



Delayed presentations to emergency departments in children with head injury: A PREDICT study

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Thanks to all the staff at the sites





Mild to moderate blunt head injuries in children

- Common reason for presentation to EDs worldwide
- Decision-making dilemma need to CT scan vs against the risks of ionising radiation
- Majority of children present to hospital <24 hours after injury
- Subset present >24 hours
 - Concern is delayed or missed diagnosis of complicated skull fractures or intracranial injury



Background – Delayed presentations

- In adults
- delayed presentations have lower rates of intracranial injury
- account for 15% of cranial CTs undertaken
- Paediatric CDRs not derived for presentations >24hrs
- Studies in children <2 years old
 - intracranial haemorrhage occur at a similar rate to <24 hours
 - additional work-up for non-accidental injury may still be required



Australasian Paediatric Head Injury Study

Prospective observational study compare and externally validate 3 CDRs

- PECARN
- CHALICE
- CATCH

Accuracy of PECARN, CATCH, and CHALICE head injury decision rules in children: a prospective cohort study

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Aim of this study

Planned secondary analysis

Primary aim

 Determine the prevalence of clinically important traumatic brain injury (ciTBI) in children presenting with delayed presentations > 24 hours

Secondary aim

- To determine PECARN and CHALICE CDR predictor variables that increase the risk of ciTBI or TBI-CT
- To assist clinicians identify patients likely to require cranial CT scan or observation in hospital.



Methods

Inclusion criteria

<18 yrs, presenting to ED > 24hours post injury, GCS 14 -15

History / characteristics of episodes

Mechanism of injury

- falls (<1, 1-1.5, 1.5-3 and >3 m)
- road traffic incident
- high-speed injury from projectile/object

CDR variables

- vomiting, any LOC, headache, amnesia, seizure, NAI concern, altered mental state, depressed skull fracture, abnormal neurological examination, non-frontal scalp hematoma
- Bivariate logistic regression to assess independent associations in delayed presentation and other variables for ciTBI and TBI-CT



Definitions

TBI-on-CT

- Intracranial haem/contusion
- Cerebral oedema
- Diffuse axonal injury
- Shearing injury
- Sigmoid thrombosis
- Signs of brain herniation
- Midline shift
- Diastasis of skull
- Pneumocephalus
- Depressed skull fracture

ciTBI

- Death
- Intubation > 24h
- Neurosurgery
- Hospital admission \geq 2 nights



Results





Results

981 (5.0%) presented >24 hours

- 386 (39.4%) female
- 277 (28.3%) being <2 years

Mechanism

- 465 (**48.5%**) from falls <1 m
 - compared with 9,333 (**50.8%**) ≤24 hours
- 37 (**3.8%**) from road traffic incident
 - compared with 1038 (5.5%) ≤24 hours



CT Rate

213 (21.7%) had head CT scan >24 hrs

– compared with 1606 (8.6%) ≤24 hours

Relationship to Clinical Decision Rule Variables

| | After 24h | | Within 24h | |
|----------------------------|-----------|------|------------|------|
| | (n=981) | | (n=18784) | |
| CDR Variables | n | % | n | % |
| Assault (NAI concern) | 14 | 1.4 | 81 | 0.4 |
| Any vomiting | 290 | 30.0 | 3034 | 16.3 |
| Headache | 310 | 31.6 | 3735 | 19.9 |
| Non-frontal scalp hematoma | 204 | 20.8 | 3402 | 18.1 |
| Any LOC at time of injury | 107 | 11.4 | 2419 | 13.5 |
| Any Amnesia | 62 | 6.3 | 1544 | 8.2 |

No significant difference in symptoms/signs

Altered Consciousness Seizure



Traumatic Brain Injuries

TBI-on-CT

37 (3.8%) - OR 3.1 Depressed skull fracture 8 (0.8%, 0.4-1.67 95% CI) Intracranial haemorrhage/contusions 31 (3.2%, 2.2-4.5 95% CI)

ciTBI

Hospitalised > 2 nights

8 (0.8%, 0.4-1.6, 95% CI, OR 1.0 (0.5-2.0, 95% CI)

Neurosurgical Intervention

2 (0.2%, 0.0-0.5 95% CI)

No deaths



Bivariate Analysis

TBI-on-CT

30 with non-frontal scalp hematoma (OR 19.0) All 8 with suspicion of depressed skull fracture No cases of children with amnesia positive

ciTBI

Suspicion of depressed fracture (OR 19.6) Non-frontal scalp hematoma (OR 11.7) Presence LOC or amnesia not associated



Discussion

- 5% of children have delayed presentation after HI
- Higher CT rate (21.7% vs 8.6%)
- Low-impact falls
- Symptoms/signs
 - Non-frontal scalp hematoma
 - Headache
 - Any vomiting
 - Assault with NAI concerns
- Risk of TBI-on-CT is increased
- Features associated with TBI-on-CT and ciTBI
 - Suspicion of depressed skull fracture
 - Non-frontal scalp hematoma



Conclusion

- Current head injury CDR parameters are not validated for head injured children with delayed presentations
- Clinicians should evaluate and manage delayed presentations outside of CDRs
- In particularly look for variables which increase risk of TBI
 - suspicion of depressed skull #
 - non frontal haematoma



