

Clinical Decision Tool Reviews

Infant Scalp Score

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Abstract

This calculator quantifies the risk of traumatic brain injury in infants who have sustained a head injury. It may assist clinicians in decision-making regarding whether or not to obtain imaging in infants, particularly those less than 12 months of age, where the broader PECARN head injury decision rule may be less applicable.

I. HOW TO USE

When to Use

Use in infants who are asymptomatic at the time of evaluation with isolated scalp swelling.

Assists the clinician in determining if cranial imaging (head CT) is necessary in the workup of intracranial injury. Skull X-rays have poor sensitivity for ruling out skull fractures (especially smaller or nondisplaced ones) and cannot evaluate for the presence/absence of traumatic brain injury; as such they have poor clinical utility.

Pearls / Pitfalls

This tool was studied in asymptomatic patients and should be applied only to patients in that population. Therefore, this tool should NOT be used in patients who have/had any of the following:

- Loss of consciousness
- Lethargy or irritability
- Seizures
- 3 or more episodes of emesis
- Mental status changes
- Bulging fontanel

- Signs of neurologic injury
- Abnormal vital signs

It should also not be used in infants who present with suspected nonaccidental trauma.

Measurement of skull hematoma characteristics is somewhat subjective. The PECARN data set used by a large validation study (Schutzman et al., see Evidence Appraisal, below) used ranges of <1cm or barely palpable, 1-3cm, and >3cm and/or boggy.

Primary outcomes differed in various validation studies with one using skull fracture and another using the outcome of clinically important traumatic brain injury (ciTBI).

Why Use

Infants may have traumatic brain injury (TBI) even if there are limited symptoms present.

This score assists in determining the risk of intracranial injury based on patient age and hematoma characteristics.

If found to be low risk, head imaging may not be necessary.

II. NEXT STEPS

Advice

Not all head-injured infants require evaluation for nonaccidental trauma, but one should always consider that possibility, particularly for infants who are not yet walking or cruising.

Management

For patients with a score <4 , head imaging may not be necessary.

For patients with a score ≥ 4 , head imaging (usually with a CT) should be considered.

Some [studies](#) have recommended a cutoff of ≥ 5 for ciTBI.

As with all risk assessment scores, clinical judgment is essential.

Critical Actions

This tool should not be used in infants in whom nonaccidental trauma is a concern. Follow institutional protocols for decision-making regarding head imaging for nonaccidental trauma, and strongly consider consultation with a Child Abuse Pediatrician.

Remember to evaluate for other injuries even if the chief complaint is a head injury.

III. EVIDENCE

Evidence Appraisal

The derivation study (Greenes & Schutzman) evaluated 422 infants, 11% of whom were diagnosed with skull fracture and 3% of whom were diagnosed with intracranial injury. They developed the tool and found a sensitivity of 0.98 and specificity of 0.49 for skull fracture. All 13 cases of intracranial injury were detected by the decision rule. Skull fracture and intracranial injury correlated with the score variables of hematoma size and location, and weakly with younger age.

A prospective validation study in 2010 (Bin, Schutzman, & Greenes) found a score of 4 or greater had a sensitivity of 0.90 and specificity of 0.78 for detecting skull fractures. A score of 3 or greater had a sensitivity of 0.93 and specificity of 0.42 for intracranial injury.

A second validation study in 2021 (Schutzman, Nigrovic, & Mannix) of 1289 infants (12 months of age and younger) found a sensitivity of 1.0 and specificity of 0.49 for a cutoff of 4 points or greater for detecting clinically important traumatic brain injury*. ROC characteristics were also strong, with an AUC of 0.916 for clinically important TBI and 0.807 for any TBI**. It is important to note that this second validation study was retrospective

in nature, however it used a robust multi-center dataset (PECARN), which may increase its validity.

Additional, more recent validation studies have shown similar performance. A single-center retrospective performed at an academic medical center in Turkey (Guneyasu et al., 2023; N = 380) found a cutoff of 4 had a sensitivity of 100% and a specificity of 70.9%. Even with a cutoff of 5, representing a higher threshold to image, no patients with clinically important TBI were missed. A prospective single-center study from Iran (Riazi et al., 2025) showed similar performance but with a higher cutoff value. With a cutoff of 6, the AUROC was 0.876; a cutoff of 7 had an AUROC of 0.890. A higher cutoff may be more useful for determining high versus low risk, but further research is needed, and no society guidelines have recommended a specific cutoff value for determining whether a patient's injuries are "low" or "high" risk. Decision-making regarding injury should be individualized to the patient, and clinicians should remember that shared decision-making with the family can be useful in most circumstances.

*Clinically important TBI defined in this study (and the overall PECARN head injury rule) as: death from TBI, needing a neurosurgical intervention, intubation for at least 24 hours for TBI, or hospitalization for 2 or more nights for TBI.

**TBI was defined as any intracranial bleeding, pneumocephalus, cerebral edema, skull fracture with depression of at least the thickness of the skull, or diastasis abnormal cranial suture separation) of the skull.

Formula

The Infant Scalp Score is calculated by the addition of the selected points:

Variable	Points
Patient age (month)	>12
	6-11
	3-5
	0-2
Hematoma size	None
	Small (barely palpable)
	Medium (easily palpable)
	Large (boggy consistency)
Hematoma Location	Frontal
	Occipital
	Temporal/Parietal

Facts & Figures

Infant Scalp Score	Risk of TBI
<4	Low
≥ 4	High

Literature

Original/Primary Reference

[Greenes DS, Schutzman SA. Clinical significance of scalp abnormalities in asymptomatic head-injured infants: *Ped Emerg Care*. 2001;17\(2\):88-92.](#)

Validation

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