVT), DIC, or history of HIT

Liver failure with known coagulopathy or elevated PT or INR ≥1.5
- Vitamin K 10 mg IV over 10 minutes (monitor for hypotension / anaphylaxis) &
- 50 IU/kg of Prothrombin Complex Concentrate (Bebulin or Profilnine) &
- If INR ≥ 2.0, give 15-20 ml/kg of FFP
- If PCC unavailable, 15-20 ml/kg of FFP total

Reversal of Platelet Dysfunction: For any patient with antiplatelet (Aspirin, Aggrenox, GPIIbIIIa or Clopidogrel) use in last 24 hours and ICH onset within 3 days
- DDAVP 0.3 mcg/kg x 1 (20 mcg in 50 cc NS over 15-30 minutes) &
- Consider one apheresis platelet unit
- For patients with von Willebrand disease: DDAVP 0.3 mcg/kg x 1 (20 mcg in 50 cc NS over 15-30 minutes)

End Stage Renal disease
- DDAVP 0.3 mcg/kg x 1 (20 mcg in 50 cc NS over 15-30 minutes) &
- Consider one apheresis platelet unit

- For clinical deterioration, administer 6 units of cryoprecipitate or FFP

Thrombocytopenia

- Transfuse for platelets <50,000

Unfractionated Heparin and Protamine Administration

- 0-30 minutes from heparin administration give 1.0 mg Protamine IV per 100 units/hour heparin
- 31-60 minutes from heparin administration give 0.75 mg Protamine IV per 100 units/hour heparin
- 61-120 minutes give 0.5 mg per 100 units/hour heparin
- >2 hours from heparin administration give 0.3 mg Protamine IV per 100 units/hour heparin
- Protamine: Maximum dose 50 mg, max infusion rate 5 mg/min., monitor for anaphylaxis and hypotension

Low molecular weight Heparin/ Lovenox- Protamine Administration

- **Enoxaparin** (Lovenox): 1 mg Protamine IV per 1 mg of enoxaparin given in last 8 hours;
  - If >8 hours since Lovenox, no Protamine
  - If bleeding continues: 0.5 mg Protamine IV per 1 mg of enoxaparin in last 8 hours
- Protamine has negligible reversal effects on danaparoid and fondaparinux
- **Dalteparin** or **tinzaparin**: 1 mg protamine for each 100 anti-Xa IU of dalteparin or tinzaparin; If bleeding, consider additional dose of 0.5 mg for each 100 anti-Xa IU of dalteparin/tinzaparin

Direct thrombin inhibitors :

- **Argatroban, Hirudin (Bivalirudin, Lepirudin)**
- There is no established reversal agent for these drugs.
- For reversal consider:
- Oral activated charcoal (25 to 50 grams in adults) if given within 2 hours post ingestion.
- Four-Factor PCC 50 units/kg
  - Alternative: Activated PCC (FEIBA) 50 to 100 units/kg
- Consider hemodialysis
- **Dabigatran (Pradaxa)**
- Praxbind (idarucizumab) 5g IV given as bolus or IV infusion. Additional 5 g may be considered if coagulation parameters re-elevate and clinically relevant bleeding occurs or if a second emergency surgery/urgent procedure is required and patient has elevated coagulation parameters.

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Factor Xa Inhibitors

- **For Rivarxaban (Xarelto)** or **Apixaban (Eliquis)** reversal, consider
- Oral activated charcoal (25 to 50 grams in adults) if given within 2 hours post ingestion.
- Four-Factor PCC 50 units/kg
- Activated PCC (FEIBA) 50 to 100 units/kg
- Hemodialysis may be considered in patients with impaired renal function

Hemophilia without Inhibitor

- **Factor 8**-Adults 40 units / Kg then 20 units / Kg Q12 hours
- Peds 50 units / Kg then 25 units / Kg Q12 hours
- **Factor 9**-Adults 80 units / Kg then 40 units / Kg Q24 hours
- Peds 100 units / Kg then 50 units / Kg Q24 hours

Hemophilia with Inhibitor

- FEIBA- Factor 8 Inhibitor Bypassing Activity 75 units / Kg Q12 hours
- If ICH worsens give rFVIIa- Recombinant Factor VIIa 90 units / Kg Q2 hours

Treatment of Intracranial Hemorrhage after IV tPA

- Stop TPA
- Check CBC, PT, PTT, platelets, fibrinogen, DDimer
- 10 units of cryoprecipitate (0.15 units/kg)
- Consider epsilon-amino caproic acid 4g IV
- If still bleeding at 1 hour and fibrinogen still <100 mg/dL repeat cryoprecipitate dose (0.15 units/kg).

Treatment of Intracranial Hypertension

In most instances, patients with signs of intracranial hypertension will be transferred to the NSICU. In event of suspicion for intracranial hypertension in a patient still in the ED, consider the following agents in consultation with Neurology and/or Neurosurgery:

- Analgesia and sedation to minimize agitation; if it continues, intubate and sedate
- Mannitol 20% 1 g / kg bolus (100g if weight unknown); re-dose q 1 hour as needed
- Place central line
- Assess for need for urgent external ventricular drain placement (Unable to follow commands or symptomatic hydrocephalus)

III. Disposition

Monitoring and management of patients with an ICH should take place in an intensive care unit setting

1) Call 1-800-TO-SINAI to arrange urgent transfer to the MSH or MSR Neuro-ICU
2) Mount Sinai Neuroemergency Hotline (on-call neuro-intensivist): 1-800-748-6445
3) Mount Sinai Neuro-ICU: 212-241-2100
4) Mount Sinai West Neuro-ICU: 212-523-2183

References:

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