BIG for littles

Can a BIG style guideline aid clinical decision making for TBI management in children?

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Disclosures

- I have nothing to disclose

Objectives

- Discuss the Brain Injury Guidelines (BIG) and their application in adult TBI management.
- Share current efforts to develop similar style clinical guidelines to manage pediatric TBI.
- Discuss potential impacts to pediatric trauma care outside of the pediatric trauma center.

Traumatic Brain Injury

- TBI is a leading cause of pediatric injury – 812,000 ED visits
- Leading cause of death and disability in children ages 0-4 and 15-19
- 23,000 hospitalizations and 2500 deaths annually
- Transfers from non-trauma centers comprise a majority of pediatric TBI patients seen in pediatric trauma centers

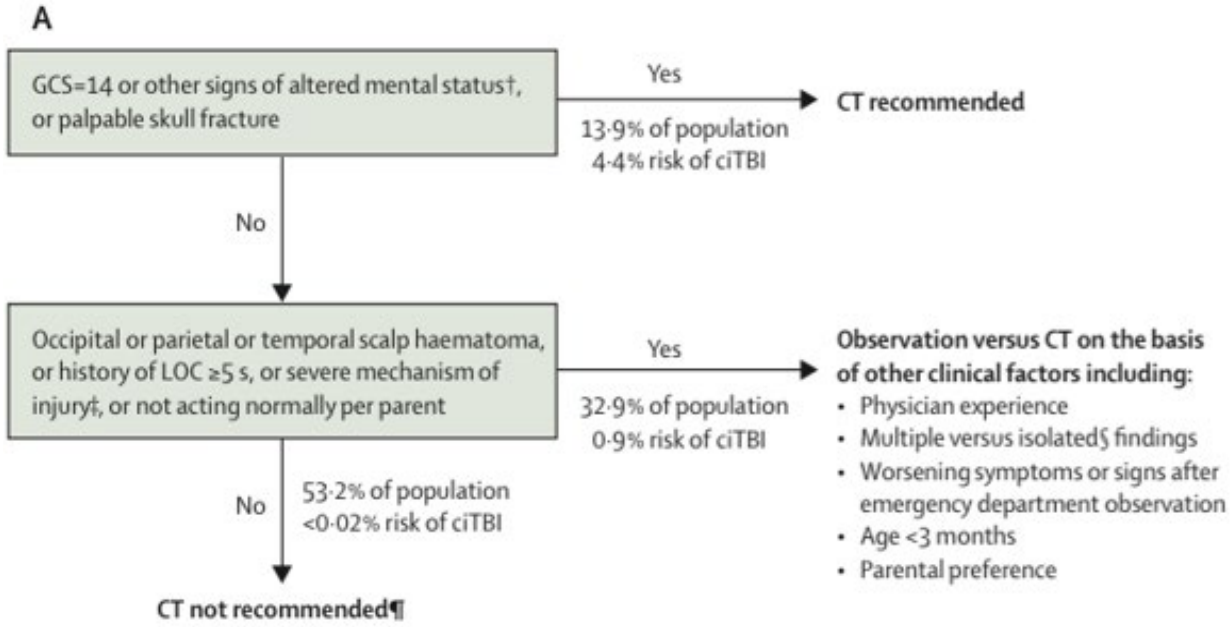
Pediatric Access to Care

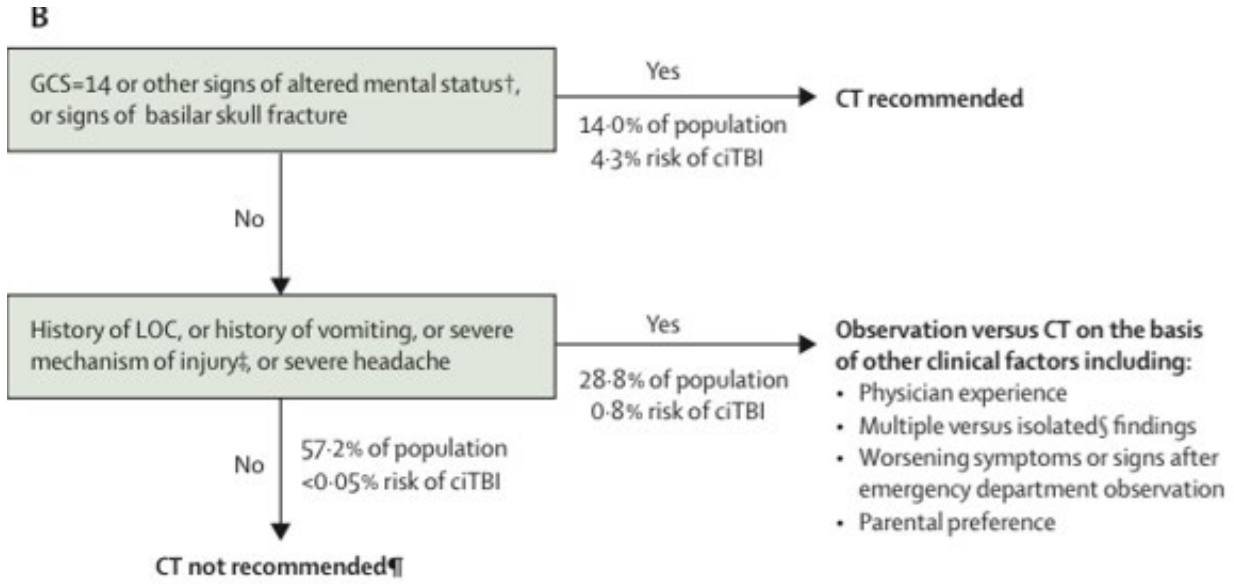
- ~240 million adults in US
- 2110 + adult trauma centers
- ~ 1 trauma center per ~113,744 adults
- ~ 91% of US has access to trauma center in 60 minutes

- ~ 79 million children in US
- 148 pediatric trauma centers (PTC) in US (Level I and Level II)
- ~ 1 PTC per ~ 533,784 children
- ~ 65% of children in US have access to PTC within 60 minutes

Pediatric Emergency Care Applied Research Network Guidelines (PECARN)

- Guides the decision for Head CT in pediatric patients





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Brain Injury Guidelines (BIG)

- Evidence-based, validated
- Stratifies patients into 3 groups – BIG 1, BIG 2 and BIG 3
- Optimize outcomes and reduce unnecessary interventions –
  - Transfer to trauma center
  - NS consult
  - Repeat head CT
- Adults

BIG Groups

Brain Injury Guidelines			
Variables	**BIG 1**	**BIG 2**	**BIG 3**
LOC	Yes/No	Yes/No	Yes/No
Neurologic examination	Normal	Normal	Abnormal
Intoxication	No	No/Yes	No/Yes
CAMP	No	No	Yes
Skull Fracture	No	Non-displaced	Displaced
SDH	$\leq$ 4mm	5 - 7 mm	$\geq$ 8 mm
EDH	$\leq$ 4mm	5 - 7 mm	$\geq$ 8 mm
IPH	$\leq$ 4mm, 1 location	3 – 7 mm, 2 locations	$\geq$ 8 mm, multiple locations
SAH	Trace	Localized	Scattered
IVH	No	No	Yes
THERAPEUTIC PLAN			
Hospitalization	No Observation (6hrs)	Yes	Yes
RHCT	No	No	Yes
NSC	No	No	Yes

BIG, brain injury guidelines; CAMP, Coumadin, Aspirin, Plavix; EDH, epidural hemorrhage; IVH, intraventricular hemorrhage; IPH, intraparenchymal hemorrhage; LOC, loss of consciousness; NSC, neurosurgical consultation; RHCT, repeat head computed tomography; SAH, subarachnoid hemorrhage; SDH, subdural hemorrhage

But what about the kids?

- Pediatric Brain Injury Guideline (pBIG)
- Can pBIG safely reduce need for repeat head CT or Neurosurgical consultation?
- Can pBIG be safely applied in pediatric TBI care?

- BIG for Kids (kBIG)
- BIG isn't verified for pediatric population
- Can BIG be applied safely to pediatric population?

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pBIG - 2020

- Can children with TBI be safely stratified to drive care?
- Need for repeat head CT, Neurosurgery consultation
- Retrospective study of 257 children with isolated TBI
- 94% of patients had NS consult
- 25% of patients had multiple head CTs
- Stratification into BIG 1, BIG 2 and BIG 3 categories can be done safely
- Applying BIG guidelines can reduce NS burden and CT/radiation exposure

pBIG - 2024

- Retrospective review – 139 patients with isolated head injury
- Mild – pBIG 1
- Moderate – pBIG 2
- Severe – pBIG 3
- Isolated Skull Fracture
- pBIG 1 and 2 can be safely managed without NS involvement
- Guideline adherence was lowest for pBIG 2 patients – suggests provider reluctance for independent mgmt of these patients
- More study is needed

kBIG

- Retrospective review of 1894 patients
- Stratified patients according to BIG criteria
- Resulted in 1.4% misclassification in BIG 2 patients
- Modified categories of minor skull fx, EDH, neurological exam and MOI
- Modifications improved the BIG 2 misclassification rate to 0.8%
- Modified Brain Injury Guidelines appears to be able to be safely applied to children
- More study is needed

ACS TQIP Best Practices

- Children with clinically significant injuries should be treated in a PTC or trauma center with pediatric capabilities
- Transfer to PTC may not necessary for low-risk injuries:
  - Low-energy blunt trauma
  - No concern for NAT
  - Low risk based on minor head injury PECARN CT guideline
  - Negative imaging OR
  - Imaging with isolated, non-displaced skull fracture without other intracranial injuries

Summary

- Pediatric TBI injury is a major public health issue in the US
- Adult Brain Injury Guidelines (BIG) have been demonstrated to safely allow TBI patients to be stratified into low, moderate and high-risk groups
- BIG Guidelines help reduce resource utilization and unnecessary transfers to trauma centers
- BIG is not validated for use in children, but two tools – pBIG and kBIG - appear to be safe stratification tools to guide pediatric TBI care.
- Additional evidence is still needed.

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Thank you, Portland!

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