Emergency Neurological Life Support

Intracerebral Hemorrhage

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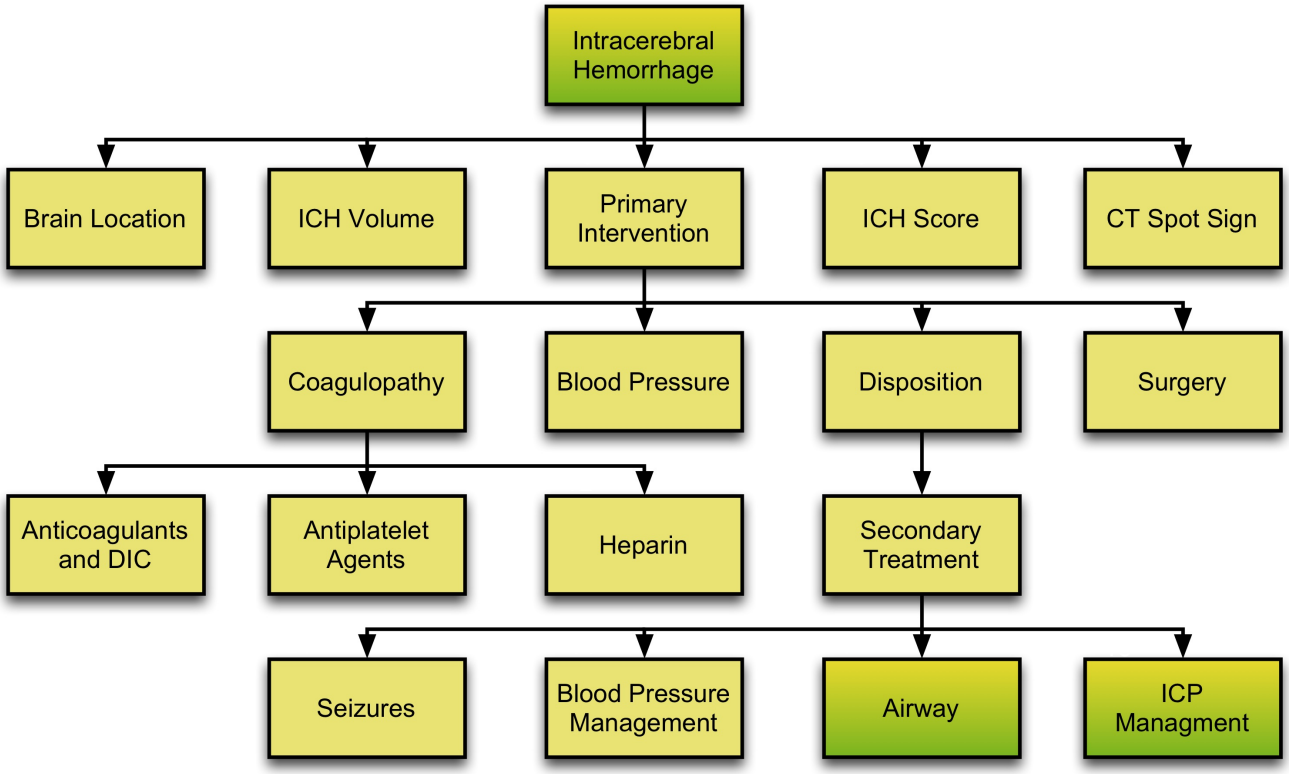


Checklist & Communication

Flowchart

Checklist

☐ Check PT, PTT, INR
☐ Head Imaging Results: Size of bleed
☐ GCS
☐ Calculate ICH Score

Communication

☐ Age
☐ ICH Volume
☐ GCS
☐ ICH Score

☐ Hydrocephalus present?

Flowchart

Admit

ICU admission

NeuroICU admission is preferable

Flowchart

Airway

Is the patient's airway stable?

ICH may continue to expand and the patient's mental status and airway may become compromised. Continued vigilance to airway is critical especially in posterior fossae hemorrhages.

Flowchart

Anticoagulants and DIC

INR > 1.4

Consider vitamin K antagonist reversal with purified factor concentrates or FFP if warfarin or other vitamin K antagonists have been prescribed, followed by Vitamin K 10 mg IV. To calculate the volume of plasma or IU of prothrombin complex concentrate:

1. Decide on target INR
2. Convert INR to percent (%) functional prothrombin complex:

INR Range	Percent function prothrombin complex
> 5	5%
4.0 – 4.9	10%
2.6 – 3.9	15%
2.2 – 2.5	20%
1.9 – 2.1	25%
1.7 – 1.8	30%
1.4 – 1.6	40%
1.0	100%

3. Calculate dose:
   (Target in %PC - Current level in %PC) X weight (kg) = mL of FFP or IU of prothrombin-complex concentrate (PCC) needed
   Example: a patient with INR on arrival = 7.5, target INR 1.5, body weight = 80 kg:
   (40-5) X 80 = 2,800
   Therefore, the needed dose is 2,800 mL of FFP or 2,800 IU of PCC.

   Reference: Schulman, S. Care of patients receiving long-term anticoagulant therapy. NEJM (2003) 349:675

Flowchart

Antiplatelet Agents

Aspirin, clopidogrel, prasugrel, etc.

If the patient has been taking antiplatelet drugs, transfuse with platelets and administer DDAVP 0.3 mcg/kg IV.

Flowchart

Blood Pressure

Should BP be lowered?

Keep SBP below 160 mm Hg or MAP below 110 mmHg; consider using IV nicardipine with and without IV labetalol

Flowchart

Brain Location

Brain location of ICH

Determine where the bleeding has occurred.
Options include:

- lobar
- basal ganglia
- thalamus
- cerebellum
- midbrain
- pons
- intraventricular

Flowchart

Coagulopathy

Is there an underlying coagulopathy?

Consider use of vitamin K antagonists, antiplatelet agents, DIC

Flowchart

Control BP

Continue to control blood pressure

Keep SBP below 160 mm Hg or MAP below 110 mmHg; consider using IV nicardipine with and without IV labetalol

Flowchart

Heparin

Recent heparin administration

Administer protamine sulfate 1 mg per 100 U heparin received in last 2 hours; maximum dose 50 mg

Flowchart

ICH Score

Calculate the ICH score

The ICH score can be calculated as follows:

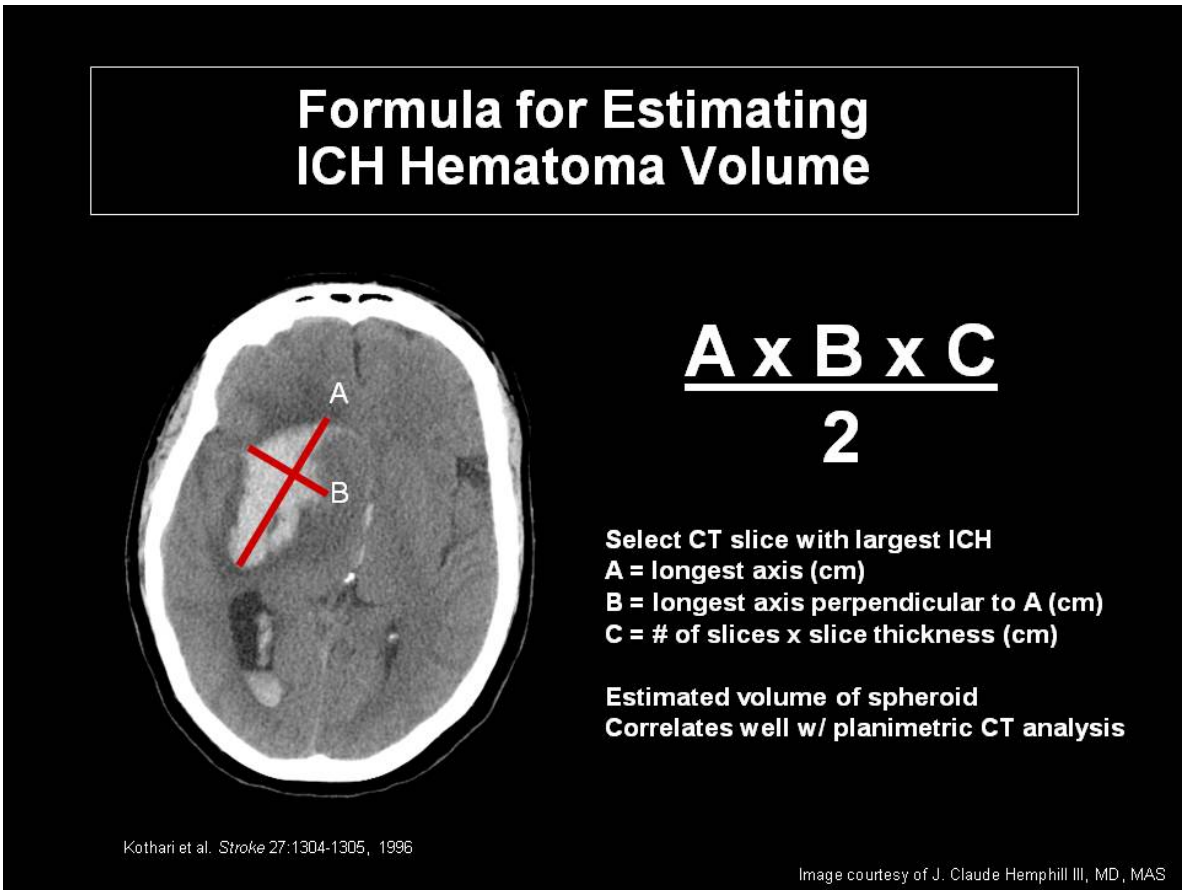
Component	Criteria	Points
GCS	3-4	2
	5-12	1
	13-15	0
ICH Volume (cc)	>= 30 cc	1
	< 30 cc	0
Intraventricular Hemorrhage	Yes	1
	No	0
Infratentorial Origin	Yes	1
	No	0
Age	>= 80 y	1
	< 80 y	0
Total		0-6

Flowchart

ICH Volume

Measure the amount of blood

If the blood is within the brain parenchyma, use the ABC/2 method.



Flowchart

ICP Elevated

Is the patient developing high ICP?

Consider ICP monitoring if GCS <8 or the patient has symptomatic hydrocephalus.
See ENLS protocol Elevated ICP and Herniation for management recommendations.

Flowchart

Intracerebral Hemorrhage (ICH) Diagnosis

ICH diagnosis confirmed

Intracerebral Hemorrhage (ICH): ICH typically produces a new headache followed by progressive neurological signs. The onset is usually sudden and many patients progress over a few hours likely due to continuing intracerebral bleeding. It is not possible to be certain whether the stroke is due to hemorrhage or ischemia based on signs and symptoms alone, so some form of brain imaging is necessary.

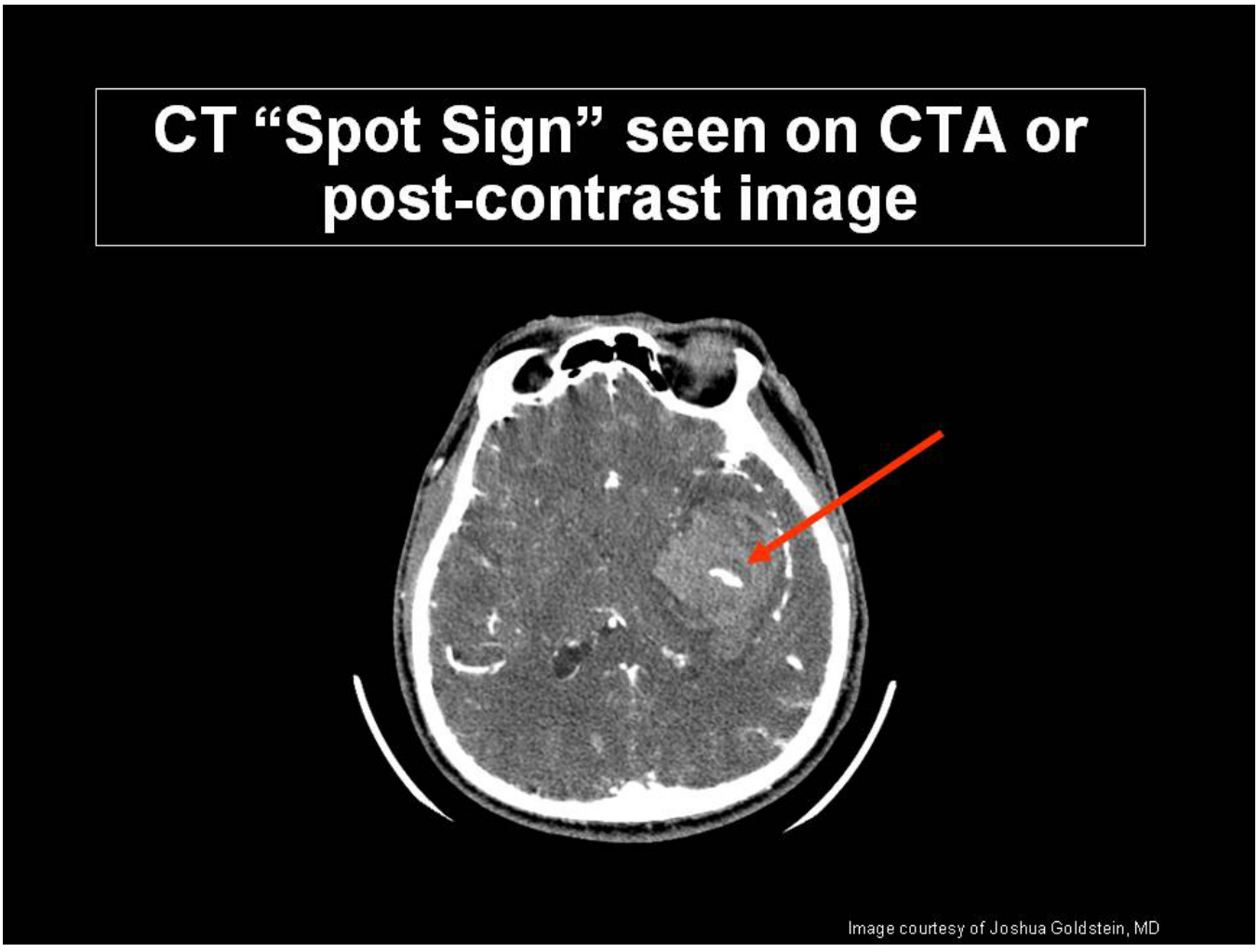
Topic Co-Chairs: J. Claude Hemphill, MD, MAS
Ed Jauch, MD
Contributors: Mary Kay Bader, Jon Edlow, Kevin Sheth, Luis Camputaro, Susan Yeager, Oliver Flower

Flowchart

Other findings

CT spot sign

If IV contrast was administered during the CT scan, extravasation of contrast can be seen in hemorrhages that are still accumulating. This is called the spot sign as shown in the figure:



Flowchart

Primary Intervention

First steps for intervention

Intervention for ICH is classified as "primary" meaning what can be done to impact the patient right now, and "secondary" once these primary interventions are addressed. Certainly, one can consider the secondary interventions of blood pressure control, declining neurological exam requiring airway protection, concurrently.

Flowchart

Secondary Treatment

Begin secondary interventions

Intervention for ICH is classified as "primary" meaning what can be done to impact the patient right now, and "secondary" once these primary interventions are addressed.

Flowchart

Seizures

Seizure prophylaxis and treatment

- Do not administer prophylactic anticonvulsants.
- Treat clinical seizures with benzodiazepines then anticonvulsants.
- Consider EEG monitoring if the patient's level of consciousness is worse than is likely explained by the size and location of the hemorrhage.

Flowchart

Surgery

Is the patient a surgical candidate?

Cerebellar ICH should be considered for surgery urgently depending on size.
Lobar ICH with mass effect should also be considered for surgery.