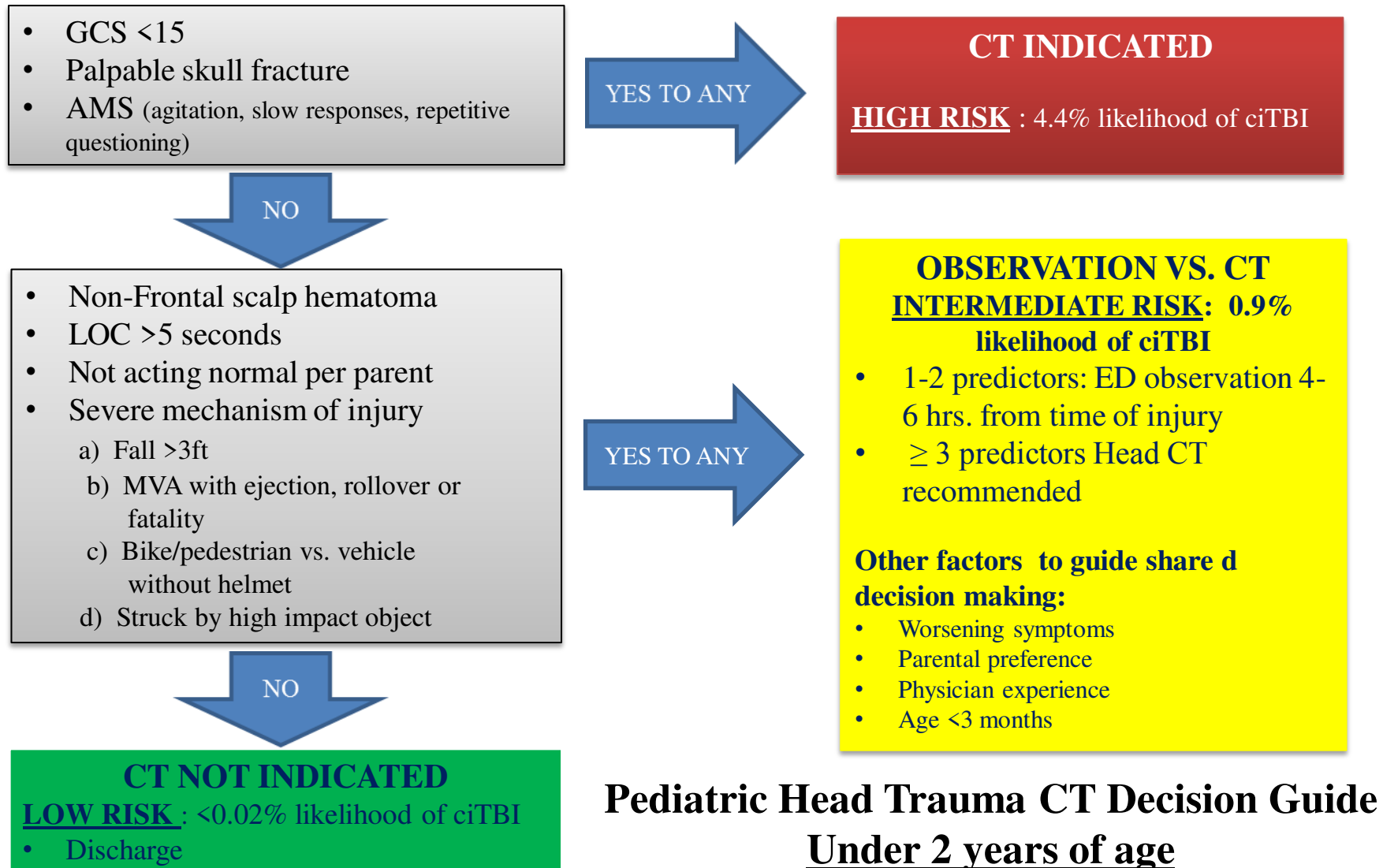


Data Supplement S1. Supplemental material

Table S1. ICD-10* Diagnosis Codes for Study Population		
Condition	ICD-10	Number of Codes in this category
Superficial injury of head	S00	451
Open wound of head	S01	417
Fracture of skull and facial bones	S02	256
Dislocation and sprain of joints and ligaments	S03	37
Injury of cranial nerve	S04	191
Injury of eye and orbit	S05	143
Intracranial injury	S06	789
Crushing injury of head	S07	25
Avulsion and traumatic amputation of part of head	S08	46
Other and unspecified injuries of head	S09	115
Other specifies and unspecified injuries of neck	S19	8
Other Headache syndrome	G44	6
* International Classification of Diseases 10th Version		

Table S2. Timeline and details of our Interventions

Time	Intervention	Detail
July 2017	Establish a multidisciplinary team	Engage stakeholders representing broad content and process perspective
July 2017	Head Injury themed journal club	Disseminate PECARN guidelines to faculty and trainees providers
August 2017	Presentation for ED group	Focused review of project purpose, background and rationale
August 2017	Monthly project team meetings	Analyze performance, identify barriers, and plan implementation strategy
October 2017	PECARN Visual Aids	Education and decision support
December 2017	Individual performance feedback	Sent via email on quarterly basis to engage and motivate providers
February 2018	Grand rounds	Broad project awareness and scope
March 2018	Data sharing with the group during staff meetings	Review aggregate performance and encourage engagement
June 2018	EMR integration of PECARN rules	Real time decision support
ED = Emergency Department PECARN = Pediatric Emergency Care Applied Research Network EMR = Electronic medical record		



Pediatric Head Trauma CT Decision Guide Under 2 years of age

Figure S1.

Source: Kuppermann et al. *Lancet* 2009;374:1160-70.

Nigrovic et al. *Pediatrics* 2015;136(1): e227-33; *Pediatrics* 2011;127:1067-73.

*ci-TBI: Clinically important traumatic brain injury defined as head injury resulting in death, intubation for > 24 h, neurosurgery, or ≥2 nights in the hospital for management of head injury

- GCS <15
- Signs of basilar skull fracture
- AMS (agitation, slow responses, repetitive questioning)



CT INDICATED
HIGH RISK: 4.3% likelihood of ciTBI



- Vomiting
- LOC
- Severe headache
- Severe mechanism of injury
 - a) Fall >5ft
 - b) MVA with ejection, rollover or fatality
 - c) Bike/pedestrian vs. vehicle without helmet
 - d) Struck by high impact object



OBSERVATION VS. CT
INTERMEDIATE RISK: 0.8%
likelihood of ciTBI

- 1-2 predictors: ED observation 4-6 hrs. from time of injury
- ≥ 3 predictors Head CT recommended

Others factors to guide shared decision making:

- Worsening symptoms
- Parental preference
- Physician experience



CT NOT INDICATED
LOW RISK: <0.05% likelihood of ciTBI

- Discharge

Pediatric Head Trauma CT Decision Guide 2 years and older

Figure S2.
 Source: Kuppermann et al. Lancet 2009;374:1160-70.
 Nigrovic et al. Pediatrics 2015;136(1): e227-33; Pediatrics 2011;127:1067-73.
 *ci-TBI: Clinically important traumatic brain injury defined as head injury resulting in death, intubation for > 24 h, neurosurgery, or ≥ 2 nights in the hospital for management of head injury

Step 1: If Peds CT-Head/Brain order set is selected in the ED, the below form open up for either < 2 or > 2 yrs based on patient's age to provide PECARN CT recommendation for MHI based upon selection

Pediatric Head Trauma CT Decision Guide (< 2 years old)

- Yes No GCS < 15
- Yes No Signs of Basilar / palpable skull fracture
- Yes No AMS (agitation, somnolence, repetitive questions)
- Yes No LOC \geq to 5 seconds
- Yes No Severe mechanism of injury
- Yes No Non-frontal scalp hematoma
- Yes No Not acting normally per parent

Examples of severe mechanism of injury < 2 years

- Fall > 3 feet
- MVA w/ ejection, rollover, fatality
- Pedestrian or bicyclist without helmet struck by vehicle
- Head struck by high impact object

Ordering Provider Comments

PECARN CT Recommendation

Low Risk - CT not recommended Intermediate Risk - Obs vs. CT High Risk - CT recommended

Step 2

After recommendation is made, following alert appears as a reminder

You are placing CT head order:
PECARN recommendation for
Intermediate risk :
Consider Obs vs. CT
Would you like to proceed ?

PECARN CT recommendation
appears at bottom:

High Risk: Yes to any- GCS < 15, signs of basilar/palpable skull fracture, or AMS

Intermediate Risk : Yes to 1 or more -LOC, severe mechanism of injury, non-frontal scalp hematoma, not acting normally per parent

Low Risk: No to all questions

Figure S3. PECARN Head Injury decision rule integrated with CT head order-set in EMR to provide real time decision support. Adapted for Atabaki et al. *Pediatr Qual Saf* 2017;2(3):e019.