E·QUAL | EMERGENCY QUALITY NETWORK

ICH Scoring and Prognostication

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American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

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Disclosures

- None

Patient 1

- 57 year old male
  - PMHx: HTN
- A+O x3, GCS 15
- Right arm weakness x 3 hours

Patient 2

- 83 year old female
- Obtunded
- On Apixaban for Atrial fibrillation

How Bad Is It?

What To Expect? (Prognosis)

Objectives

- Understand how to calculate prognostic scores in patients with ICH
- Utilize prognostic scoring for disposition in patients with ICH

Introduction

- ICH: 10% of all strokes
- Deterioration: 15-23% within first hour of arrival
- Mortality: up to 40% at 1 month
- High rate of disability
- Early aggressive management

Stroke. 1997; 28:1–5
Acad Emerg Med. 2012; 19:133–138
Stroke. 2015;46(7):2032-60
J Neurol Sci. 2019;398:54-66

AHA/ASA ICH Guidelines (2015)

Emergency Diagnosis and Assessment: Recommendations

1. **A baseline severity score should be performed as part of the initial evaluation of patients with ICH *(Class I; Level of Evidence B*).** (New recommendation)

Stroke. 2015 Jul;46(7):2032-60

Why Not NIHSS?

Characteristics of Ideal Scoring Tool

- Easy to use
- Objective criteria
- Reproducible
- Accurate

ICH Scoring Tools

- ICH Score
- mICH
- ICH-GS
- FUNC

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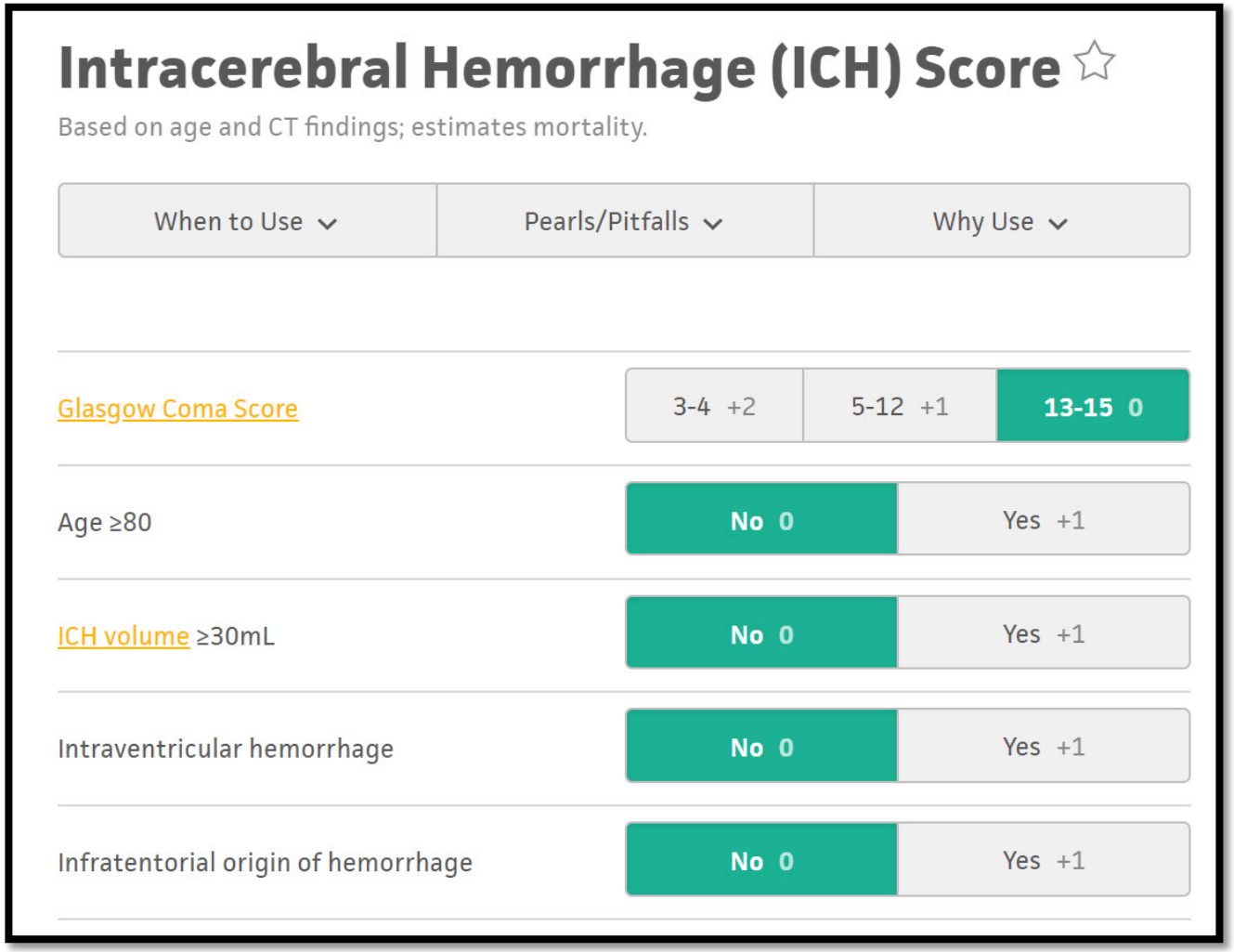
ICH Score

- 5 elements
- Predicts 30-day Mortality



https://www.mdcalc.com/intracerebral-hemorrhage-ich-score

ICH Score

ICH Score	Mortality
0	0%
1	13%
2	26%
3	72%
4	94%
5	100%
6	100%

Stroke. 2001 Apr;32(4):891-7
Neurocrit Care. 2004;1(1):53-60

ICH Score – GCS

- GCS – 13-15: 0
- GCS – 5-12: 1
- GCS – 3-4: 2

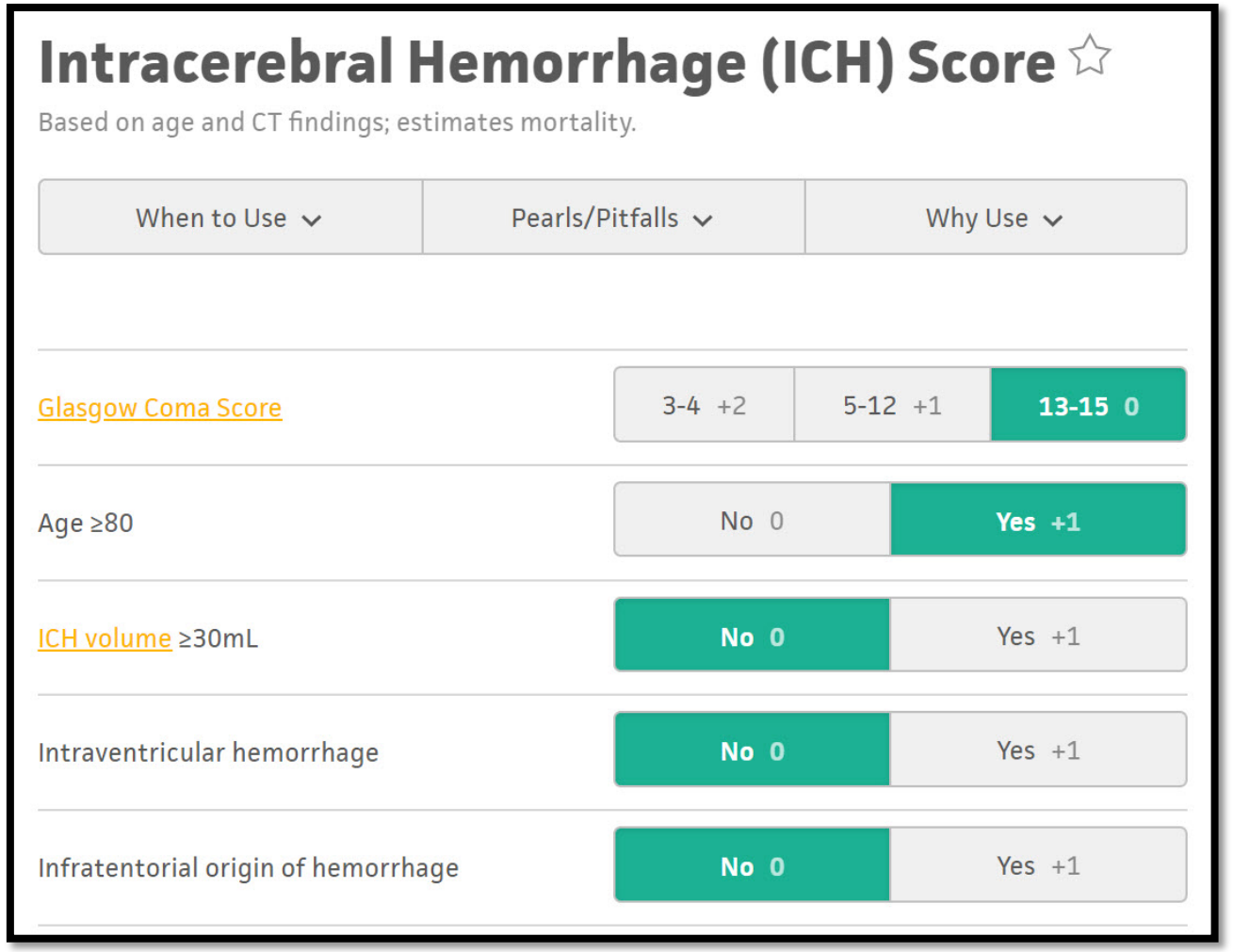
Best Verbal Response	
A+O x 3	5
Confused	4
Inappropriate Words	3
Incomprehensible Sounds	2
No Response	1

Eye Opening Response	
Spontaneous	4
To Speech	3
To Pain	2
No Response	1

Best Motor Response	
Obeys Commands	6
Localizes Pain	5
Flexion – Withdrawal	4
Abnormal Flexion – Decorticate	3
Abnormal Extension – Decerebrate	2
No Response	1

ICH Score – Age

- >= 80: 1
- < 80: 0



Intracerebral Hemorrhage (ICH) Score

Based on age and CT findings; estimates mortality.

When to Use | Pearls/Pitfalls | Why Use

Glasgow Coma Score	3-4 +2	5-12 +1	**13-15 0**
Age ≥80	No 0	**Yes +1**	
ICH volume ≥30mL	**No 0**	Yes +1	
Intraventricular hemorrhage	**No 0**	Yes +1	
Infratentorial origin of hemorrhage	**No 0**	Yes +1	

https://www.mdcalc.com/intracerebral-hemorrhage-ich-score

ICH Volume

- Computer measurement
- ABC/2

BRAIN AND POSTERIOR FOSSA: There is a hyperdense region likely centered in the left thalamus measuring 4.6 cm in maximal AP diameter by 3.2 cm in width by 3.3 cm in height with a volume of 24 cc. Surrounding vasogenic edema is seen causing significant compression upon the adjacent left lateral ventricle with resultant 4 mm left-to-right midline shift. No other significant abnormality is seen.

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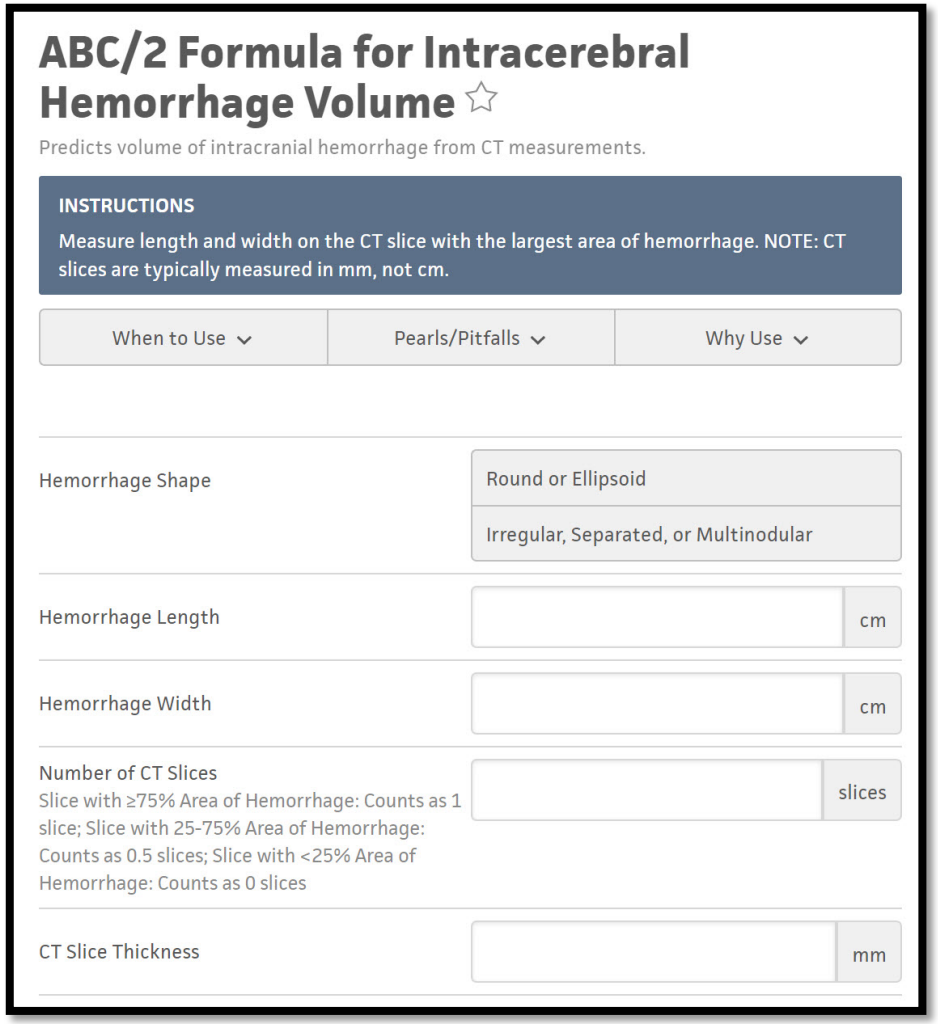
ICH Volume

- Online formula

- >= 30mL: 1
- < 30mL: 0



ABC/2 Formula for Intracerebral Hemorrhage Volume ☆

Predicts volume of intracranial hemorrhage from CT measurements.

INSTRUCTIONS

Measure length and width on the CT slice with the largest area of hemorrhage. NOTE: CT slices are typically measured in mm, not cm.

When to Use ⌄ | Pearls/Pitfalls ⌄ | Why Use ⌄

Hemorrhage Shape	Round or Ellipsoid Irregular, Separated, or Multinodular	
Hemorrhage Length		cm
Hemorrhage Width		cm
Number of CT Slices Slice with ≥75% Area of Hemorrhage: Counts as 1 slice; Slice with 25-75% Area of Hemorrhage: Counts as 0.5 slices; Slice with <25% Area of Hemorrhage: Counts as 0 slices		slices
CT Slice Thickness		mm

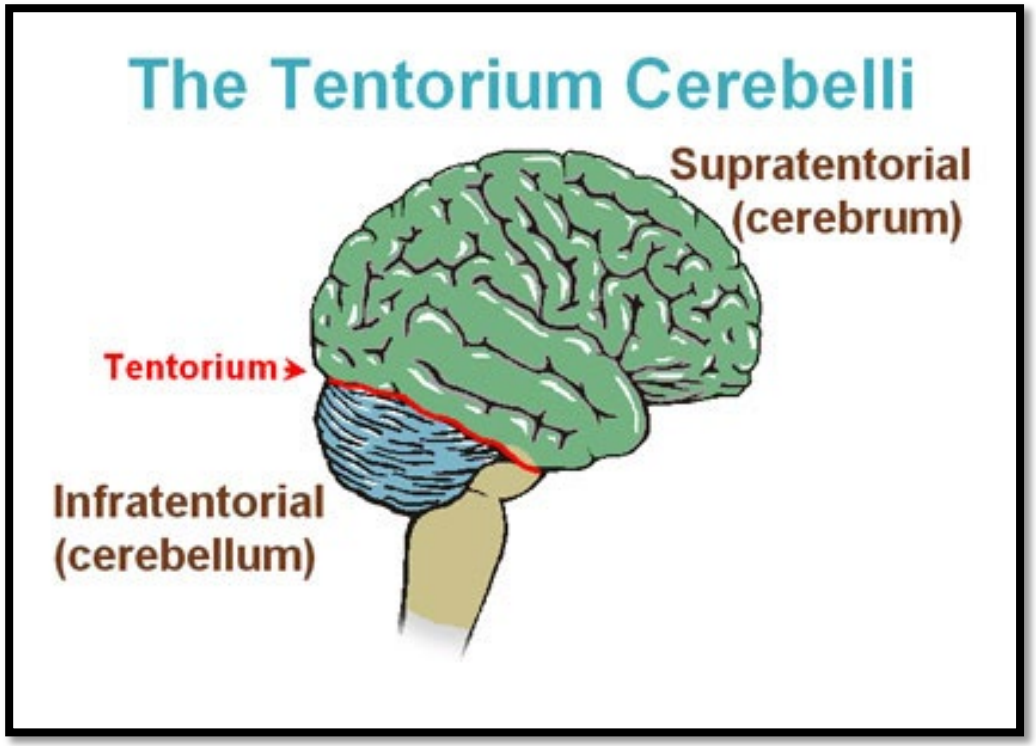
https://www.mdcalc.com/abc2-formula-intracerebral-hemorrhage-volume

ICH Score – Intraventricular Hemorrhage

- Yes: 1
- No: 0

ICH Score - Infratentorial

- Yes: 1
- No: 0



Individual Characteristics of ICH Score

	30-Day mortality					
	Univariable analysis			Multivariable analysis		
	OR	95% CI	*p*Value	OR	95% CI	*p*Value
Age >80	1.89	1.48–2.41	<0.001	2.01	1.47–2.74	<0.001
Glasgow Coma Scale (GCS) 13–15	1.00			1.00		
GCS 5–12	6.59	5.01–8.65	<0.001	3.90	2.86–5.32	<0.001
GCS 3–4	63.85	29.01–140.54	<0.001	27.10	11.85–62.00	<0.001
Infratentorial	1.39	1.02–1.91	0.040	1.95	1.29–2.93	0.001
Intracerebral hemorrhage ICH volume >30	6.90	5.32–8.94	<0.001	4.03	2.93–5.55	<0.001
Intraventricular extension	5.13	4.01–6.57	<0.001	2.52	1.87–3.40	<0.001
OAC use	2.30	1.76–3.02	<0.001	2.09	1.48–2.95	<0.001

Front Neurol. 2018;9:100

ICH Scoring Tools

Original ICH score	Points	ICH Grading scale	Points	Modified ICH score	Points	FUNC score	Points
GCS		GCS		NIHSS		GCS	
3-4	2	3-8	3	21-40	2	< 9	0
5-12	1	9-12	2	11-20	1	≥ 9	2
13-15	0	13-15	1	0-10	0		
Haematoma volume		Haematoma volume		Haematoma volume		Haematoma volume	
≥ 30 cc	1	*Infratentorial*		≥ 30 cc	1	>60	0
< 30 cc	0	> 20 cc	3	< 30 cc	0	30-60	2
		10-20 cc	2			<30	4
		< 10 cc	1				
		Supratentorial					
		> 70 cc	3				
		40-70 cc	2				
		< 40 cc	1				
Haematoma location		Haematoma location		Haematoma location		Haematoma location	
Infratentorial	1	Infratentorial	2	Infratentorial	1	Infratentorial	0
Supratentorial	0	Supratentorial	1	Supratentorial	0	Deep	1
						Lobar	2
Age		Age		Age		Age	
≥ 80 years	1	≥65	3	≥ 80 years	1	≥ 80 years	0
< 80 years	0	45-64	2	< 80 years	0	70-79 years	1
		<45	1			< 70 years	2
IVH		IVH		IVH		Cognitive impairment	
Yes	1	Yes	2	Yes	1	Yes	
No	0	No	1	No	0	No	0
							1
Total score	**0-6**	**Total score**	**5-13**	**Total score**	**0-6**	**Total score**	**0-11**

Neurocrit Care. 2019;30(2):449-466

Anticoagulation

- Larger ICH volume
- More hematoma/IVH expansion
- Higher morbidity/mortality

J Neurol Sci. 2019;398:54-66

Predicting Prognosis of Intracerebral Hemorrhage (ICH): Performance of ICH Score Is Not Improved by Adding Oral Anticoagulant Use

Rik Houben[1]*, Floris H. B. M. Schreuder[2], Kim J. Bekelaar[1], Danny Claessens[1], Robert J. van Oostenbrugge[1,3] and Julie Staals[1,3]

- OAC did not significantly affect ICH Score performance

Front Neurol. 2018;9:100

Other Risk Factors for Mortality

- Co-morbidities
- Previous stroke/ICH
- Illicit drug use (Cocaine)
- Functional status

Functional Outcome

- Anticoagulation
- Premorbid function
- **GCS**
- **Hemorrhage >60mL**
- IVH

Brain Behav. 2018;8(10):e01113

FUNC Score

- Functional Independence
  - 90-day
- Glasgow Outcome Scale

ICH volume (cm^3)	<30 +4	30-60 +2	>60 0
Age	<70 +2	70-79 +1	≥80 0
ICH location	Lobar +2		
	Deep +1		
	Infratentorial 0		
GCS score	≥9 +2	≤8 0	
Pre-ICH cognitive impairment	No +1	Yes 0	

https://www.mdcalc.com/functional-outcome-patients-primary-intracerebral-hemorrhage-func-score#next-steps

FUNC Score – Likely Functional Independence

- Score 0-4: 0%
- Score 5-7: 1-20%
- Score 8: 21-60%
- Score 9-10: 61-80%
- Score 11: 81-100%

Stroke. 2008;39(8):2304-9
Neurocrit Care. 2013;19(3):329-35

Limitations

- Score does not account for all factors
- Prognostication: only 1 point in time

Utilizing Prognostic Scores

- No score should be used in isolation
- Score do not dictate treatment/intervention
- Use in conjunction with:
  - Baseline Neuro Status
  - Co-morbidities
  - Patient/Family wishes

AHA/ASA – Outcome Prediction (2015)

1. **Aggressive care early after ICH onset and postponement of new DNAR orders until at least the second full day of hospitalization is probably recommended *(Class IIa; Level of Evidence B*). Patients with preexisting DNAR orders are not included in this recommendation. Current prognostic models for individual patients early after ICH are biased by failure to account for the influence of withdrawal of support and early DNAR orders. DNAR status should not limit appropriate medical and surgical interventions unless otherwise explicitly indicated *(Class III; Level of Evidence C*).** (Revised from the previous guideline)

Stroke. 2015 Jul;46(7):2032-60

Disposition

Disposition

- System policy
- Interventions
- Shared decision making (Patient-centric)

Patient 1

- 57 year old male
  - PMHx: HTN
- A+O x3, GCS 15
- Right arm weakness x 3 hours
- ICH volume: 4mL

Patient 1

- Age: 0
- GCS 15: 0
- ICH volume < 30: 0
- No IVH: 0
- Supratentorial: 0

Disposition: Patient 1

- ICH Score: 0

- 30-day Mortality: 0%

Patient 2

- 83 year old female
- Obtunded, GCS: 5
- On Apixaban for Atrial fibrillation
- ICH volume: 42mL

Patient 2

- Age: 1
- GCS: 1
- IVH: 1
- ICH volume: 1
- Supratentorial: 0

Disposition

- ICH Score: 4
- Mortality: 94%
  - Anticoagulation
- Family discussion (goals of care)

Conclusion

- Use prognostic score (ICH score)
- Realize limitations with all prognostic scoring
- Use to help drive discussion with patient/family

Questions?

Thank You