PEDIATRIC EMERGENCY MEDICINE EVIDENCE-BASED PATHWAY

UCSF Benioff Children's Hospital San Francisco

Hemorrhagic Stroke - Mission Bay ED

(C) BCH Emergency Department

Inclusion Criteria
Patient > 1 mo old with confirmed or concern for spontaneous ICH

Exclusion Criteria
Patient with traumatic ICH

[1] BP management:
Maintain normal MAPs for age. Consider history of hypertension (e.g., chronic renal failure) and adjust as needed when deciding blood pressure goals.
(see below for BP Management Table)

[2] Emergent assessment, imaging, and management plan

Medical management:
1. History: Precipitating factors, prior history, bleeding diathesis
2. Exam: Vitals (SBP, MAP), ABCs, neuro exam, general exam (look for telangiectasias, petechiae)
3. Initial labs: CBC with platelets, PT/PTT/INR, CMP, drug screen (UTox)
4. Supportive care and ICP management (refer to separate UCSF Pediatric ICP Guidelines)
   a. HOB at 30 degrees, neutral position; room lights reduced; low stimulation environment
   b. Euvolemia, normoglycemia, normothermia (< 37.5C), acetaminophen and cooling blanket as needed
   c. Treat pain & agitation to achieve Pain score < 2 & SBS goal -1 – 0
   d. If GCS < 9, give osmotic therapy (**5ml/kg 3% Saline IV bolus** [preferred] or mannitol 0.25-1 g/kg), consider EVD placement if at outside hospital
5. Seizure prevention and treatment: Load with levetiracetam bolus IV.
   Prophylactic dosing (no seizure yet): Levetiracetam 40 mg/kg IV bolus, max dose 4.5 g
   Symptomatic dosing (resolved seizure): Levetiracetam 60 mg/kg IV bolus, max dose 4.5 g
   Status epilepticus: treat according to status guidelines
   EEG monitoring if GCS < 9
6. If confirmed aneurysmal SAH: administer IV nimodipine (0.5 mg/kg/dose q2h; max 30 mg per dose) Consider smaller, more frequent dosing if hypotension.

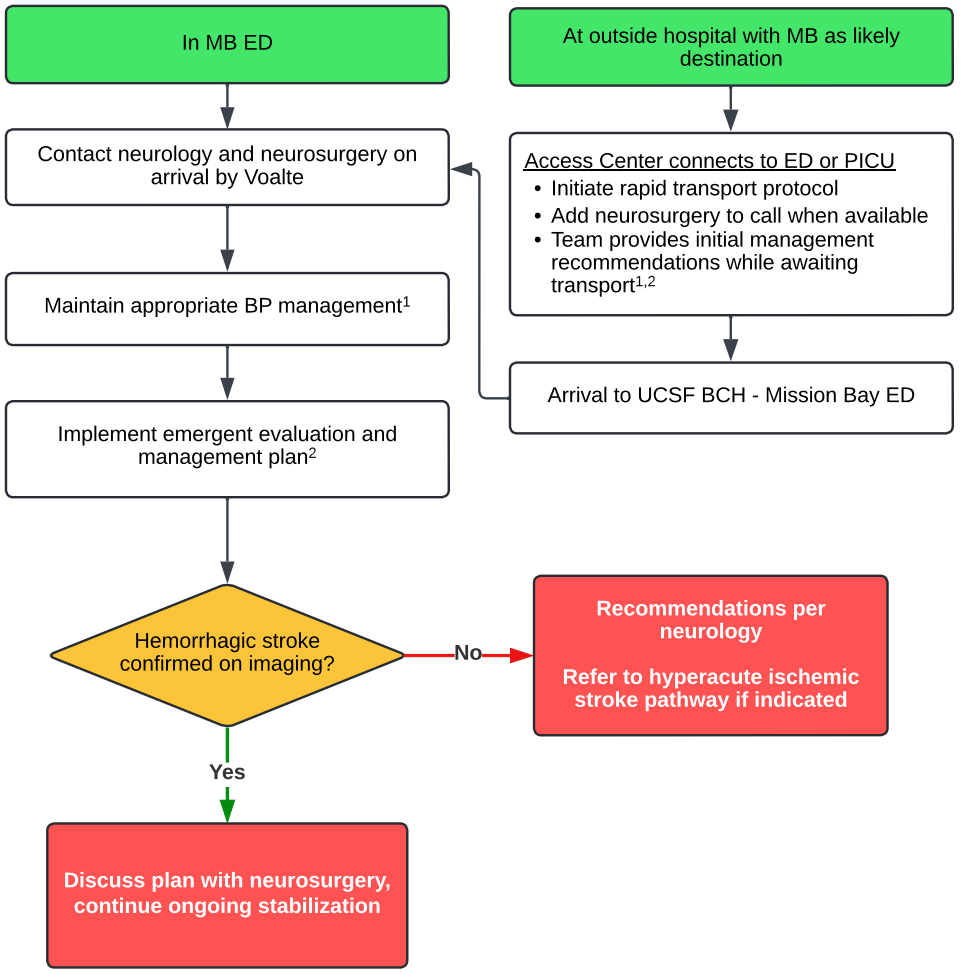
Initial imaging or for reassessment [if more than 6 hours from last study or status change]:

Unstable or needed prior to immediate neurosurgical intervention: Repeat CT/ CTA. If concern for herniation or increased ICP, standard/full dose CT (default is pediatric dosing)

To evaluate for hydrocephalus: Focused MR Brain or pediatric dose NCHCT (if too unstable for MRI)

Stable patient: MRI/MRA/MRV brain with and without contrast

Emergent surgical management:
1. Consider ICP monitor if GCS < 9. Discuss with Neurosurgery: EVD vs fiberoptic ICP monitor
   a. If acute hydrocephalus is present, an EVD is preferred.
   b. If a posterior fossa hematoma is present, an EVD may be used but set at higher level and drain cautiously to minimize risk of upward herniation.
2. Surgical craniectomy and/or hematoma evacuation may be indicated for parenchymal hemorrhage if:
   a. Cerebellar hematoma or moderate to large lobar hematoma
   b. Neurologic deterioration or ICP persistently > 20 despite optimal management



BP Management Table

Age (years)	Minimum CPP	Goal/minimum MAP*	Treat systolic hypertension SBP*	
			SAH (unsecured)	IPH (unsecured)
0-3	40-45	60-65	>100	>110
3-8	50-55	70-75	>110	>120
9-14	55-60	75-80	>120	>130
14-18	60-70	80-90	>120	>140

* ***Priority:* maintain cerebral blood flow to prevent secondary brain injury.**
Treat hypertension to decrease the risk of re-bleeding.
- PO: Nimodipine
- IV: Nicardipine (IV (0.5 mg/kg/dose q2h; max 30 mg per dose) Consider smaller, more frequent dosing if hypotension
- Avoid hydralazine.

Do not lower BP below Goal MAP. Adjust goal in patients with known hx of hypertension (chronic kidney disease)

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Approved by: Steven Bin MD, Christine Fox MD, Sharon Wietstock MD